Final Report

Formerly Used Defense Sites Remedial Investigation / Feasibility Study

Port Angeles Combat Range, Washington
FUDS Property No.: F0WA0033
Contract No.: W9128F 10 D 0058
Delivery Order: 0006

Military Munitions Response Program

March 2015

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Port Angeles Combat Range, Washington

Formerly Used Defense Sites - FUDS Property No.: F10WA0033

Remedial Investigation / Feasibility Study

Final Report

Military Munitions Response Program

March 2015

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1.0 Executive Summary

The Port Angeles Combat Range (PACR) Remedial Investigation (RI) results indicate that sufficient data were collected to complete the RI and meet the objectives to determine the nature and extent of areas impacted by munitions related activities, and provide data sufficient to determine whether further action is required under the Military Munitions Response Program (MMRP) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The original munitions response site (MRS) is recommended to be split into three separate MRSs, based on the nature and extent of munitions and explosives of concern (MEC)/munitions debris (MD) within each MRS. The RI results were used to perform a Feasibility Study (FS) to develop the remedial action objective (RAO) and remedial action alternatives appropriate to each MRS. The results provide sufficient information for stakeholders to make decisions regarding the need for further action or No Department of Defense (DoD) Action Indicated (NDAI).

The PACR was used from 1943 through 1944 to train troops in various types of weapons use. The range was intended to be used for tactical firing problems and short-range known distance firing (200 to 300 yards). Munitions that were utilized at the site include 37millimeter (mm) and 75mm projectiles, 60mm and 81mm mortars, and various small arms.

The objective of the RI was to characterize the presence, nature, and extent of areas impacted by munitions related activities and assess the risk to human health and the environment from munitions constituents (MC) and the remaining explosive hazard from MEC. Remedial Investigation field activities were conducted from mid-October to mid-December 2013. Field activities included assisted visual surveys (AVS), geophysical surveys, and subsurface investigations using hand-held analog geophysical instruments and in-situ X-ray Fluorescence (XRF) screening for lead in soil. XRF screening was conducted at locations where natural features (e.g., natural berm feature) or small arms debris were found. During the RI, MEC, MD, and small arms debris were found. The high density of coverage during the AVS and geophysical surveys, along with the results of subsurface investigations and in-situ XRF screening for lead in soil have met the objectives of the investigation.

During the AVS, field teams surveyed the accessible acreage in the MRS, walking a total of 112 miles of transects during which approximately 250 features documenting general site conditions and metal debris (non-military related) were recorded. Only one MD item (frag) was identified during the AVS. No MEC was observed during the ASV.

A geophysical survey was performed within the impact areas that were open and accessible. Once the geophysical survey was completed and areas with high metallic anomaly densities (i.e., 250 anomalies or greater) were identified, a subsurface investigation was performed using hand-held analog geophysical instruments to define the nature and extent of MEC/MD. One hundred and twenty four (124) grids were established and investigated. One hundred forty seven (147) MD items and 25 small arms debris items were observed in 53 grids located in the northeastern portion of the MRS.

Five MEC items, M63 37mm high explosive (HE) projectiles, were discovered during the RI. The first four M63 37mm HE projectiles were destroyed in consolidated disposal operations; the fifth M63 37mm HE projectile was destroyed separately in an adjacent location within grid Q-09.

In-situ XRF screening for lead in soil was conducted in two locations where natural features (e.g., natural berm feature) were found, and in one location where small arms debris was found. XRF screening was utilized to assist the field investigation team to determine sampling locations for laboratory analysis. A conservative in-situ XRF lead screening level of 125 milligrams/kilogram (mg/kg) (compared to the State of Washington [WA] lead soil cleanup level of 250 mg/kg) was utilized. Sixty-eight (68) in-situ XRF screening locations were sampled in two natural features. Forty-five (45) in-situ XRF screening locations were also sampled where small arms debris was found. A total of 113 in-situ XRF screening samples were collected from the three locations. All in-situ XRF screening results for lead were below 125 mg/kg. Thus, no soil samples were collected for laboratory analysis.

Conceptual site models (CSMs) for MEC and MC were updated to evaluate the human and ecological receptors and exposure pathways reflecting the fate and transport of MEC and MC. MEC was discovered during the RI; consequently the exposure pathway for contact with MEC in surface soil (0 – 6 inches deep) is considered complete for all human receptors. The exposure pathway for contact with MEC in subsurface soil (> 6 inches deep) is potentially complete.

If MEC are present in damaged condition, MC could potentially be released to the environment; however, based on historical investigations and the 2013 RI, the potential for human and ecological exposure to MC is likely very low. There is some degree of uncertainty associated with potential MEC items which could remain buried; however, all current information suggests that the soil exposure pathway for MC is likely incomplete or likely insignificant.

For organization and discussion purposes, the PACR parent MRS is discussed as three MRSs based on the different levels of risk as determined by the types and distribution of MEC/MD within each area; however, these three areas have not been formally designated as MRSs in this RI/FS report The first MRS, comprising 4% of the original PACR parent MRS, is recommended to be carried forward and retain the Range Complex No. 1 MRS designation. This 105.7-acre MRS comprises parcels encompassing the identified impact areas and surrounding terrain. The second MRS is designated the Range Complex No. 1 (a) MRS. This 1,286.5-acre MRS includes the areas adjacent to the delineated impact areas (i.e., the Range Complex No. 1 MRS). The third MRS is designated the Range Complex No. 1 (b) MRS. This 1,238.5-acre MRS is comprised of property within the Olympic National Park (ONP) that was not investigated because a programmatic agreement to conduct investigations and remedial actions between the National Park Service (NPS) and the DoD does not exist. The area within the ONP is at the furthest extents of the range safety buffer. Based on topography and the typical configuration of the munitions identified during the RI there is a low probability that munitions are present within the ONP.

RAOs for each MRS are identified and provide a basis for developing the remedial action alternatives that may be selected to address any possible remaining explosive hazards. Because there were no areas impacted by MC identified during the RI, alternatives addressing MC were not evaluated. General response actions applicable to one or more of the PACR Complex MRSs include a No Action (NA) alternative as required under CERCLA, Land Use Controls (LUCs), surface clearance, and subsurface clearance remedial actions. For purposes of the detailed analysis of alternatives, magnetometer and dig (mag and dig) was selected and used as a representative technology applicable for the subsurface clearance alternatives. The specific technology best suited for each clearance area will be selected during the remedial design.

The general response actions were selected individually or in combination to develop remedial action alternatives that apply to the Range Complex No. 1 MRS as follows:

- Alternative 1 – NA (cost to complete $0)
- Alternative 2 – LUCs for site visitors and site workers (cost to complete $501.1K)
- Alternative 3 – Surface clearance and LUCs (cost to complete $1,133.9K)
- Alternative 4 – Surface clearance, subsurface clearance, and LUCs (cost to complete $2,517.5K)
- Alternative 5 – Surface clearance, subsurface clearance, tree survey and clearance, and LUCs (cost to complete $3,195.7K)

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2.0 Introduction

The DoD has established the MMRP to address DoD sites suspected of containing MEC or MC. Under the MMRP, the United States Army Corps of Engineers (USACE) is conducting environmental response activities at Formerly Used Defense Sites (FUDS) for the Army, DoD's Executive Agent for the FUDS program.

The USACE must comply with the Defense Environmental Response Program (DERP) statute (10 United States Code [USC] 2701 et seq.), the Comprehensive Environmental Response Compensation, and Liability Act (CERCLA, 42 USC § 9601 et seq., Executive Orders (EOs) 12580 and 13016, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and all applicable DoD (e.g., DoD Management Guidance for the DERP [28 September 2001]) and Army policies in managing and executing the FUDS program. Because of the linkages between the DERP and CERCLA and the delegation of certain Presidential authorities under CERCLA to DoD, CERCLA is DoD's preferred framework for environmental restoration.

This RI/FS was conducted under contract to the USACE, Omaha District in accordance with Contract No. W9128F-10-D-0058, Task Order 006, and the USACE Statement of Objectives dated June 2012. This RI/FS presents the results of the field surveys and results of sampling and analysis and presents remedial alternatives to provide decision-makers with an appropriate range of options and sufficient information to compare and select alternatives.

2.1 Purpose

This RI/FS was conducted in support of the MMRP at the Range Complex No. 1 MRS at the former PACR, WA. Previous work at this MRS consists of research of historical documents, and preparation of an Inventory Project Report (INPR), an Archive Search Report (ASR), an ASR Supplement, and a Site Inspection (SI). The Range Complex No. 1 MRS was established at the conclusion of the SI and was recommended for further characterization in an RI and if needed and a FS to identify and analyze remedial action alternatives.

2.1.1 Report Outline

The contents and order of presentation of this RI/FS report includes the following sections and appendices:

Section 1.0 Executive Summary

Section 2.0 Introduction

Section 3.0 Project Remedial Response Objectives

Section 4.0 Characterization of MEC and MC

Section 5.0 Revised Conceptual Site Models and Remedial Investigation Results

Section 6.0 Contaminant Fate and Transport for MEC and MC

Section 7.0 Baseline Risk Assessment for MC and Hazard Assessment for MEC

Section 8.0 Summary of Results

Section 9.0 Identification and Screening Technologies for MEC and MC

Section 10.0 Development and Screening of Alternatives

Section 11.0 Detailed Analyses of Alternatives

Section 12.0 References

Appendices:

Appendix A Definitions

Appendix B Abbreviations and Acronyms

Appendix C Photo Documentation Log

Appendix D Survey Control

Appendix E Field Notes and Forms

Appendix F Geophysical Investigation Quality Control Data

Appendix G Instrument Verification Memorandum

Appendix H Ordnance Technical Data Sheets

Appendix I Demilitarization Documentation

Appendix J Summary of Lead in Soils - X-ray Fluorescence Screening Data

Appendix K Visual Sampling Plan Reports

Appendix L Munitions and Explosives of Concern Hazard Assessment Tables

Appendix M Munitions Response Site Prioritization Protocol Tables

2.2 Property Description and Problem Identification

The following subsections describe the PACR RI project, problem identification, and access controls and restrictions, as well as current and future land use at the PACR.

2.2.1 Property Description

The PACR FUDS property No.: F10WA0033 is located approximately seven miles southeast of the City of Port Angeles, in Clallam County, Washington. The PACR is partially located in Township 29 North, Range 5 West – Sections 5, 8, and 17 of the Willamette Meridian (**Figure 2-1**). The PACR is included in the MMRP Inventory in the Defense Environmental Programs Annual Report to Congress Fiscal Year 2011 (DENIX, 2012) under Federal Facility Identification number WA09799F318400 with range information as identified in **Table 2-1** below (DENIX, 2009).

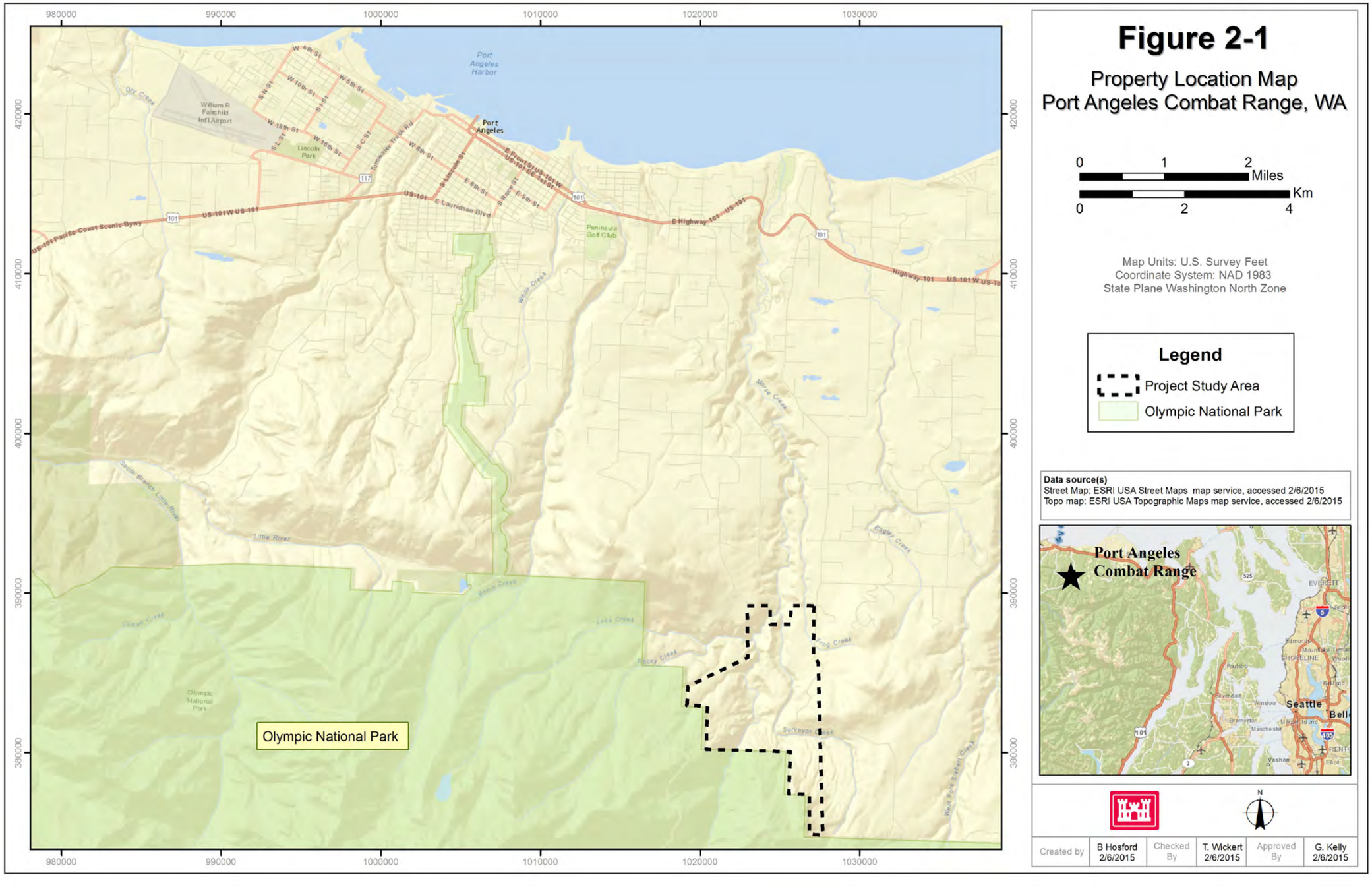

Figure 2-1

Property Location Map
Port Angeles Combat Range, WA

0 1 2 Miles
0 2 4 Km

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- Project Study Area
- Olympic National Park

Data source(s)
Street Map: ESRI USA Street Maps map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015

N

Created by	B Hosford 2/6/2015	Checked By	T. Wickert 2/6/2015	Approved By	G. Kelly 2/6/2015

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Table 2-1 Defense Environmental Restoration Programs Annual Report to Congress, Fiscal Year 2007, Site Inventory – Port Angeles Combat Range

Site ID*	RAC Score	Nearest City	Landowner Name	Ownership Interest	Range Total Acreage	Land Use Restrictions	Land Use Access Controls
01OEW	2	Port Angeles	Other / Federal Government	No Data Available	2,629	No Data Available	No Data Available

Note:
* Information presented in this table is per the SI Report
RAC = Risk Assessment Code

2.2.2 Buildings and Man-Made Features

There are 313 buildings within two miles of the MRS including primary residences on privately owned property within the MRS. There are no schools or hospitals with two miles of the MRS.

The private properties are served by electrical and phone utilities that branch off from the main lines along Deer Creek Road.

2.2.3 Current and Future Land Uses

The PACR is primarily maintained as a protected watershed for the City of Port Angeles, for timber production, as a National Park, and contains private residences (**Figure 2-2** and **Figure 2-3**). During the hunting season, the field team saw evidence of deer hunting and encountered numerous hunters each day while conducting the field investigation. The field team also saw and heard occasional evidence of recreational target shooting (e.g., improvised targets).

The closest population center is the City of Port Angeles, WA located approximately seven miles to the northwest of the PACR. The 2010 census population for the City of Port Angeles is 19,038. The 2010 population density for Clallam County is 40.4 persons per square mile (USCB, 2010).

The Census Block Group closest to the northern boundary of the PACR has a population density of 126 persons per square mile. Estimated populations within a four-mile radius and two-mile radius of the PACR property boundary are 3,887 and 1,064, respectively. The estimated numbers of households within a four-mile radius and two-mile radius of the PACR property boundary are 1,769 and 496, respectively (**Figure 2-4**).

The future use of the PACR is anticipated to be the same or very similar to the current use. Parts of the PACR will continue to be maintained as a protected watershed for the City of Port Angeles. Manke Timber Corporation owns eight parcels with the PACR and the Green Crow Company manages one parcel for timber harvesting.

Additional residential development in privately owned portions of the site should be anticipated. Future plans include the continuation of forest management, hunting, and possibly fish and wildlife conservation.

2.2.4 Access Controls and/or Restrictions

There are a number of land owners and leaseholders associated with the PACR and vicinity. These owners and lessees are within the FUDS boundary and include the City of Port Angeles, Clallam County, Washington Department of Natural Resources (WDNR) and private individuals or corporations (e.g., Manke Timber Corporation). A significant portion of the PACR is owned and maintained as a watershed for Port Angeles. The City permits cattle grazing in some areas. According to the ASR, no land in the PACR is owned by any DoD or other federal agency (USACE, 1996).

Right of Entry (ROE) was not obtained by the USACE during the RI for the following areas:

- **Parcel 47730** (87.2 acres) - located in the southeast corner of the PACR
- **Parcel 47501** (3.9 acres) - located on the eastern boundary of the PACR
- **Parcel 47404** (14.5 acres) - located in the northeastern corner of the PACR
- **ONP** (1,238.5 acres) – located in the southern portion of the PACR. The acreage within the ONP was not investigated because the NPS and the DoD do not have a programmatic agreement to address MMRP sites.

Refer to **Figure 2-3** for the location of the ONP and parcels where ROE was not obtained during the RI.

The MRS is accessible to the general public on the east side from the Deer Park Road side of the MRS. During the RI field investigation in 2013, barbed wire fencing was observed along the Deer Park Road boundary in the northern portion of the PACR. The fencing was in poor condition and was propped up in places. A few munitions hazards warning signs are still present within the MRS. The MRS is also accessible from Snow Ridge Road on the west side of the MRS. The field teams were able to walk into the MRS along a logging easement maintained by Manke Timber Corporation. The MRS is not accessible from Hurricane Ridge Road on the southwest side of the MRS. The field team tried to access the MRS from multiple access points along Hurricane Ridge Road; however, the terrain was too steep and treacherous for entry.

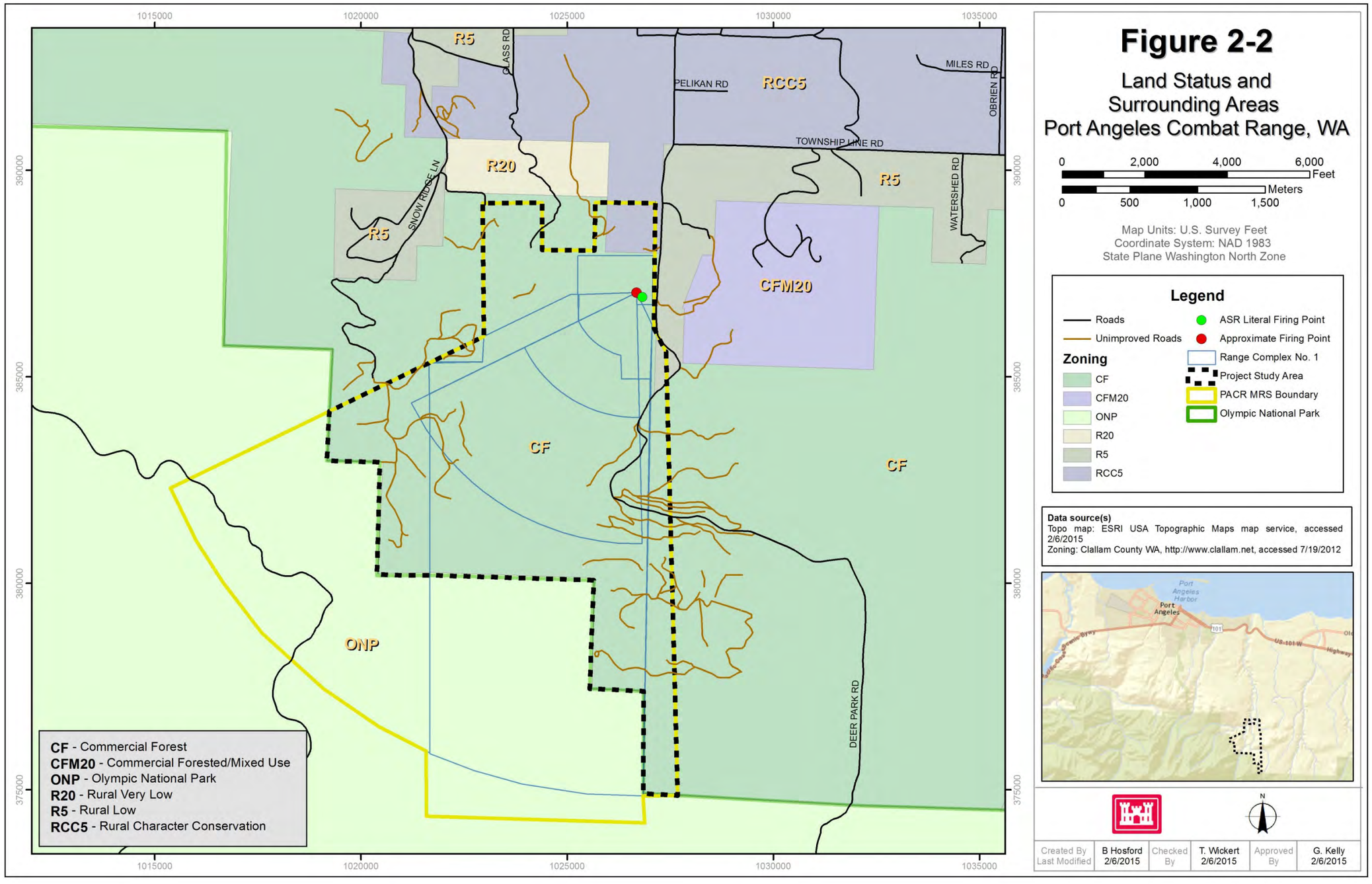

Figure 2-2

Land Status and Surrounding Areas Port Angeles Combat Range, WA

0 2,000 4,000 6,000 Feet
0 500 1,000 1,500 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- Roads
- Unimproved Roads
- ASR Literal Firing Point
- Approximate Firing Point
- Range Complex No. 1
- Project Study Area
- PACR MRS Boundary
- Olympic National Park

Zoning

- CF
- CFM20
- ONP
- R20
- R5
- RCC5

Data source(s)
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Zoning: Clallam County WA, http://www.clallam.net, accessed 7/19/2012

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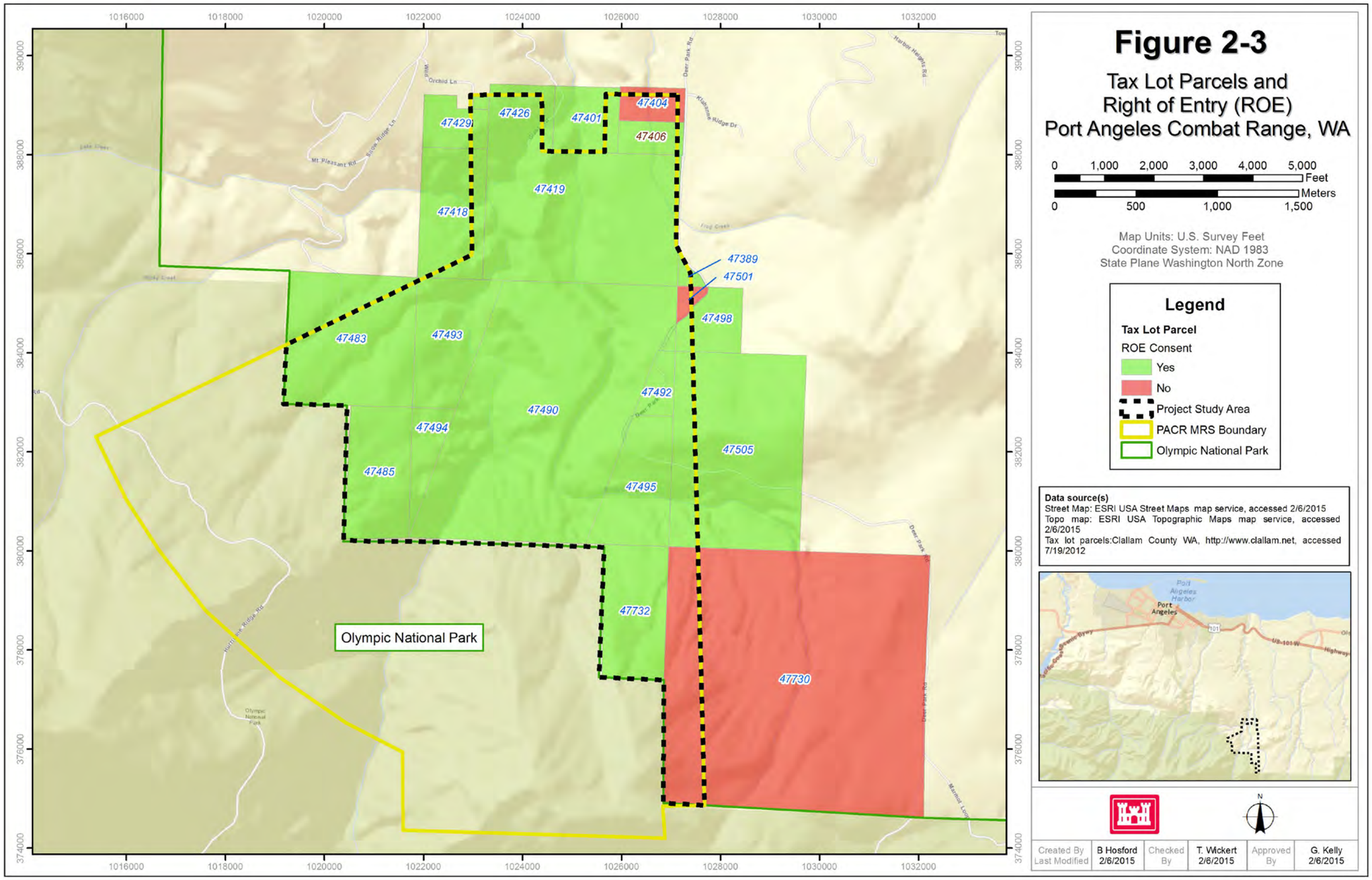

Figure 2-3

Tax Lot Parcels and Right of Entry (ROE) Port Angeles Combat Range, WA

0 1,000 2,000 3,000 4,000 5,000 Feet
0 500 1,000 1,500 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

Tax Lot Parcel
ROE Consent
- Yes
- No
- Project Study Area
- PACR MRS Boundary
- Olympic National Park

Data source(s)
Street Map: ESRI USA Street Maps map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Tax lot parcels:Clallam County WA, http://www.clallam.net, accessed 7/19/2012

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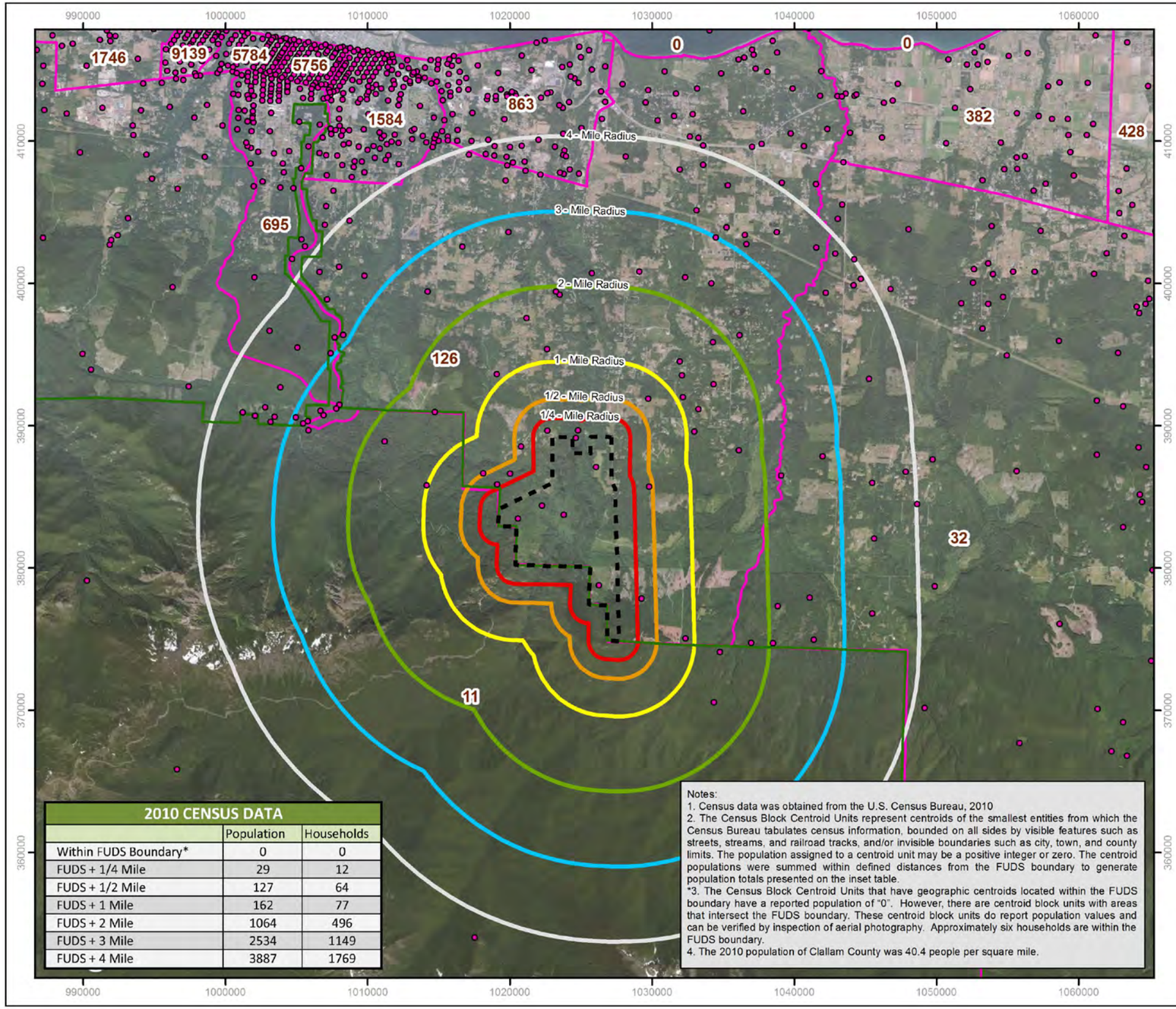
Figure 2-4

Nearby Census Population
Port Angeles Combat Range, WA



2010 CENSUS DATA		
	Population	Households
Within FUDS Boundary*	0	0
FUDS + 1/4 Mile	29	12
FUDS + 1/2 Mile	127	64
FUDS + 1 Mile	162	77
FUDS + 2 Mile	1064	496
FUDS + 3 Mile	2534	1149
FUDS + 4 Mile	3887	1769

Notes:
1. Census data was obtained from the U.S. Census Bureau, 2010
2. The Census Block Centroid Units represent centroids of the smallest entities from which the Census Bureau tabulates census information, bounded on all sides by visible features such as streets, streams, and railroad tracks, and/or invisible boundaries such as city, town, and county limits. The population assigned to a centroid unit may be a positive integer or zero. The centroid populations were summed within defined distances from the FUDS boundary to generate population totals presented on the inset table.
*3. The Census Block Centroid Units that have geographic centroids located within the FUDS boundary have a reported population of "0". However, there are centroid block units with areas that intersect the FUDS boundary. These centroid block units do report population values and can be verified by inspection of aerial photography. Approximately six households are within the FUDS boundary.
4. The 2010 population of Clallam County was 40.4 people per square mile.

0 1 2 3 Miles
0 2 4 6 Km

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- Census Block Centroid Unit
- Census Block Group (Showing Number of People Per Square Mile)
- Project Study Area
- Olympic National Park

Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015



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2.2.5 Climate

The MRS area climate 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 (USACE, 1996). The average maximum high temperature within the City of Port Angeles occurs in July at 68.4 degrees Fahrenheit (°F) and the minimum average low temperature occurs in January at 34.1°F. The average annual precipitation is 25.0 inches, which occurs primarily between October and April. Average total snowfall is 4.1 inches (WRCC, 2013). See **Table 2-2** for monthly averages.

Table 2-2 Climate Table – Port Angeles Combat Range

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (ºF)	44.9	47.4	50.2	54.9	60.3	64.2	68.4	67.9	65.0	57.1	49.6	45.9	56.3
Average Min. Temperature (ºF)	34.1	35.4	36.9	40.3	44.9	49.1	51.7	52.0	48.7	43.4	38.2	35.5	42.5
Average Total Rainfall (inches)	3.9	2.7	2.1	1.3	1.3	0.9	0.5	0.8	1.1	2.5	4.0	4.3	25.0
Average Total Snow Fall (in.)	1.7	0.9	0.4	0	0	0	0	0	0	0	0.3	0.8	4.1
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

2.2.6 Topography

The Range Complex No. 1 MRS is located within the State of WA and the Olympic Peninsula. The land is hilly to mountainous. The northern portion of the Range Complex No. 1 MRS contains areas of meadowland/grassland, but other areas are densely forested. The minimum and maximum elevations of the MRS are approximately 700 feet in the north and 3,541 feet in the south at Round Mountain. Deep erosion features associated with Morse and Surveyor Creeks are present at the MRS and likely follow the same channels present during historical U.S. Army training activities. Topography, including surface elevations and prominent features, is illustrated on **Figure 2-5**.

2.2.7 Hydrology

Three creeks transect the MRS flowing from south to north; Surveyor Creek, Frog Creek, and Morse Creek (**Figure 2-6**). These creeks flow north toward the City of Port Angeles. Property associated with the MRS serves as a watershed for the City of Port Angeles. A surface water intake is located at the location labeled as “Port Angeles Dam” on **Figure 2-6** and the second intake is located approximately 1,200 feet downstream of the dam. The intake at “Port Angeles Dam” is within the MRS boundary.

The United States Fish & Wildlife Service (USFWS) National Wetlands Inventory indicates a 0.43-acre wetland in the southern portion of the large meadow present within the MRS. The wetland is classified as freshwater emergent. It is specifically described as a palustrine, emergent, persistent, seasonally flooded wetland. Wetlands of this type are dominated by trees, shrubs, emergents, and mosses or lichens. Surface water is present for extended periods, especially early in the growing season (USFWS, 2013). The wetland was not investigated, as no ROE was granted for the privately owned parcel in which it is located (parcel 47501).

2.2.8 Soil and Vegetation

Soils present at the MRS are Elwha gravelly sandy loam, Neilton very gravelly sandy loam, Puget silt loam, and Terbies very gravelly sandy loam (NRCS, 2007) (**Figure 2-7**). During the 2008 SI sampling, the surface soils were described as consisting of silty sand (Shaw, 2009).

Vegetation on the MRS consists of primarily second growth fir and alder with some cedar trees. In forested areas, the MRS has very dense undergrowth that makes access difficult. Recently logged areas have very dense growth of small trees and shrubs that makes these areas nearly inaccessible.

Review of historical aerial photographs indicates that the areas of meadowland/grassland have been present since at least 1939, and contained target features used for artillery practice. The southern portion of the MRS (buffer zone) is located within the ONP.

2.2.9 Geology

Geology of the area is controlled by the converging of two tectonic plates (Juan de Fuca and North American plates). Underlying the MRS 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 glaciations over much of the Olympic Peninsula and Puget Lowland, leaving thick glacial outwash deposits over older rocks (NRCS, 2007). North of the MRS, these glacial outwash deposits pinch out and bedrock is covered by deposits of rocky alluvium on hillsides and by sands and gravels with silt in areas of low relief (Shaw, 2009).

2.2.10 Hydrogeology

Shallow groundwater in the region occurs in gravelly units within the glacial outwash deposits. In the MRS vicinity groundwater occurs within sand and gravel units that overlie the bedrock. Based on well logs, groundwater occurs in these units at a depth ranging from 50 to 120 feet. Regional groundwater flow is to the north from the highlands to the Strait of Juan de Fuca. A site resident indicated that depth to groundwater at his domestic well was approximately 18 feet below ground surface (bgs). No well log is available to determine the well depth or geology. Because of the surface streams in the area, shallow groundwater flow within the MRS is likely toward nearby streams where it is assumed to discharge (Shaw, 2009).

Drinking water in the area is obtained from the Clallam County Public Utility District (PUD) No. 1 and private water supply wells. Clallam County PUD No. 1 obtains water from Morse Creek at two water intake structures. There are two private domestic wells located in the northern portion of the MRS (Shaw, 2009). The total depth of the Mortensen well is 285 feet bgs and the Whitcomb well is 116 feet bgs. Static water levels were recorded as 0 feet and 30 feet below top of casing (btoc), respectively. Both wells were installed by Louie's Well Drilling Inc. (WDOE, 2013).

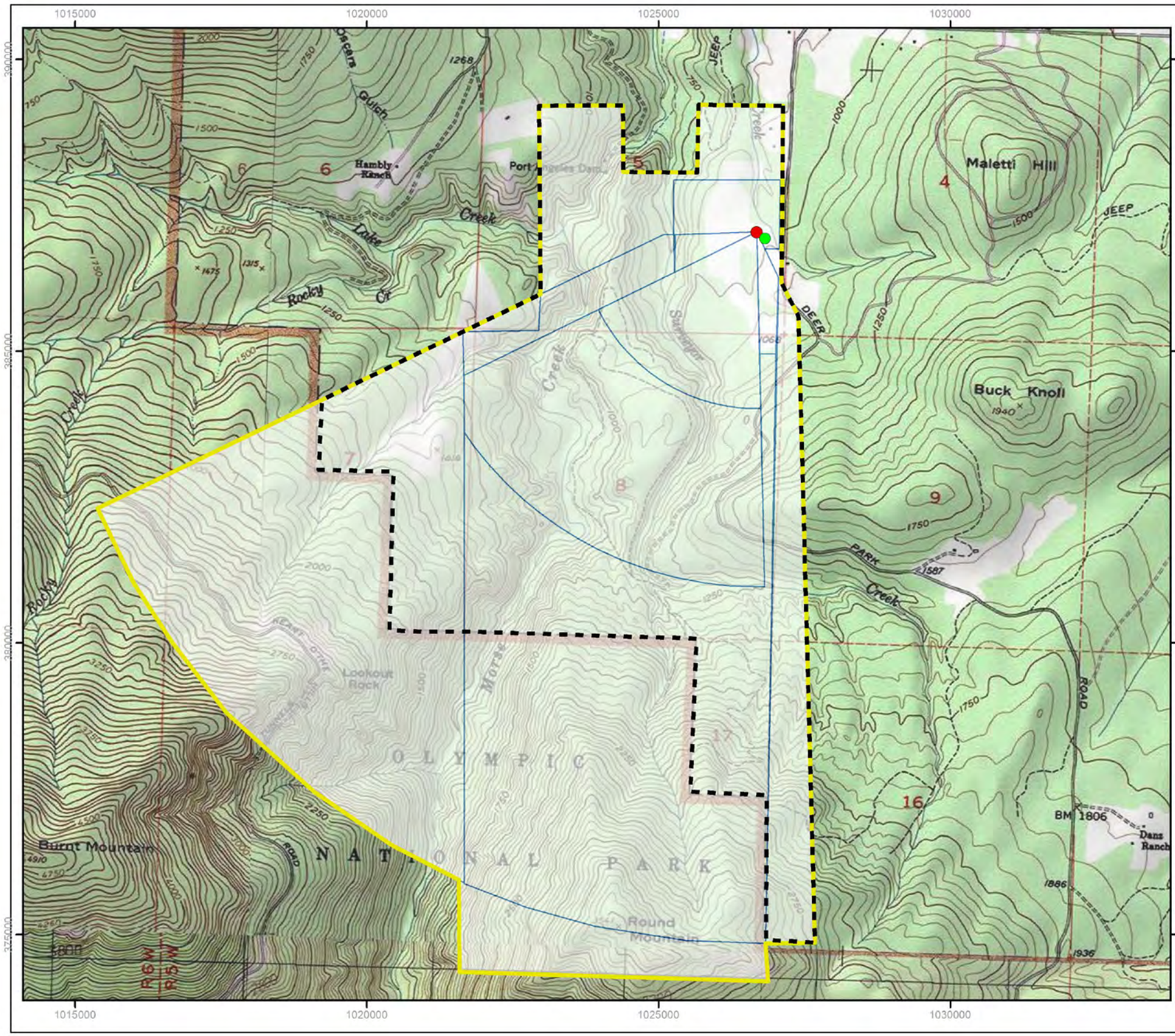

Figure 2-5

Topography
Port Angeles Combat Range, WA

0 1,000 2,000 3,000 4,000 5,000 Feet
0 500 1,000 1,500 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- ASR Literal Firing Point
- Approximate Firing Point
- Range Complex No. 1
- Project Study Area
- PACR MRS Boundary

Data source(s)
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015



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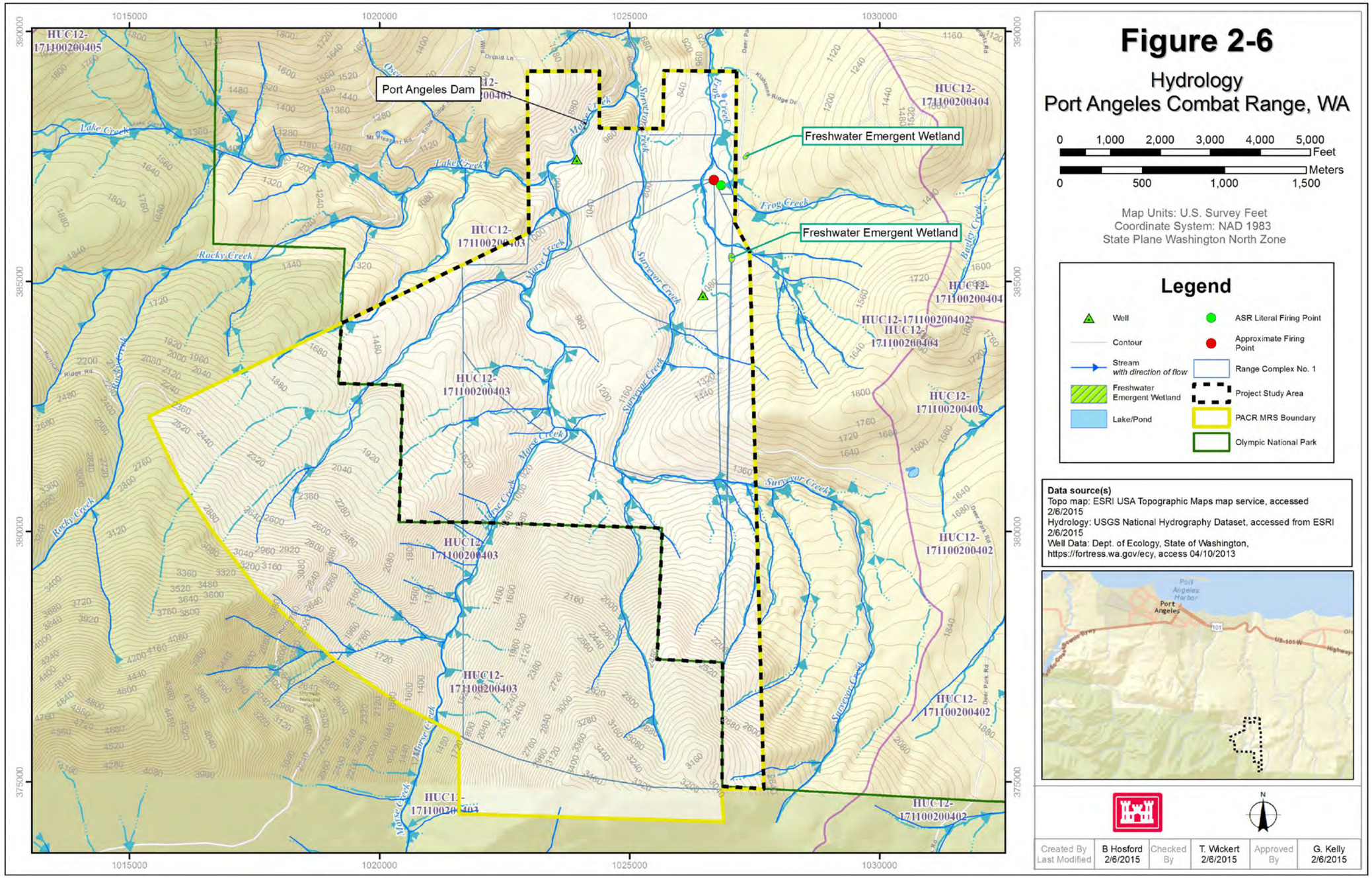

Figure 2-6

Hydrology
Port Angeles Combat Range, WA

0 1,000 2,000 3,000 4,000 5,000 Feet

0 500 1,000 1,500 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- Well
- Contour
- Stream *with direction of flow*
- Freshwater Emergent Wetland
- Lake/Pond
- ASR Literal Firing Point
- Approximate Firing Point
- Range Complex No. 1
- Project Study Area
- PACR MRS Boundary
- Olympic National Park

Data source(s)
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Hydrology: USGS National Hydrography Dataset, accessed from ESRI 2/6/2015
Well Data: Dept. of Ecology, State of Washington, https://fortress.wa.gov/ecy, access 04/10/2013

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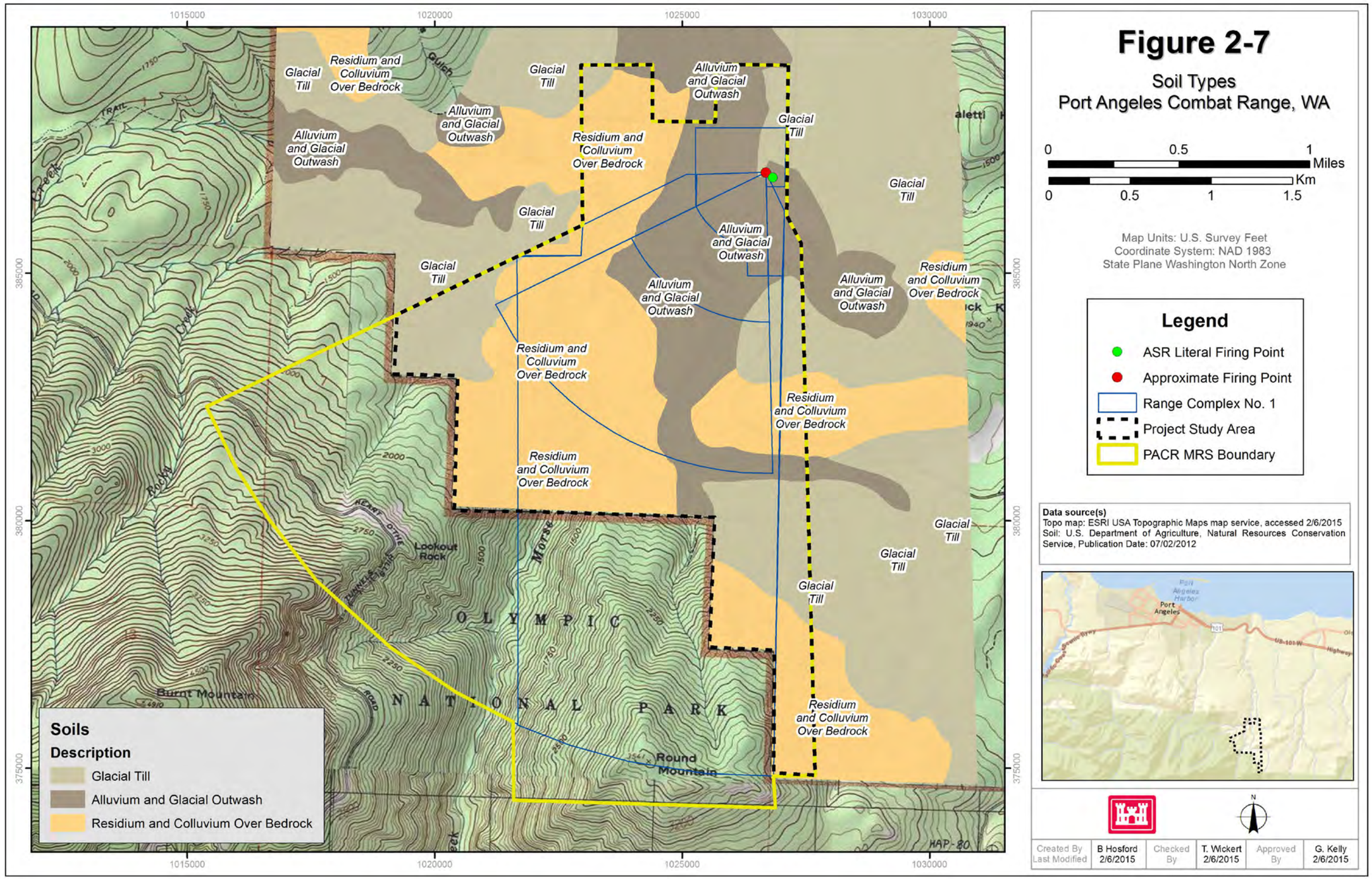

Figure 2-7

Soil Types
Port Angeles Combat Range, WA

0 0.5 1 Miles
0 0.5 1 1.5 Km

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- ASR Literal Firing Point
- Approximate Firing Point
- Range Complex No. 1
- Project Study Area
- PACR MRS Boundary

Data source(s)
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Soil: U.S. Department of Agriculture, Natural Resources Conservation Service, Publication Date: 07/02/2012

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2.2.11 Potential Receptors

2.2.11.1 ECOLOGY

The MRS contains varied habitat that supports a range of wildlife. The USFWS listing (USFWS, 2013a) identifies the following Threatened and Endangered (T&E) species that may be present on or near the MRS:

- Bull Trout (Salvelinus confluentus) – Coastal Puget Sound distinct population segment (DPS) - Threatened
- Marbled Murrelet (Brachyramphus marmoratus) – Threatened
- Northern Spotted Owl (Strix occidentalis caurina) – Threatened
- Short-tailed albatross (Phoebastria albatrus) [outer coast] – Endangered

There is federally designated critical habitat for the following T&E species in Clallam County:

- Bull Trout
- Marbled Murrelet
- Northern Spotted Owl

There is there is no designated critical habitat located on the MRS; however, there is federally designated critical habitat located within one-mile of the MRS. Recovery Plans have been published by the USFWS for the Marbled Murrelet and the Northern Spotted Owl (*http://ecos.fws.gov/tess_public/pub/speciesRecovery.jsp?sort=1*) (USFWS, 2014).

The USFWS also maintains species, which are candidate species and proposed species for listing (USFWS, 2013a). The species that are proposed for listing in the State of Washington and possibly present in Clallam County include:

- White Bluffs bladderpod (Physaria douglasii ssp. tuplashensis) – Proposed Threatened;
- Umtanum Desert buckwheat (Eriogonum codium) – Proposed Threatened
- Taylor's Checkerspot (Euphydryas editha taylori) – Proposed Endangered
- Streaked Horned lark (Eremophila alpestris strigata) – Proposed Threatened
- Olympia pocket gopher (Thomomys mazama pugetensis) – Proposed Threatened
- Roy Prairie pocket gopher (Thomomys mazama glacialis) – Proposed Threatened
- Tenino pocket gopher (Thomomys mazama ssp. tumuli) – Proposed Threatened
- Yelm pocket gopher (Thomomys mazama ssp. yelmensis) – Proposed Threatened
- North American wolverine (Gulo gulo luscus) – Proposed Threatened
- Dolly Varden (Salvelinus malma) – Proposed Similarity of Appearance (Threatened)

Species identified as *candidates* for Federal listing (USFWS, 2013a) which are known or believed to occur in the State of Washington and possibly in Clallam County include:

- Yellow-Billed Cuckoo (Coccyzus americanus)
- Oregon Spotted frog (Rana pretiosa)
- Canada Lynx (Lynx canadensis)
- Whitebark pine (Pinus albicaulis)
- Brush Prairie pocket gopher (Thomomys mazama ssp. douglasii)
- Olympic pocket gopher (Thomomys mazama ssp. melanops)
- Shelton pocket gopher (Thomomys mazama ssp. couchi)

- Tacoma Western pocket gopher (Thomomys mazama tacomensis) (Pacific Region)
- Greater sage-grouse (Centrocercus urophasianus)
- Washington ground squirrel (Urocitellus washingtoni)
- Northern Wormwood (Artemisia borealis var. wormskioldii)

Information pertaining to T&E species was sought as part of the planning process. According to the ASR, "Earlier conversations with the Clallam County Extension Office and the NPS environmental personnel, along with review of Environmental Impact Statements and reports from the Natural Heritage Program, indicated there was no confirmed existence of any endangered plant or animal species within the project site. However, it was noted that complete surveys of the area were not done, and it was likely that at least some of the state threatened or endangered wildlife species would occur in a "transient mode" (USACE, 1996). During the RI, the field investigation teams learned that in the past, adjacent landowners had participated in Northern spotted owl surveys conducted by the Washington Department of Natural Resources.

Priority areas for the Marbled Murrelet in Clallam County are near the MRS (WDFW, 2008). Priority areas for anadromous and resident fish are also nearby (Shaw, 2009). Washington Department of Fish and Wildlife (WDFW) Conservation Division defines priority areas as follows: *"Species are often considered a priority only within known limiting habitats (e.g., breeding areas) or within areas that support a relatively high number of individuals (e.g., regular concentrations)*" (WDFW, 2008). The WDNR indicated that there were no records for rare plants or high quality native ecosystems near the MRS (WDNR, 2008).

USFWS Pacific Region 1 Washington Office, the WDNR, and the WDFW Conservation Division are jointly tasked with enforcing Federal statutes with respect to the Endangered Species Act (ESA). In addition, these agencies designate species within the State of Washington that may need specific and additional protection and habitat conservation.

The WDFW Conservation Division provided a comprehensive Federal and State summary of T&E and candidate species for listing and species of concern at their website (*http://wdfw.wa.gov/conservation/endangered/*) (WDFW, 2012).

2.2.11.2 NATURAL RESOURCES

The MRS contains abundant natural resources. The area contains forests, rangeland, streams, and wetlands. The MRS is primarily maintained as a protected watershed for the City of Port Angeles. Manke Lumber Company manages eight parcels of commercial timberlands within the MRS and the Green Crow Company manages one parcel for timber harvesting. The ONP borders the southern boundary of the MRS.

At the completion of the RI, disturbed areas such as where the on-site portable magazine was staged, the demolition area grid Q-09, and parking areas where vegetation had been removed or damaged was hand-seeded with a native seed mix. Inside Passage Seed and Native Plant Services (http://www.insidepassageseeds.com/) (Inside Passage, 2013) was consulted regarding suitable native plants for the MRS. The native seed mixture presented below was utilized for restoration efforts:

6% *Achillea millefolium* Yarrow
10% *Agrostis exarata,* Pacific bentgrass
12% *Danthonia californica,* California oatgrass
18% *Deschampsia caespitosa,* Tufted Hair-grass or Tussock grass
12% *Elymus glaucus*, Wild rye
20% *Festuca rubra*, red fescue or creeping red fescue
8% *Hordeum brachyantherum*, Meadow barley
10% *Lupinus spp.*, Lupine
4% *Prunella vulgaris*, common self-heal or heal-all
100%

2.2.12 Known Explosive Hazards

PACR was used from 1943 through 1944 to train troops in various types of weapons use. The range was intended to be used for tactical firing problems and short-range known distance firing (200 to 300 yards). The ASR also indicated that there were reports that land mines were used at the PACR. An U.S. Army investigator noted a practice land mine was found.

Previous investigations and clearances conducted within the Range Complex No. 1 MRS have identified MEC and MD items, including 81mm mortars, 75mm projectiles, and 37mm projectiles. The historical activities, documented munitions use, and the MEC and MD findings indicate that there is potential for remaining surface and subsurface MEC, and associated MC contamination in the MRS. This RI/FS was performed to the determine the nature and extent of areas impacted by munitions related activities, as well as determine the risk posed to human health and the environment by MEC and MC contamination with the Range Complex No. 1 MRS.

2.3 Historical Information

The following subsections describe the range mission and history of munitions use, and previous investigations conducted at the PACR.

2.3.1 Installation Mission and Operational History

In early 1943, the U.S. Army requested that land be leased in the area of Port Angeles, WA for use as a ground-to-ground 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 of the Willamette Meridian for use as the PACR. The INPR (USACE, 1993) indicated the range was used for weapons practice with 37mm and 75mm projectiles, 60mm and 81mm mortars, and various small arms.

The ASR also indicated that there were reports that land mines were used at the PACR. An U.S. Army investigator noted a practice land mine had been found. There were no buildings or improvements constructed at the PACR 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 directly at stationary and moving targets (targets and tanks pulled across the range using cables). Indirect firing occurred 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 U.S. Army to perform any range clearance prior to returning the range lands to private ownership. In addition, there was no information to indicate that the U.S. Army attempted to notify landowners of the actual use of the former range in terms of potential hazards that could remain.

As a result, two youths were killed in August 1948, when a 37mm shell exploded while they were cutting downed timber within the former range. The 37mm shell was embedded in a log they were sawing. Immediately after the death of the two youths, the U.S. Army initiated the dedudding of the area expected to be impacted. 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. Copies of the Certificate of Clearances are included as Appendix E within the ASR (USACE, 1996). It should be noted that there were no standard operating procedures (SOPs) identified that document the level of effort for the clearances; however, the typical procedures for clearances performed circa 1950s do not meet the quality requirements of today's standards. In addition to the clearances being conducted, at some point in the late 1940s, signs were posted warning the public of dangers from munitions and explosive materials at the site. The information included in the ASR (e.g., Certificate of Clearances) has been analyzed and any spatial information that could be accurately extracted is displayed on **Figure 2-8**.

In 1963, 652 acres were purchased by the U.S. Army to restrict and control access to the property. The 652 acres were retained until 1968 when they were transferred to the City of Port Angeles and to Mr. Raymond Diehl. Records indicated that the quitclaim deed included a "surface use only" and indemnity clause. None of the accumulated evidence summarized in the ASR indicated that chemical warfare materiel (CWM) or chemical agent identification sets (CAIS) were used at the PACR, and based upon the documented site usage, there is no reason to suspect the presence of CWM or CAIS (USACE, 1996).

2.3.2 Summary of Munitions Related Activities

PACR was used from 1943 through 1944 to train troops in various types of weapons use. The range was intended to be used for tactical firing problems and short-range known distance firing (200 to 300 yards). The INPR indicated the range was used for weapons practice with 37mm and 75mm projectiles, 60mm and 81mm mortars, and various small arms (USACE, 1993). The ASR (USACE, 1996) and ASR Supplement (USACE, 2004) indicate that 37mm (target practice, high explosive, and armor piercing), 75mm (practice, high explosive, and white phosphorus [WP] smoke), 60mm mortar (high explosive and practice), and 81mm mortar (high explosive, practice, and WP smoke) were used at the PACR. The ASR also included unverified reports of the use of M9A1 High Explosive Anti Tank (HEAT) rifle grenades, 2.36-inch rockets (practice and HEAT), and anti-personnel and anti-tank practice mines. The quantities of munitions used at the PACR are unknown.

Previous investigations and clearances conducted within the Range Complex No. 1 MRS have identified MEC and MD items, including 81mm mortars, 75mm projectiles, and 37mm projectiles. The historical activities, documented munitions use, and the MEC and MD findings indicate that there is potential for remaining surface and subsurface MEC, and associated MC contamination in the MRS. This RI/FS was performed to the determine the nature and extent of areas impacted by munitions related activities, as well as determine the risk posed to human health and the environment by MEC and MC contamination with the Range Complex No. 1 MRS.

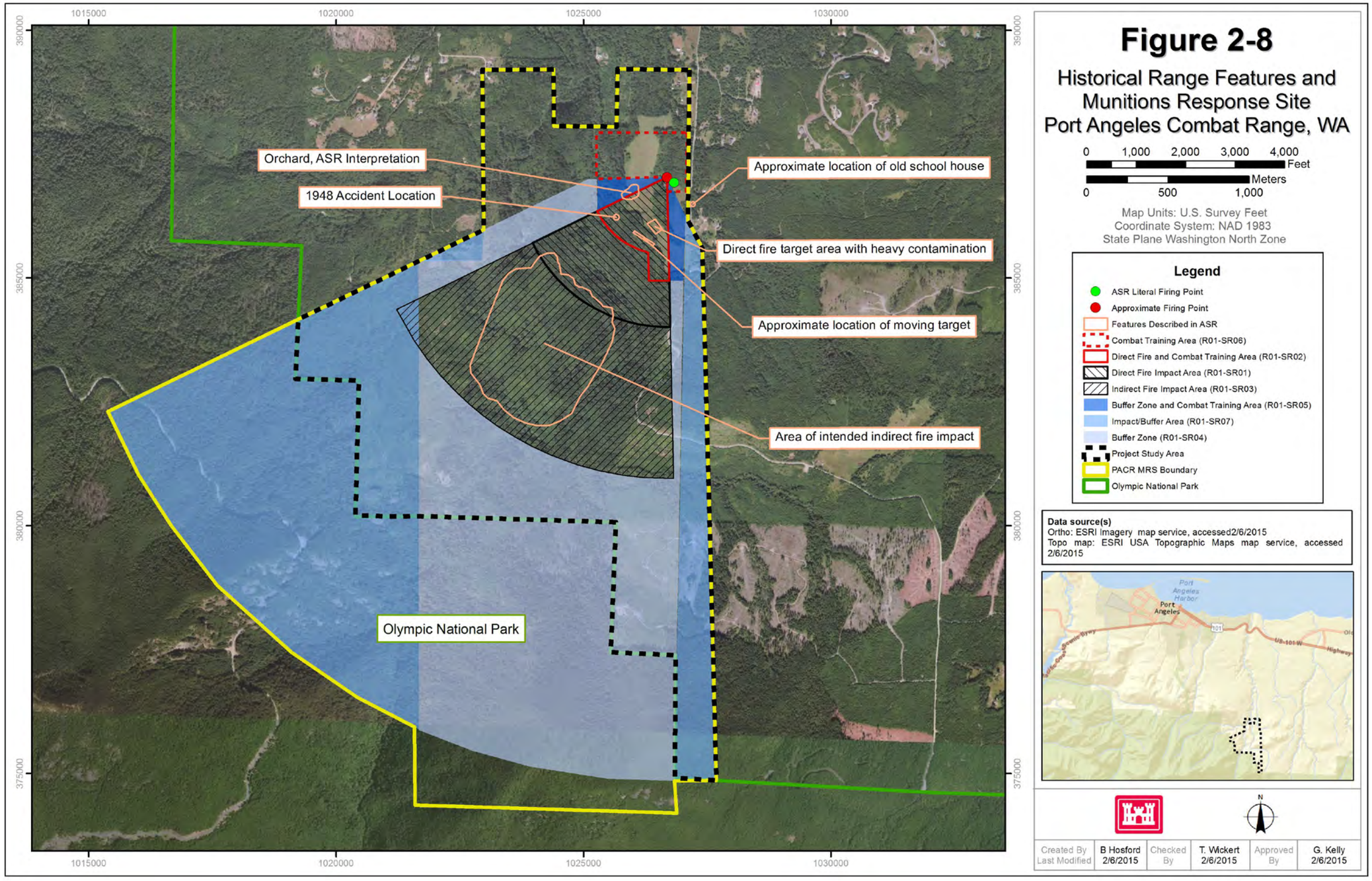

Figure 2-8

Historical Range Features and Munitions Response Site Port Angeles Combat Range, WA

0 1,000 2,000 3,000 4,000 Feet

0 500 1,000 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- ASR Literal Firing Point
- Approximate Firing Point
- Features Described in ASR
- Combat Training Area (R01-SR06)
- Direct Fire and Combat Training Area (R01-SR02)
- Direct Fire Impact Area (R01-SR01)
- Indirect Fire Impact Area (R01-SR03)
- Buffer Zone and Combat Training Area (R01-SR05)
- Impact/Buffer Area (R01-SR07)
- Buffer Zone (R01-SR04)
- Project Study Area
- PACR MRS Boundary
- Olympic National Park

Data source(s)
Ortho: ESRI Imagery map service, accessed2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015

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2.3.3 Documentation and Identification of Munitions-Related Sites at the PACR

Areas potentially impacted by munitions-related activities were identified through a phased investigation process under the MMRP. These areas were investigated and the boundaries refined, and the terminology used to designate these areas changes as they move through the process. The designations of sites or areas under investigation at the PACR were developed as follows:

- Initial areas or ranges where munitions-related activities may have been conducted were identified based on historical records and limited site visits as documented in the ASR (USACE, 1996). Initial boundaries for these ranges were drawn using historical maps, aerial photos, and other documentation as available. Initially the ranges and other areas were designated as Areas of Interest (AOIs) A through F.
- These AOIs, or potentially impacted areas and ranges, were further evaluated in the ASR Supplement (USACE, 2004). The range boundary and sub-ranges were developed considering munitions types, exposure potential, and other considerations from the CSM for each AOI (Shaw, 2009).
- The PACR is designated in the MMRP inventory in the Defense Environmental Program's Annual Report to Congress (ARC), as early as Fiscal Year 2007 (DENIX, 2008). The MMRP inventory was prepared to document the status, progress, and projected costs of environmental restoration programs.
- The SI collected information needed to determine if any areas qualify for NDAI because they pose no significant health threat or explosive hazard, to determine the need for immediate removal action, and to collect data to better characterize the site for more effective initiation of the RI/FS.
- The Range Complex No. 1 Munitions Response Area (MRA) and sub-ranges were further investigated through site walks and sampling during the SI. The MRA was determined to require additional investigation in a RI and was retained as an MRS (Shaw, 2009).

In this report, references to historical ranges and activities are consistent with the designation (AOI, MRA, sub-range, MRS) that was current relative to the information cited and used for evaluation and interpretation of the RI findings.

2.3.4 Identification of Port Angeles Combat Range

The PACR is included in the MMRP Inventory in the Defense Environmental Programs Annual Report to Congress Fiscal Year 2007 (DENIX, 2008) under Federal Facility Identification number WA09799F318400 with range information as identified in **Table 2-1**. As described in **Section 2.3.3**, the ranges at the PACR were initially identified in the ASR (USACE, 1996) as AOIs, and were subsequently consolidated into one range and seven sub-ranges in the ASR Supplement. The acreage and coordinates for Range Complex No. 1 and sub-ranges as listed in the ASR Supplement (USACE, 2004) are identified in **Table 2-3** on the next page.

Table 2-3 ASR Ranges and Sub Ranges – Port Angeles Combat Range – ASR Supplement

ASR Range/Sub-range Name	ASR Range Identification	Approximate Acreage (acres)
Range Complex No. 1	F10WA003301R01	2,629
Direct Fire Impact Area	F10WA003301R01-SR01	119
Direct Fire and Combat Training Area	F10WA003301R01-SR02	37
Indirect Fire Impact Area	F10WA003301R01-SR03	483
Buffer Zone	F10WA003301R01-SR04	856
Buffer Zone and Combat Training Area	F10WA003301R01-SR05	23
Combat Training Area	F10WA003301R01-SR06	41
Impact/Buffer Area	F10WA003301R01-SR07	960

***Note**: The ASR Ranges were identified and compiled in 1996.*

The reported approximate total area of Range Complex No.1 (2,629 acres) exceeds the total area of the seven sub-ranges combined (2,519 acres). This discrepancy is due to the Impact/Buffer Area extending beyond the FUDS property boundary in the northern portion of the Range Complex No. 1 MRS. The project geographic information system (GIS) files depict the actual total acreage of the Range Complex No. 1 as 2,629.8 acres.

2.4 Previous Investigations

Several investigations focusing on the identification of MEC have been performed at the PACR. The following sections describe the scope and major conclusions of previous work.

2.4.1 Identification of Munitions Response Areas

The Range Complex No. 1 MRA was established based on the AOIs identified in the ASR completed in 1996 (USACE, 1996), the ASR Supplement (USACE, 2004), and the SI completed in 2009 (Shaw, 2009). Munitions used, impact areas, and firing points were confirmed at the AOIs during site visits. In many cases, the AOIs had similar current and reasonably anticipated future land uses and thus had the same exposure potential. They also would have the same or very similar investigation and decision-making approaches. Therefore, to facilitate evaluation for future munitions response activities, they were combined into one MRA. The MRA was developed based on three criteria: munitions types, exposure potential, and other notable considerations from the CSM for the AOIs.

2.4.2 Identification of Munitions Response Sites

A SI was completed in 2009 and included Technical Project Planning (TPP) activities involving key stakeholders to identify concerns and develop the plan for further investigation of the MRA (Shaw, 2009). SI activities included additional records research and coordination with the Washington Historical Society, and the Washington Department of Ecology (WDOE), and included review of historical aerial photographs to supplement the information gathered during the ASR (USACE, 1996) and ASR Supplement (USACE, 2004). Field activities were conducted that included visual surveys and sampling to assess potential munitions-related soil, sediment, groundwater, and surface water contamination. The objective of the SI was to determine whether the MRA required additional action by evaluating the presence or absence of MEC or MEC-related MC and to determine the possibility of exposure and impacts to human health or the environment.

Based on evaluation of the SI records research and field results, the PACR MRA was recommended for further investigation, and the MRA was designated as an MRS (**Figure 2-8**).

The Range Complex No. 1 MRS boundary extends beyond the project study area. However, due to the NPS and the DoD not having a programmatic agreement to address MMRP sites the acreage within the ONP was not investigated.

2.4.3 Certificates of Clearance

There have been multiple range clearances on the PACR since World War II (WWII). 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. It should be noted that there were no SOPs identified that document the level of effort for the clearances; however, the typical procedures for clearances performed circa 1950s do not meet the quality requirements of today's standards. The clearance reports are available in Appendix E of the ASR (USACE, 1996).

2.4.4 Range Clearance Technology Assessment

In 1986, a Range Clearance Technology Assessment was completed by the Naval Explosives Ordnance Disposal Facility Center (NEODFC) for the PACR. The report is limited to a one-page summary and does not contain details regarding how the conclusions were derived. The report concluded that the future use of the PACR is scenic and livestock grazing; access to virtually all of the range is extremely limited due to terrain and vegetation; high explosive filled munitions have been used on the range; surface and selected subsurface clearance has been accomplished; and additional mechanical clearance of the range is environmentally, technically and economically unfeasible at this time or in the foreseeable future. The report recommended that the PACR not be considered for mechanical clearance in the foreseeable future; an investigation be conducted to determine the effect of natural processes on unexploded munitions; and restrictions placed on the use of the land remain in force (NEODFC, 1986).

2.4.5 Inventory Project Report

An INPR was prepared and issued in 1993 (USACE, 1993). The INPR stated, "Based on the foregoing findings of fact, the site has been determined to be formerly used by the DoD. It is therefore eligible for the Defense Environmental Restoration Program – Formerly Used Defense Sites, established under 10 USC 2701 et seq." (USC, 2004). It was also proposed that further evaluation of the site be completed to better determine the hazards posed by the presence of unexploded ordnance (UXO).

2.4.6 Archives Search Report

The ASR was prepared and issued in 1996 (USACE, 1996) and summarized historical information and information collected during a site visit (July 25-29, 1994) to confirm site conditions. The ASR identified six AOIs:

- 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
- Area F – Impact/Buffer Area (additional acreage)

The ASR identified the likely munitions used at the PACR. During the site visit, the ASR team did not observe any ordnance-related items, metal fragments, or obvious signs of ordnance usage. None of the accumulated evidence summarized in the ASR indicated that CWM or CAIS were used at the PACR (USACE, 1996).

2.4.7 Archives Search Report Supplement

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

- 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
  - Combat Training Area
  - Impact/Buffer Area

2.4.8 Site Inspection

A SI was conducted in 2008 and 2009 for the USACE Northwestern Division Omaha District (NWO) Military Munitions Design Center. The technical approach was based on the *Type 1 Work Plan, SI at Multiple Sites, NWO Region* (Shaw, 2006); and the *FUDS, MMRP, SI, Program Management Plan* (USACE, 2005). Field activities included visual surveys and environmental media sampling (Shaw, 2009).

Visual surface reconnaissance was conducted between October 20 and October 24, 2008, along meandering paths and along roadways through portions of the PACR. A two-person reconnaissance team, including a qualified UXO Technician, conducted the visual inspection.

The team documented conditions with respect to vegetative cover, evidence of military activity, unexpected debris or material, presence or absence of water or any other conditions that could potentially impact planned field activities. Particular attention was paid to identifying MEC and MD, potential indications of contamination such as vegetative stress and other features of interest (e.g., building foundations, permanent structures, etc.). Additionally, the field reconnaissance team recorded the path walked and driven within the MRS using a hand-held global positioning system (GPS) unit. Digital photographs were taken to document significant features and sample points. Representative photographs of reconnaissance and sampling activities and observations are included in the SI Final Report.

The walking visual field reconnaissance was conducted within open fields and accessible abandoned logging roads within the Buffer Zone and Combat Training Area (SR-05), the Combat Training Area (SR-06), the Direct Fire and Combat Training Area (SR-02), and the Indirect Fire Impact Area (SR-03). Vehicle reconnaissance was used to supplement the walking reconnaissance and focused on observing for indications of former military operations. The walked visual reconnaissance path length was approximately 11.2 miles. The vehicle reconnaissance path length

was approximately 40.7 miles. Traversing within areas where no logging roads were present was prevented due to steep slopes near creek bottoms, dense vegetation, and fallen timber that made travel unsafe. Portions of the Combat Training Area (SR-06), Direct Fire and Combat Training Area (SR-02), and Direct Fire Impact Area (SR-01) sub-ranges were comprised of open meadows with thick, tall (up to knee high) grass that were used for cattle grazing. An open meadow can be seen on **Figure 2-8** as a lighter green with a sharp boundary within the forested areas, which is where the direct fire target area, with heavy contamination and the orchard based on the ASR interpretation, is located. The tall grass restricted visual observations in the open meadows. In the extreme northern portion of this open meadow, old farm equipment, car bodies, and miscellaneous debris were observed. No media sampling was completed in this extreme northern area.

No obvious military use features were observed in the open meadow or in the surrounding heavily forested areas. All other areas in the PACR were very heavily forested with thick underbrush and fallen timber. Access through some of the heavily forested areas was via old logging roads. Travel beyond these old logging roads was very limited because of the thick vegetation and fallen timber. No obvious sign of military training activities was observed during the visual reconnaissance. The area east of Surveyor Creek was inaccessible because of the terrain and vegetation hazards. Logged areas observed on aerial photographs were heavily overgrown by thick underbrush and alder trees and safe foot access was not possible.

During the SI field reconnaissance, anomaly avoidance was implemented using a magnetometer to identify subsurface anomalies. Subsurface anomalies identified during the SI were noted in the area described in the 1955 range clearance documents (refer to **Section 2.4.3**) as an “Area of Heavy Contamination”, which is also in the general vicinity of the1948 Accident Location. No MEC or MD or obvious signs of military activity were identified during SI field reconnaissance activities completed in October 2008, (Shaw, 2009).

The SI collected surface soil, sediment, surface water, and groundwater samples that were analyzed for metals of concern (chromium, copper, iron, lead, mercury, and nickel) and aluminum, magnesium, manganese, and zinc by United States Environmental Protection Agency (USEPA) SW-846 Methods 6020 and 7470/7471 and explosives (including nitroglycerin and Pentaerythritol tetranitrate [PETN]) by USEPA Method 8330 Modified (USEPA, 2006).

Because MC concentrations were below agreed upon screening values, the stakeholders agreed that MC sampling would not be required for subsequent investigations (Shaw, 2009).

Based on historical evidence of MEC, Range Complex No. 1 at the PACR FUDS was recommended for additional investigation for potential MEC hazards. Based on the SI, the location and size of the MRS at the PACR were correct as provided in the MMRP Inventory (Shaw, 2009).

2.4.9 Environmental Security Technology Certification Program Demonstration

In 2011, digital geophysical mapping (DGM) data were collected over an area at the PACR (portions of SR-01 and SR-05) in an effort to characterize the site for future Environmental Security Technology Certification Program (ESTCP) demonstrations. Naeva Geophysics, Inc. under a subcontract to Hydro Geologic, Inc. (HGL) who was supporting the ESTCP, collected data on a parcel of approximately 31 acres using a Geonics EM61 MK-2, with a series of parallel transects

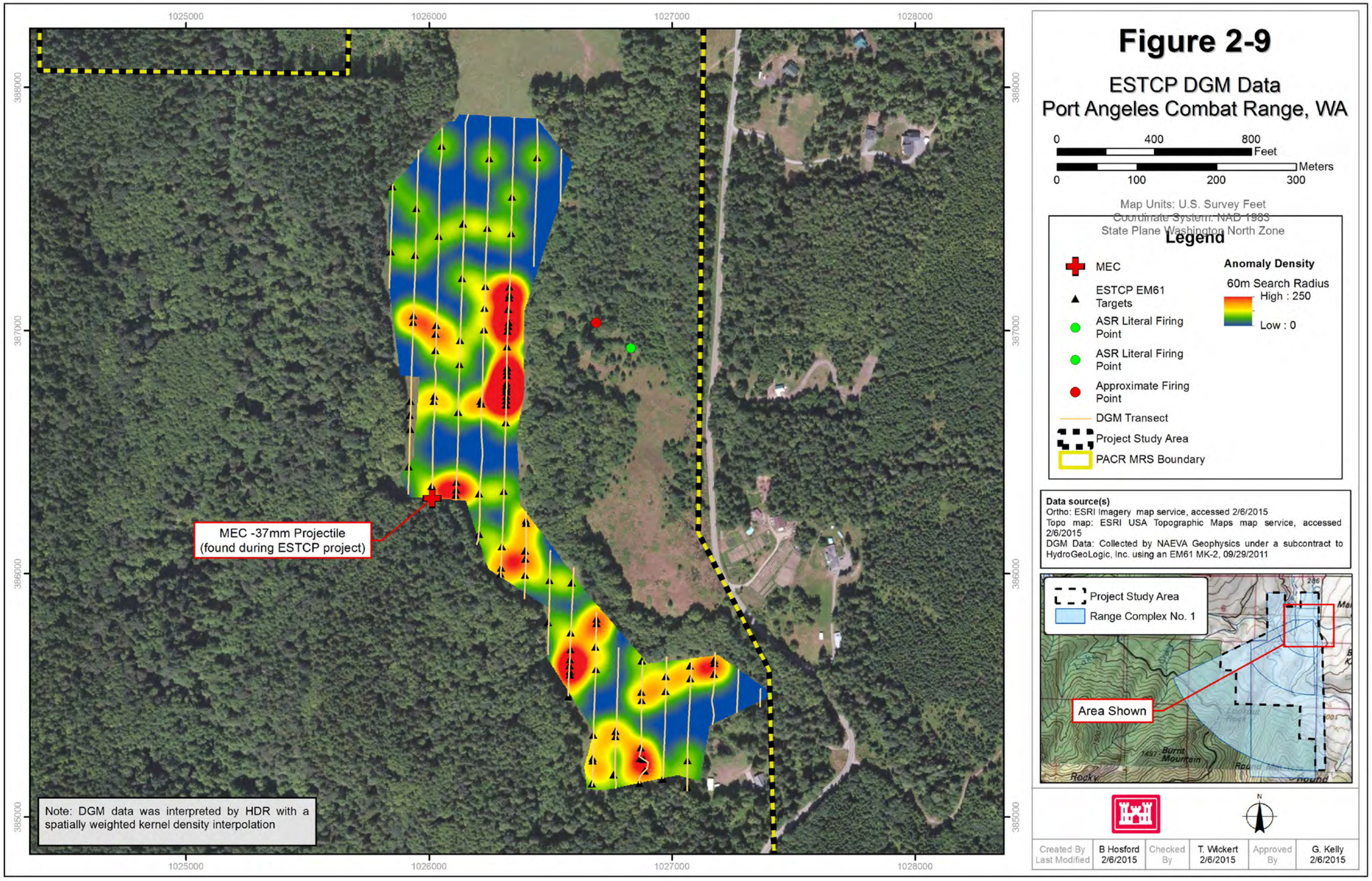
spaced 30 meters apart. **Figure 2-9** shows the areal extent of the data coverage using the EM61-MK2 (ESTCP, 2011).

On September 29, 2011, HGL's UXO technician found a 37mm projectile at the southern extent of transect T-4 (**Figure 2-9**). The North American Datum of 1983 (NAD83) Washington State Plane coordinates in U.S. survey feet were 386308.69 northing and 1026013.62 easting. The UXO technician immediately notified the Clallam County Sheriff's office. A Washington State Police bomb technician safely disposed of the item explosively on September 29, 2011 (ESTCP, 2011).

The ESTCP DGM data was interpreted in May 2013 (**Figure 2-9**). Density analysis of the ESTCP dataset was performed using a weighted kernel density estimation (KDE) analysis utilizing the ESRI Spatial Analyst toolbox. This process is commonly used to generate a probability density function for point datasets. An initial KDE raster was generated over the entire ESTCP survey area utilizing the anomaly picks from the study. The initial KDE raster was weighted to account for coverage bias to accommodate for the approximate 3.5% coverage of the site by DGM survey transects. Percent coverage was determined for each one-meter kernel location in the KDE by creating a regularly spaced dense grid of points. These points were selected and retained where they intersected the actual transect swath from the survey. A KDE was then performed on the selected points and the output was normalized to values between 0 (no coverage) and 1 (100% coverage). This value was then applied to the original density calculation to provide final estimates of actual target densities throughout the ESTCP study area.

2.4.10 Cultural Resources Survey

No cultural resources have been identified within the PACR. During the SI, The Washington Department of Archaeology and Historic Preservation (WDAHP) was contacted to determine if any new historical or cultural sites may have been identified within the PACR. The WDAHP recommended that consultation with nearby tribes and an archaeological survey be conducted (WDAHP, 2008). The USACE Seattle District completed an archaeological evaluation of the PACR and noted a "No Historic Properties Affected" determination. This determination was forwarded to the WDAHP, who concurred with the determination. A copy of the WDAHP concurrence letter is included in the SI Report (Shaw, 2009). No further consultation with the WDAHP was planned. The RI did not encounter items with potential cultural or archeological relevance.


1025000
1026000
1027000
1028000
386000
387000
385000
MEC -37mm Projectile
(found during ESTCP project)
Note: DGM data was interpreted by HDR with a spatially weighted kernel density interpolation
Figure 2-9
ESTCP DGM Data
Port Angeles Combat Range, WA
0
400
800
Feet
0
100
200
300
Meters
Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone
Legend
MEC
ESTCP EM61 Targets
ASR Literal Firing Point
ASR Literal Firing Point
Approximate Firing Point
DGM Transect
Project Study Area
PACR MRS Boundary
Anomaly Density
60m Search Radius
High : 250
Low : 0
Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
DGM Data: Collected by NAEVA Geophysics under a subcontract to HydroGeoLogic, Inc. using an EM61 MK-2, 09/29/2011
Project Study Area
Range Complex No. 1
Area Shown
N
Created By / Last Modified
B Hosford 2/6/2015
Checked By
T. Wickert 2/6/2015
Approved By
G. Kelly 2/6/2015

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3.0 Project Remedial Response Objectives

The remedial response objective for sites where MEC may be present is to reduce explosive safety hazards and MC, and to ensure protection of human health and the environment. An additional objective for the Range Complex No. 1 MRS is to ensure that access to the public lands is maintained, and the current and future use of the site is not limited. This RI/FS was conducted to collect data needed to complete characterization of the MRS, to determine the nature and extent of MEC and MC, and to determine whether additional action is required under the MMRP and CERCLA to achieve these objectives. The data are evaluated and presented in this report along with analysis of the possible actions that may be taken at the site.

3.1 Conceptual Site Model and Project Approach

3.1.1 Conceptual Site Model

Site-specific CSMs for human and ecological receptors were developed to address the existing or potential access and exposure pathways for MEC and/or MC at the MRS Range Complex No. 1. The CSMs were developed and presented in the *RI Work Plan* (HDR, 2013) and have since been revised based on the results from the RI field effort.

The PACR CSMs represent descriptions of the site and the environment based on existing knowledge. They describe contamination sources and possible receptors, and the interactions that link them. They are intended to assist in planning, data interpretation, and communication. The CSMs address both current and future land use scenarios. The CSMs are developed and used as planning tools to integrate information from a variety of resources and to evaluate the information with respect to project objectives and data needs. As such, CSM development is an iterative process based on further knowledge acquisition, field activities, and interim remedial actions. The information provided is then used to refine the CSMs as necessary through the RI/FS process.

Current and future land uses were described in **Section 2.2.3**. The City of Port Angeles lands within and adjacent to the MRS are actively managed for watershed protection. There are private parcels including primary residences within and adjacent to the MRS. Additional development should be anticipated on these privately owned parcels. The Manke Timber Corporation manages timber harvesting on their property within the MRS (parcel numbers 47418, 47483, 47485, 47492, 47493, 47495, 47497, and 47505). Green Crow Corporation also manages timber on parcel 47498 (**Figure 2-3**). There is no designated critical habitat located on the PACR; however, there is abundant wildlife on and adjacent to the site, and critical habitat for federally listed T&E species within one mile of the PACR. No planned changes in the existing land uses are known at this time.

These land uses and the human and ecological receptors associated with them are reflected in the CSMs, and this information was a primary consideration in developing the project approach for investigation and evaluation of potential remedial actions.

The Range Complex No. 1 MRS represents a very large area with terrestrial and aquatic features and multiple ecological receptors; additional information was needed to adequately characterize this MRS. Without detailed range-specific information at hand, when the RI commenced, all potential soil, sediment, and surface water exposure pathways were considered in the development of the RI Work Plan (HDR, 2013). This included the potential for complete groundwater pathways. The

presence or absence of groundwater, especially via seeps and springs was unknown. Consequently, as a conservative measure, protection of groundwater was also evaluated.

For the SI (Shaw, 2009), a text-based CSM was developed for the Range Complex No. 1 MRS as a whole based on the review of historical information and the ASR (USACE, 2004). The graphical CSMs presented in the RI Work Plan (HDR, 2013) were updated following completion of the RI activities and are presented in **Section 5.0** of this report.

The environmental sampling data from the SI (Shaw, 2009) were reviewed for establishing an initial list of potential concern (COPCs) or contaminants of potential ecological concern (COPECs) for the RI. There were no COPCs or COPECs identified for further evaluation in the RI.

3.1.1.1 SITE INFORMATION AND LAND USE

The current primary land uses for the MRS is logging, infrastructure maintenance (e.g., Morse Creek Dam), recreational activities, hunting, and private residential use. Most of the PACR is privately owned. There are no known mining claims in the MRSs. No planned changes in the existing land uses are known at this time.

These land uses and the human and ecological receptors associated with them are reflected in the CSMs, and this information was a primary consideration in developing the project approach for investigation and evaluation of potential remedial actions.

3.1.1.2 POTENTIAL MEC EXPOSURE TO HUMAN AND ECOLOGICAL RECEPTORS

The potential for MEC (i.e., sources of MEC) resulted from the historical munitions use in the PACR during the WWII period. This area was used as a combat range for military maneuvers and target practice, which included firing points and moving targets (targets and tanks pulled across the range using cables)

Based upon the discovery of five MEC items in surface soil during the RI (**Figure 5-10**), the potential for access and contact with MEC exists at the MRS Range Complex No. 1 for all mobile receptors. In addition, MEC on the subsurface could potentially be accessed by all mobile receptors conducting intrusive activities. Considerable MD were recovered down to 1.5 feet bgs. Numerous removal actions and surface sweeps have been conducted since WWII, and the majority of MEC items have been removed from the surface.

Access to the MRS, Range Complex No. 1 is generally unrestricted, except uneven and sometimes steep terrain, dense vegetation, and dilapidated fencing can limit mobility. Public access may be limited on private property. Access to visible MEC on the surface is still of concern even with previous investigations and removals as the MEC items recovered during this RI were in surface soil. Human receptors conducting intrusive activities could potentially contact MEC in surface and subsurface soils except in cliff areas and other steep or inaccessible terrain.

Human receptors could be exposed to MEC in surface and subsurface soils through the following pathways:

- Physical disturbance
- Intrusive activities
- Handle or tread underfoot

It is possible that MEC could have migrated down the slopes from its original positions due to heavy precipitation; however, human access to potential MEC on the steeper slopes to the west of MRS Range Complex No. 1 is likely limited.

3.1.1.3 POTENTIAL MC EXPOSURE FOR HUMAN AND ECOLOGICAL RECEPTORS

The updated CSMs consider that MEC and MC on the surface and subsurface could be potentially accessed by all mobile receptors due to the unrestricted access within the MRS. MC released to the environment from damaged or leaking munitions could become COPCs for human receptors, and COPECs for ecological receptors. As such, the chemicals could potentially present hazards to all receptors from several exposure pathways.

Human receptors could be exposed to MC contamination in surface and subsurface soils through the following pathways:

- Incidental soil ingestion.
- Dermal contact with soil.
- Fugitive dust inhalation primarily from surface soil; likely insignificant exposure pathway due to heavy vegetative cover and high rates of annual precipitation.
- All exposures would be assumed to take place outdoors.

Ecological receptors could be exposed as follows:

- Plants – direct soil contact and root uptake; root uptake not addressed quantitatively.
- Soil Invertebrates (soil fauna) – direct soil contact, soil ingestion; soil ingestion not addressed quantitatively.
- Animals – incidental soil ingestion, dermal soil contact, dust inhalation, and dietary uptake of potentially contaminated food items. Neither dermal contact nor inhalation of fugitive dust can be assessed quantitatively due to the lack of receptor-specific exposure factors.
- Aquatic Life – incidental sediment and surface water ingestion and direct contact, and dietary uptake of food items. Dermal contact cannot be assessed quantitatively due to the lack of receptor-specific exposure factors.

3.1.2 Project Approach

This RI collected the data necessary to support decision-making regarding the potential explosive hazard posed by MEC and potential risk posed to human health and the environment by MC directly attributable to MEC. A combination of investigation methods were used to optimize data collection. Unsurveyable areas consisted of slopes greater than 65%, heavy vegetation that could not be cleared with hand tools, water bodies that could not be traversed by foot, and any other field conditions that presented an unacceptable safety risk to the field investigation team.

The project area was delineated into three separate technical approach areas based on the types of munitions used, how the munitions were fired, the types of investigation methods required to delineate nature and extent and the ability to implement the technology available at the time of the RI based on site-specific limitations such as topography and vegetation. The three different technical approach areas are presented below:

Technical Approach 1 was conducted within the Combat Training Area and buffer zones north of the Firing Point (R01-SR06). The technical approach within this area was driven by the potential use of small arms and practice land mines.

- AVS with real time excavations by hand were performed by a UXO Technician and a Geophysical/Field Technician to characterize the nature and extent of MEC and small arms (i.e. visual evidence of military small arms such as brass casings or lead projectiles). All field teams were assembled in accordance with EM-385-1-97 (USACE, 2013). If real time digs were performed, the Geophysical/Field Technician was temporarily replaced with a UXO Technician. Initial AVS transects were spaced 150 feet apart.
- In-situ XRF screening was conducted to analyze for lead in soils where natural features (e.g., natural berm feature) or small arms debris was identified. XRF screening was utilized for information only and to assist the field investigation team to determine sampling locations for subsequent laboratory analysis (if it was required).
- Sampling for laboratory analysis would have been conducted if there was evidence of small arms use and elevated XRF lead levels above the WDOE soil clean-up level of 250 mg/kg. Environmental media samples for laboratory analysis would have been collected as necessary for all decision-making purposes.

Technical Approach 2 was conducted within the Direct Impact Fire Area and adjacent buffer zones to the east and west (R01-SR01, R01-SR02, R01-SR05, a portion of R01-SR04, and a portion of R01-SR07). The technical approach within this area was driven by the use of 37mm and 75mm artillery fired at fixed and towed ground based targets within a discrete area.

- AVS was performed by a UXO Technician and a Geophysical/Field Technician. All field teams were assembled in accordance with EM-385-1-97 (USACE, 2013). Initial AVS transects were spaced 75 feet apart. AVS transects were spaced 35 feet apart within the open area where there were likely targets (meadow/open area) illustrated in historical aerial photography. Non-munitions related features (e.g., fencing, utilities) that could interfere with DGM were recorded.
- DGM surveys were conducted to determine areas with high subsurface metallic anomaly densities. DGM transects were spaced 75 feet apart. DGM transects were spaced 35 feet apart within the open area where there were likely targets (meadow/open area) illustrated in historical aerial photography.
- 200-foot x 200-foot subsurface investigation grids were positioned over areas identified as containing high anomaly densities (250 anomalies per acre or greater) determined by the DGM. A minimum of 10% of each grid (i.e., a 200 feet x 200 feet grid with 5-foot lanes at the 0-foot, 50-foot, 100-foot, 150-foot and 200-foot intervals) were intrusively investigated. Contiguous subsurface investigation grids stepping out from the high anomaly density areas (i.e., 250 anomalies per acre or greater) were established if munitions were observed and until the extent of the munitions were determined.
- Analytical sampling for explosives would have been conducted, if required.

Technical Approach 3 was conducted within the Indirect Impact Fire Area and adjacent buffer zones to the east, west, and south (R01-SR03, a portion of R01-SR07, and a portion of R01-SR04). The technical approach within this area was driven by the trajectory, distance, and impact of 60mm and 81mm mortars, and the areas identified during the ASR. Some 37mm and 75mm artillery were also anticipated based on the line of sight analysis presented in the approved work plan. Artillery that

may have been fired over the intended target within the area presented for Technical Approach 2 could potentially be deposited within the area defined by Technical Approach 3. The topography and vegetation was rugged throughout the area limiting the effective use of DGM and subsurface investigation grids.

- AVS with real time excavations of all anomalies was performed by two UXO Technicians to characterize the nature and extent of MEC. All field teams were assembled in accordance with EM-385-1-97 (USACE, 2013). AVS transects were spaced 75 feet apart within the intended impact area per the ASR and the immediately adjacent 300 feet buffer area. AVS transects were spaced 150 feet apart outside the 300 feet buffer area.
- Analytical sampling for explosives would have been conducted, if required.

3.2 Preliminary Remediation Goals

The Preliminary Remediation Goals (PRGs) are used to determine the need for and effectiveness of remedial actions to address MC contamination. There are no established PRGs for MEC, particularly UXO and Discarded Military Munitions (DMM); therefore, the property's use and MEC exposure pathways drive the development of the munitions response alternatives. In general, remediation goals for MEC focus on removing or limiting the exposure pathways.

For MC, the PRGs are established screening levels. The USEPA has developed Risk Screening Levels (RSLs) (USEPA, 2013) for residential and industrial receptors to differentiate areas that do not require further evaluation from contaminated sites that require further evaluation, including a complete baseline risk assessment. The RSLs are located at USEPA's website "Regional Screening Levels for Chemical Contaminants at Superfund Sites", available at http://www.epa.gov/region9/superfund/prg/ (USEPA, 2013).

3.3 Preliminary Identification of Applicable or Relevant and Appropriate Requirements and "To Be Considered" Information

Section 121 of CERCLA requires that site cleanups comply with federal Applicable or Relevant and Appropriate Requirements (ARARs), or State ARARs in cases where these requirements are more stringent than federal requirements. Applicable requirements are defined as those cleanup or control standards, or other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state laws. Applicable requirements are identified on a site-specific basis by determination of whether the jurisdictional prerequisites of a requirement fully address the circumstances at the site of the proposed remedial activity. A requirement is applicable if the specific terms (or jurisdictional prerequisites) of the statute or regulation directly address the circumstances at the site.

If not applicable, a requirement may be relevant and appropriate if circumstances at the site are sufficiently similar to the problems or situations regulated by the requirement. "Relevant and Appropriate" refers to those cleanup standards, or other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law, that, while not necessarily applicable, address problems or situations sufficiently similar to those encountered at the CERCLA site, and whose use is well suited to the particular site (USEPA, 1988).

ARARs that govern actions at CERCLA sites fall into three broad categories based upon: 1) the munitions-related chemical contaminants present, 2) site characteristics, and 3) alternatives proposed for cleanup. These three categories are identified as chemical-specific, location-specific, and action-specific ARARs. An analysis of Federal ARARs is presented in **Table 3-1** based on the RI data. In accordance with 40 C.F.R. § 300.515(d)(1) (USEPA, 2011), a request was provided to the WDOE for identification of potential State ARARs. WDOE did not provide State ARARs for consideration.

In addition to ARARs, non-promulgated advisories or guidance referred to as "to be considered" (TBC) may also apply to the conditions found at a site. TBCs are not legally binding. The USEPA RSLs are TBCs used for comparison with MC results for the PACR RI/FS.

Table 3-1 Preliminary ARARs, Range Complex No. 1 MRS, Port Angeles Combat Range, WA

Standard, Requirement, Criteria or Limitation	Citations	Description	ARAR Type	Applicability to Site
Endangered Species Act	Endangered Species Act, 16 USC § 1538(a)(1)(B)	Prohibits the unlawful taking of any endangered species.	Location	Applicable to any action that could impact listed or proposed threatened or endangered species at the site.
Migratory Bird Treaty Act	Migratory Bird Treaty Act, 16 USC § 703(a)	Prohibits the unlawful taking, killing or possession of migratory birds.	Location	Applicable to any action that could impact migratory birds present at the site.
Protection of Bald and Golden Eagles	Bald and Golden Eagle Protection Act, 16 USC § 668(a)	Prohibits the unlawful taking of bald and golden eagles, including their parts, nests, or eggs.	Location	Applicable to any action that could impact bald and golden eagles present at the site.

3.4 Summary of Institutional Analysis

An Institutional Analysis is conducted to identify and analyze the institutional framework necessary to support the development of institutional controls (ICs). The purpose of this analysis is to gather background information and document which stakeholder entities have jurisdiction over the Range Complex No. 1 MRS and to assess the capability and willingness of these entities to assert and maintain institutional controls selected as an effective alternative.

With the exception of the private parcels, the MRS is managed for watershed and forest resource management and other activities as described in **Section 2.2.3**.

The stakeholder team includes federal, state, and local agencies and has developed a strong working relationship over the years of examining and addressing historical military munitions in the PACR area. The stakeholders and their jurisdictions for the MRS are:

- USACE, Kansas City District, is responsible for overall project management, with overall management, contractual, and funding responsibility. The USACE conducts the environmental cleanup work on former military land under the FUDS program.
- The City of Port Angeles manages public lands within the MRS.
- Washington Department of Ecology is the lead regulatory agency and provides the State of Washington input and regulatory oversight for the investigation and remediation activities.
- The USEPA is the federal regulatory agency providing oversight for the investigation and remediation activities.
- Area stakeholders are non-agency entities that have an interest in activities occurring in the PACR area. These entities include public and elected officials of surrounding towns, counties, and the state; area residents and landowners; area users such as seasonal, recreational, and special-use permittees; utilities; and emergency responders.

Additionally, the Washington State Police will perform MEC responses for items found by the public as needed after completion of selected remedial alternatives.

The preliminary Institutional Analysis will be refined during a working group session between the USACE and other project stakeholders as part of the development of the Proposed Plan (PP). Additional stakeholder and public input will be considered as part of the formal public comment period. Once the preferred remedial alternative is identified and if it includes the use of Institutional Controls a more detailed Institutional Analysis will be performed including review by the land manager attorney and the USACE general counsel to examine state and local laws relevant to the ICs being considered. The results of the Institutional Analysis including the roles and responsibilities of the stakeholders will be documented within the Decision Document (DD).

Prior to the preparation of the final DD a Memorandum of Agreement (MOA) or a Memorandum of Understanding (MOU) may be prepared to facilitate discussions between the USACE and any land owners or managers that may be affected by the implementation of Institutional Controls. Initial discussions regarding the use of a MOA or MOU would occur during the TPP process.

3.5 Data Needs and Data Quality Objectives

The PACR RI activities included AVS, DGM surveys, in-situ XRF screening for lead in soil, and subsurface investigations. The subsurface investigations were conducted to explore potential subsurface MEC based on the AVS and DGM results.

Data quality objectives (DQOs) were developed for MEC and MC for the PACR RI and followed the *Data Quality Objectives Process for Hazardous Waste Site Investigations, EPA QA/G-4HW* (USEPA, 2000). The DQO process included the following steps:

- State the problem
- Identify the decision
- Identify inputs to the decision
- Define the study boundaries
- Develop a decision rule
- Specify limits on decision error
- Optimize the design for obtaining data

The DQOs for MC sampling were developed in accordance with the systematic planning process in Worksheet #11 of the *Uniform Federal Policy (UFP) Quality Assurance Project Plan (QAPP)* (see Appendix D of the PACR RI Work Plan) (HDR, 2013). **Table 3-2** presents the DQOs established for the Range Complex No. 1 MRS as presented in the RI Work Plan (HDR, 2013). The DQOs for the DGM Geophysical Investigation are provided in **Section 4.1.3** (**Table 4-1**).

Table 3-2 Data Quality Objectives for the Range Complex No. 1 MRS

Step	Data Quality Objective
1. State the problem	There is the potential for surface and subsurface MEC and MC at the PACR MRS based on past military use of the area. The distribution of potential MEC/MD and MC must be established in order to assess the potential explosive hazard associated with MEC, and the potential risk posed to human health and the environment associated with MC contamination. The potential for remaining MEC and MC was identified based on the INPR, the ASR, the ASR Supplement, and SI results (**Section 2.4**). These information sources documented the U.S. Army's use of the PACR for training in tactical firing problems and short-range known-distance firing in 1943 and 1944. Munitions used at the site included 37mm and 75mm projectiles and 60mm and 81mm mortars. There are also unconfirmed reports of small arms, rifle grenade and land mine usage within the MRS.
2. Identify the goal of the study	The soil sampling conducted as part of the SI in 2009 reported no MC concentrations above the agreed upon screening levels and concluded that further MC sampling was not recommended. During the SI, subsurface soils were not addressed. This RI will collect the data necessary to support decision-making regarding the potential explosive hazard posed by MEC and potential risk posed to human health and the environment by MC directly attributable to MEC requiring further action under CERCLA. The RI will evaluate nature and extent of MEC/MD. The RI will identify and characterize any observed MEC/MD source or sources. The extent of the MEC/MD will be characterized horizontally and vertically. The RI will also evaluate the nature and extent of MC in soil from explosives and small arms sources (if warranted). Evaluating the MC extent will include comparing analytical sample results to human health screening levels of MC (**Section 7.1**). The horizontal extent and vertical depth of MC which exceed human health risk-based screening levels will be delineated.

Table 3-2 Data Quality Objectives for the Range Complex No. 1 MRS (Continued)

Step	Data Quality Objective
3. Identify the information inputs	Information inputs are needed to assess the potential hazard posed by MEC and potential risk posed to human health and/or the environment by MC at the MRS. Information inputs in support of decision making will include the compilation of all previously gathered site information, such as the following: • INPR, ASR, and SI Reports (Refer to **Section 2.4**) • Preliminary Conceptual Site Model from the SI • Data to characterize the extent of surface and/or subsurface MEC/MD from metal detector AVS with the hand excavation of identified anomalies throughout the MRS • DGM surveys using an EM61 in selected areas within the MRS to determine areas of high density anomalies o High density anomaly areas (target features/impact areas which generally consist of areas containing 250 anomalies per acre or greater) to be investigated will be selected by the project geophysicist and approved by the USACE. UXO teams will investigate the high density areas to evaluate the subsurface (**Section 4.1.4**). o Refer to **Section 4.2.1** for discussion regarding sampling for lead as an indicator for small arms MC. • Intrusive Investigations (**Section 4.1.4**). o UXO teams will investigate areas containing high anomaly densities (generally 250 anomalies per acre or greater) determined from the DGM data utilizing grid methodology. o Grids will be expanded as necessary to define the horizontal extents of MEC/MD. • Analytical results of discrete samples collected for explosives and lead will be used to determine the nature and extent of potential MC contamination based on MEC discoveries or evidence of small arms activities. MC in soil will only be sampled if the criteria presented in **Section 4.2.1** and **Figure 4-7** is met. • Discrete MC (explosives) soil samples are proposed beneath all MEC items defined by the criteria presented in and discussed in **Section 4.2.1**.
4. Define the study boundaries	The physical boundary of the 2,629* acre Range Complex No. 1 MRS was defined at the conclusion of the SI, though the spatial boundary of this RI will be constrained to those areas within the 1,392 acre FUDS eligible property where ROE may be obtained and AVS, geophysical survey, intrusive investigation and MC sampling data collection may occur. Surveys are not planned in areas where an ROE cannot be obtained. Total acreage investigated will be affected by which ROEs can be obtained and unsurveyable areas (e.g., steep slopes greater than 65%). RI activities are not planned within the ONP because an agreement is not in place between the NPS and DoD to permit environmental investigations. The temporal boundaries of this RI include any limitations of technology in unsurveyable areas. Data acquisition may be limited by unsurveyable areas. *Approximate ASR/SI acreage was 2,629. Project GIS boundary provided by USACE is 2,629.8.

Table 3-2 Data Quality Objectives for the Range Complex No. 1 MRS (Continued)

Step	Data Quality Objective
5. Develop the analytical approach	The purpose of these analyses is to delineate the area considered most likely contaminated with MC. 1. GIS Analysis • Line-of Sight Analysis for artillery (37mm and 75mm projectiles) travel. • Trajectory and effective range for mortars (60mm and 81mm) • Historic Aerial Photography Analysis 2. Assisted Visual Surveys • UXO teams will assess the nature and extent of any MEC/MD located on the surface. • UXO teams will investigate subsurface anomalies indicative of munitions observed during the AVS throughout Technical Approach Areas 1 and 3 to define the nature and extent of subsurface MEC/MD. 3. Digital Geophysical Mapping • DGM is proposed for the Direct Fire Impact Area to identify areas of high anomaly densities. • High density anomaly areas (target features/impact areas which generally consist of an area containing 250 anomalies or greater per acre) to be investigated will be selected by the project geophysicist and approved by the USACE. • UXO teams will reconcile the subsurface anomalies identified by the DGM as target features or as non-munitions related features starting at the high density anomaly areas (250 anomalies per acre or greater) to define the nature and extent of subsurface MEC/MD. 4. MC Sampling and Analytical Analysis • Discrete MC (explosives) soil samples are proposed beneath all MEC items defined by the criteria presented in **Figure 4-7**. o If the MRS is observed to have multiple MEC items, and sampling is warranted for these items as discussed in **Section 4.2.1**, samples will be collected that are geographically dispersed throughout the MRS. If 20 samples are collected and analyzed for energetics and the results indicate concentrations below the screening levels then MC sampling will no longer be required for the MRS. • Discrete MC (lead) samples will be collected at the Range Complex No. 1 MRS if evidence of small arms debris or a natural berm feature are identified that could have been used as a backstop. • If analytical soil sample results show presence of MC above the screening levels established in the RI Work Plan, then additional surface and subsurface samples will be collected to establish the vertical and horizontal extent of soil impacted by small arms contamination. If a significant soil impact is determined *(i.e., MC are above human health screening levels)* and the nearby sediment, surface water, or groundwater pathways are potentially complete, then sampling and analysis of those media will be performed provided that the criteria for such sampling as identified in **Sections 4.2.1** are met. • In-situ XRF screening for lead in soils – For field information only and to help assist the field teams where to collect samples for laboratory analysis • Analytical data will be collected as necessary for all decision-making purposes • Refer to **Section 4.2.1** for discussion regarding sampling for lead as an indicator for small arms MC. • Discrete MC (explosives) soil samples are proposed beneath all MEC items

Table 3-2 Data Quality Objectives for the Range Complex No. 1 MRS (Continued)

Step	Data Quality Objective
	defined by the criteria presented in **Figure 4-7** and discussed in **Section 4.1.5**. 5. If MC samples are collected, analytical results will be used to perform a Baseline HHRA (**Section 7.1**) and a BERA (**Section 7.2**). 6. MEC HA using the USEPA MEC HA Methodology (Interim) (USEPA, 2008) will be performed whether or not MEC is found (**Section 7.3**) When AVS, DGM, intrusive investigations, and MC sampling are performed in accordance with the SOPs, DQOs specified in the GIP, and the UFP-QAPP, then adequate data to perform a MEC HA and MC risk assessment for the PACR will have been collected. The RI will have provided sufficient data necessary to support decision-making regarding the progression of the PACR through the CERCLA process.
6. Specify performance or acceptance criteria	Data collected will be of the quantity and quality necessary to provide technically sound and defensible assessment of potential risks to human health and the environment and will support the determination of potential explosive hazard. Assisted visual surveys, geophysical surveys, intrusive investigations, and MC sample collections are proposed to occur in accordance with the USACE Three Phase Inspection Process, as presented in Section 4.0 of the RI Work Plan, and will meet or exceed the level of QA/QC established for this project. Analytical data will meet the UFP-QAPP requirements for data quality and usability as presented in Appendix D of the RI Work Plan (HDR, 2013).
7. Develop the plan for obtaining data	The plan for obtaining data was developed through the TPP and presented within the RI Work Plan. Information inputs gathered during the RI will be used to develop a determination of potential hazards associated with MEC, and of potential risks posed by MC directly attributable to munitions contamination within the spatial confines of this RI. An FS will be performed to develop and screen remedial response alternatives.

Notes:
ASR – Archive Search Report
BERA - Baseline Ecological Risk Assessment
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
DGM – Digital Geophysical Mapping
DoD – Department of Defense
DQO – Data Quality Objective
FUDS – Formerly Used Defense Sites
GIS – Geographic Information System
HHRA - Human Health Risk Assessment
INPR – Inventory Project Report
MC – Munitions Constituents
MD – Munitions Debris
MEC – Munitions and Explosives of Concern
MEC HA - MEC Hazard Assessment
MRS – Munitions Response Site
PACR – Port Angeles Combat Range
QA/QC - Quality Assurance/Quality Control Project Plan
RI – Remedial Investigation
ROE – Right of Entry
SI – Site Inspection
TPP – Technical Project Planning
UFP-QAPP – Uniform Federal Policy Quality Assurance
USACE – United States Army Corps of Engineers
USEPA – United States Environmental Protection Agency
UXO – Unexploded Ordnance XRF – X-ray Fluorescence

3.5.1 Data Management

Data produced in association with all aspects of the RI are maintained on secure servers. All mapping products such as AVS, soil screening locations, locations of MEC, etc., will be submitted in compliance with *DID MMRP-09-007.01, Geospatial Information and Electronic Submittals* (USACE, 2009). All GIS data is subject to the same storage, restoration, and security protocols as outlined in **Section 3.5.1.1.**

3.5.1.1 MAPPING

Data and figures are presented in NAD1983 Washington State Plane Coordinates North Zone, U.S. Survey Feet. Some of the raw data collected during the investigation is inherently based upon Universal Transverse Mercator (UTM) coordinates. Any data collected utilizing UTM coordinates will be provided as both UTM (raw) data and State Plane (project coordinate system).

3.5.1.2 MUNITIONS AND EXPLOSIVES OF CONCERN TRACKING

The locations of all MEC items found during the RI field investigation were recorded on the Trimble GeoXH GNSS units carried by each field team. The data was then downloaded to the GIS database for tracking and mapping of the results. Photograph locations also were recorded and tracked. The photograph locations are included in the Photograph Documentation Log (**Appendix C**).

4.0 Characterization of MEC and MC

This section summarizes the approaches used to complete the RI and the activities conducted to characterize MEC and MC at the site.

4.1 Munitions and Explosives of Concern Characterization

4.1.1 Survey Control

A State of Washington licensed surveyor was contracted to establish geodetic survey control to be utilized as a spatial reference frame for the DGM and AVS activities. A total of six control points were established. The following specifications were met during the geodetic survey:

Horizontal Specifications:

- Horizontal Datum: NAD83
  - Realization: 2011 Adjustment
  - Epoch: 2010.00
- Projection: Washington State Plane, North Zone
- Absolute Horizontal Accuracy (relative to true datum): +/- 4 centimeters (cm) at the 95% confidence interval (1.96 sigma)
- Relative Horizontal Accuracy: +/- 2 cm at the 95% confidence interval (1.96 sigma)
- A minimum of three National Geodetic Survey (NGS) control stations relative to the horizontal datum were utilized during the establishment of the project control points.
- Linear Units: Meters and U.S. Survey Feet

Vertical Specifications:

- Vertical Datum: North American Vertical Datum of 1988 (NAVD88)
- Geoid Model: NGS Geoid12A
- Absolute Vertical Accuracy (relative to true datum): Not Applicable
- Relative Vertical Accuracy: +/- 2 cm at the 95% confidence interval (1.96 sigma)
- Linear Units: Meters and U.S. Survey Feet

Monumentation Specifications:

- Survey control monuments consisted of No. 4 rebar with cap at least 24 inches long.

All data and deliverables generated by the State of Washington licensed surveyor (**Appendix D**) were reviewed and approved by the Project Geodesist. Independent QC measurements were collected by the field investigation team to verify the relative spatial accuracy.

4.1.2 Assisted Visual Surveys

AVS were performed during the field investigation at the MRS. The AVS included observations of surface and subsurface MEC/MD, evidence of small arms activity, as well as any other features relevant to the CSM such as water features, nearby receptors, etc. The AVS team conducted real-time intrusive investigations on subsurface anomalies in areas where the use of DGM was not

practical. DGM was not practical in areas with limited access, heavy vegetation, and steep topography.

4.1.2.1 ASSISTED VISUAL SURVEY PLANNING AND FIELD COORDINATION

During planning activities, the MRS was separated into Technical Approach Areas 1, 2, and 3 due to its size and for purposes of organizing and coordinating the field effort. The Technical Approach Areas were based on the types of munitions used, how the munitions were fired, the types of investigation methods required to delineate nature and extent, and the ability to implement the technology available at the time of the RI. Site-specific limitations such as topography and vegetation were also considered when determining the Technical Approach Areas. **Figure 4-1** presents the technical approach areas.

4.1.2.2 ASSISTED VISUAL SURVEY METHODOLOGY

A UXO Technician III functioned as the Team Leader and used either a Schonstedt magnetometer or White's all-metals detector to locate surface and sub-surface anomalies. Vegetation was cleared by hand or with hand tools, when practical, to navigate the transect. A UXO Technician II operated a Trimble GeoXH GPS unit to navigate, record the path of travel and to record any findings (including photographs). Within the areas that required DGM or environmental sampling the UXO Technician II was replaced by a Field/Geophysical Technician. The Field/Geophysical Technicians were not present during the subsurface investigations. A minimum of one UXO Technician III and one UXO Technician II performed the subsurface investigations during the AVS. To the maximum extent practicable, the AVS team walked transects along terrain contours and perpendicular to the firing line. For areas where physical barriers or manmade features were present (e.g., structures, equipment, land features) the teams diverted around the barrier and reacquired the transect pathway once the barrier was bypassed.

Planned transects were uploaded to the Trimble GeoXH GPS unit and the AVS team navigated along each planned transect using the GPS. The GPS system was configured to record position data at maximum intervals of one minute or no more than 50 feet along each transect to create a permanent record of where each team walked. If MEC or MD were identified along the transect path, the location was stored in the GPS along with a brief description of the findings. The GPS track path and findings along each transect were uploaded to the project GIS database in order to create a permanent record of the actual path followed. The spatial distribution of MEC, MD, small arms or evidence of historical munitions use were analyzed and used to refine the extents of the MRS.

4.1.2.3 ASSISTED VISUAL SURVEY TECHNOLOGIES

Schonstedt Model GA-52 Cx Metal Detector – The Schonstedt GA-52 Cx metal detector has been the industry standard for 35 years. It is a hand-held, analog, fluxgate magnetometer equipped with five sensitivity settings. It emits an audio tone that peaks in frequency when the instrument's tip is directly over a ferrous item. The magnetometer does not detect nonferrous material such as aluminum and brass.

White's MXT 300 All-Metals Detector – The White's MXT 300 all-metals detector is a handheld, high performance all metals detector with multiple operating modes and a liquid crystal display. It has an operating frequency of 15 kilohertz, a drop-in battery pack, and a waterproof 12-inch search coil. Gain, threshold and dual controls allow for adjustable sensitivity and maximum discrimination for items at variable depths.

Trimble Model GeoXH GPS - The Trimble GeoXH GPS unit is a high performance, dual-frequency Global Navigation Satellite System (GNSS) receiver and antenna with Everest™ multipath rejection technology and Floodlight technology, sub-meter GPS receiver combined with a rugged handheld computer. The computer runs Microsoft Windows Mobile Version 6.5 powered by a TI OMAP 3503 processor. The Trimble GeoXH GPS is weatherproof and is powered by a rechargeable battery. The unit contains a built in 5.0 mega-pixel, auto-focus camera. As each photo was taken, it was geo-tagged with the location of the Trimble GeoXH GPS allowing for seamless integration with existing data capture workflows. The camera's lens allows for both wide-angle and close-up photographs and the geo-coded images can be converted into "layer files" for GIS.

4.1.2.4 ASSISTED VISUAL SURVEY QUALITY CONTROL PROCEDURES

Calibration Procedures - At the start of each field day, the visual survey teams validated the Trimble GeoXH units at an established control point to ensure the units were functioning properly and returning correct positional information. If an established control point was unavailable, positions from the Trimble GeoXH were compared to each other to verify proper operation.

At the start of each field day, the Schonstedt metal detector was held 12 inches above ground surface and was passed over an instrument verification strip (IVS) (described in **Section 4.1.3**) containing inert 37mm projectiles (<1-foot bgs) to confirm that the instrument was functioning properly.

To ensure instrument functionality, each instrument operator was required to sweep the IVS using the sweep techniques and instrument settings proposed for the project at least once a day (Section 3.4.1 of the RI Work Plan), and detect 100% of the items. There were no data generated during the verification of analog detectors. The results of the test resulted in a "go" or "no-go" decision. There were no instances of instrument failure during the RI.

Daily Site Report - The Site Manager was responsible for documenting the day's field activities and significant items in a Daily Site Report (DSR). The DSR provided a standardized format to document the AVS team activities, hours and locations of fieldwork, significant items recorded, weather conditions, photographs of items recorded and terrain, or any other pertinent information that required formal documentation. The DSRs are included in **Appendix E**.

Daily Quality Control Report - The UXO Quality Control Specialist (UXOQCS) was responsible for documenting the day's field activities in a Daily Quality Control Report (DQCR). The DQCR provided a standardized format to document the visual survey team activities, hours and locations of fieldwork, verification of data quality procedures, weather conditions, circumstances that affected the quantity or quality of the survey, or any other pertinent information that required formal documentation. The DQCRs are included in **Appendix E**.

4.1.2.5 ASSISTED VISUAL SURVEY ACTIVITIES SUMMARY

Assisted visual surveys were conducted from October 24 to December 11, 2013, at the Range Complex No. 1 MRS. The total transect mileage from the Trimble units for all three Technical Approach Areas was 112 miles as illustrated on **Figure 4-1**. Assisted visual survey transects were planned and executed based on the technical approach areas described below.

Technical Approach Area 1 - Transects were spaced approximately 150 feet apart (**Figure 4-1**).

Technical Approach Area 2 – The majority of the transects were spaced approximately 75 feet apart; however, some of the transects were spaced 35 feet apart. The transects that were spaced 35 feet apart were collected within an area that was historically an open meadow that contained the target features. This area was determined from a historic aerial photograph analysis. The historic photograph analysis utilized the dataset closest to the ranges post operational status (i.e., 1956) (**Figure 4-1**).

Technical Approach Area 3 - Transects were spaced approximately 75 feet apart within the intended impact area per the ASR and the immediately adjacent 300 feet buffer area. Transects were spaced at approximately 150 feet apart outside the intended impact/300 feet buffer area (**Figure 4-1**).

The physical boundary of the Range Complex No. 1 MRS, defined at the conclusion of the SI, was 2,629 acres. The project GIS boundary provided by USACE was determined to be 2,629.8 acres. The spatial boundary determined during this RI is 1,286.3 acres and is constrained to areas within the FUDS eligible property where ROEs were obtained.

During the AVS, 718.5 acres of the Range Complex No. 1 MRS were surveyed. The USACE did not receive ROE for three parcels that overlapped the eastern boundary of the MRS, consequently 105.9 acres were not surveyed (**Section 2.2.4**). The ONP was not surveyed due to the NPS and the DoD not having a programmatic agreement to address MMRP sites. During the AVS, a total of 567.8 acres were classified as unsurveyable due to dense vegetation, steep slopes, wetlands, and streams. **Figure 4-2** shows representative terrain associated with unsurveyable areas. Total original MRS project acreage increased from 2629.8 acres to 2630.7 acres. The additional acreage is discussed further in **Section 8.5.1**.

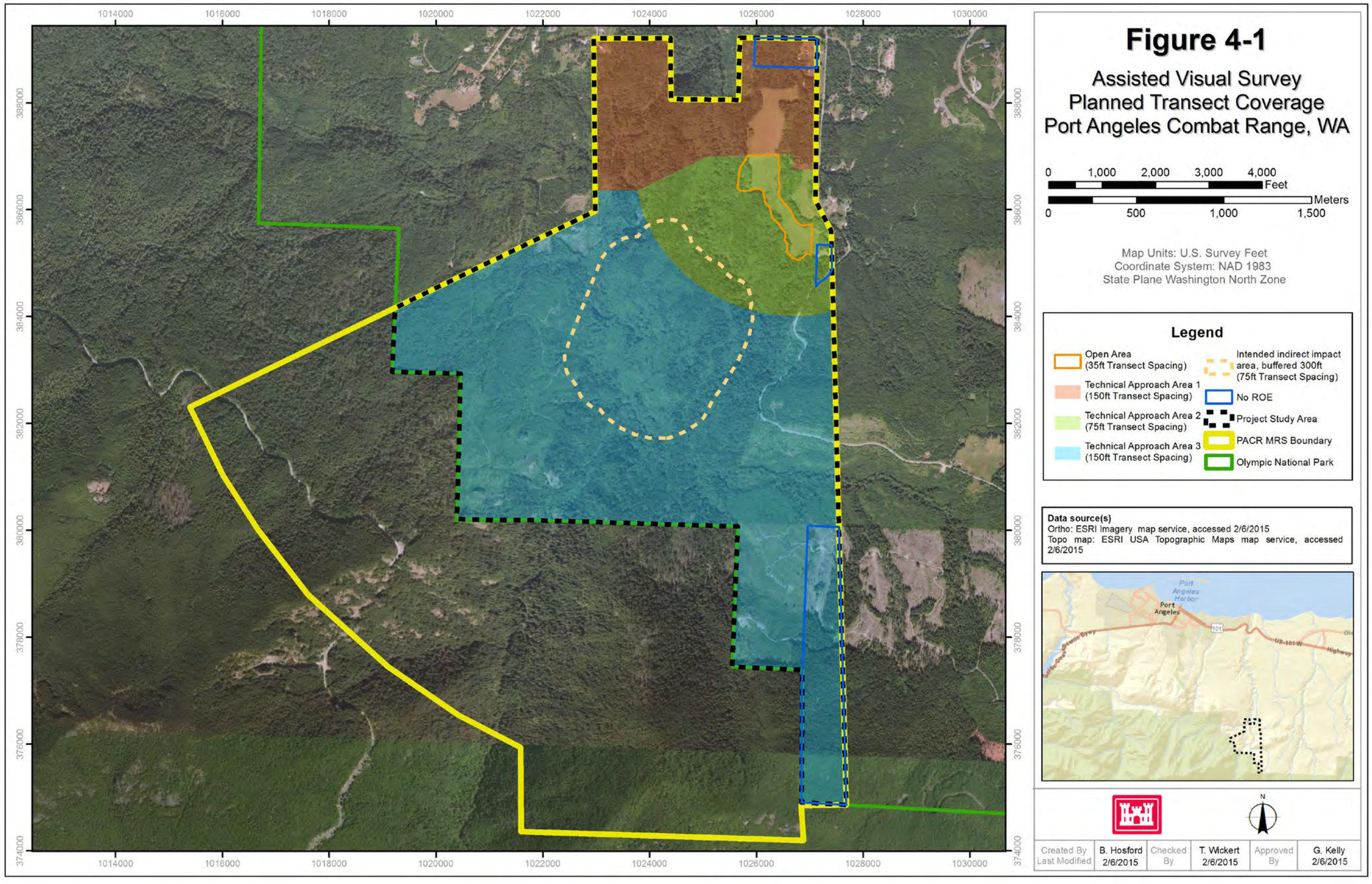

Figure 4-1

Assisted Visual Survey
Planned Transect Coverage
Port Angeles Combat Range, WA

0 1,000 2,000 3,000 4,000 Feet

0 500 1,000 1,500 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- Open Area (35ft Transect Spacing)
- Technical Approach Area 1 (150ft Transect Spacing)
- Technical Approach Area 2 (75ft Transect Spacing)
- Technical Approach Area 3 (150ft Transect Spacing)
- Intended indirect impact area, buffered 300ft (75ft Transect Spacing)
- No ROE
- Project Study Area
- PACR MRS Boundary
- Olympic National Park

Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015

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Created By	Last Modified	Checked By		Approved By	
B. Hosford	2/6/2015	T. Wickert	2/6/2015	G. Kelly	2/6/2015

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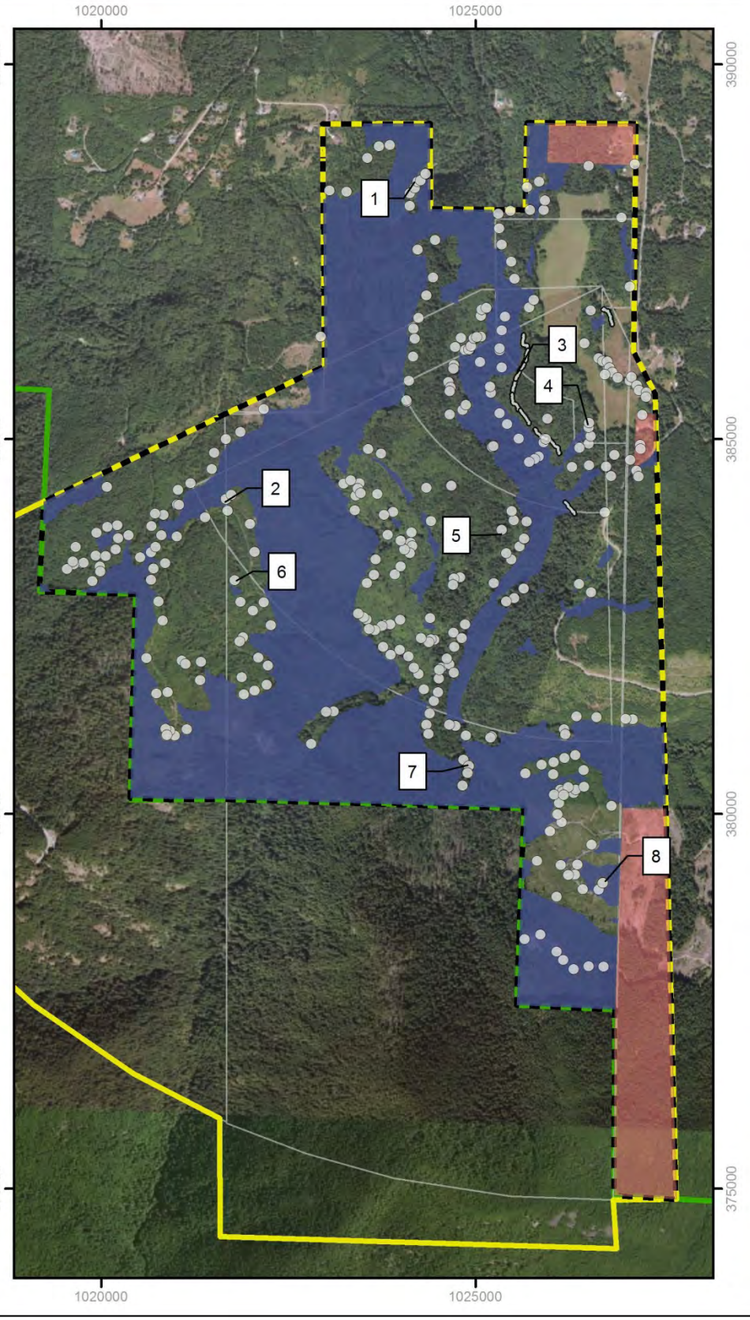


Figure 4-2

Examples of Unsurveyable Terrain Port Angeles Combat Range, WA

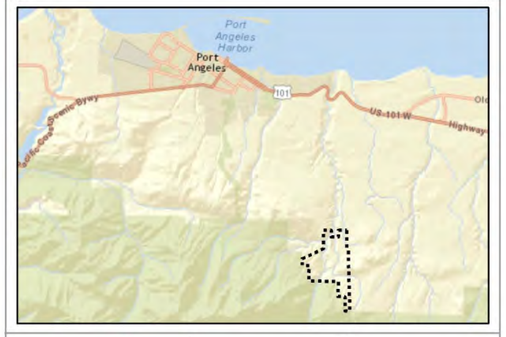
0 1,000 2,000 3,000 4,000 5,000 Feet
0 500 1,000 1,500 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- Location of digital photograph to document site terrain
- Unsurveyable
- Unsurveyable (567.8 acres)
- No ROE (105.9 acres)
- Range Complex No. 1
- Project Study Area
- PACR MRS Boundary
- Olympic National Park

Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015



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4.1.3 Digital Geophysical Mapping Investigation

The objective of the DGM surveys was to determine whether a MEC subsurface hazard may exist by mapping and selecting metallic anomalies within areas that may contain target features.

The DGM process is described in detail in the Geophysical Investigation Plan (Section 3.4 of the RI Work Plan). DGM was used to identify areas exhibiting high anomaly densities indicative of munitions within Technical Approach Area 2. DGM transects were walked at a spacing of 35 feet or 75 feet using a Geonics EM61-MK2 (EM61-MK2) sensor mounted on a man portable non-metallic litter. Any additional suspected munitions related features outside the pre-determined transect spacing (35 feet or 75 feet) within areas assigned to Technical Approach Area 2 were also captured. The EM61-MK2 could not be operated reliably on slopes greater than 65%. The transect spacing was determined using the Visual Sample Plan (VSP) software and spacing agreed upon with the regulatory agencies. VSP is a software program developed by Pacific Northwest National Laboratory under funding from the Strategic Environmental Research and Development Program (http://vsp.pnl.gov) (**Section 5.1.1.2**). It utilizes statistical sampling theory and statistical analysis of sample results to provide a defensible sampling plan. Typically, 1% - 20% of an area is mapped during such a sampling activity.

4.1.3.1 DIGITAL GEOPHYSICAL MAPPING DATA COLLECTION AND METHODOLOGY

The DGM methodology for this RI was developed in accordance with the *Data Item Description (DID) MMRP-09-004, Geophysics* (USACE, 2009a), *Engineering Manual (EM) 1110-1-4009* (USACE, 2007), *Digital Geophysical Mapping Guidance Operational Procedures and Quality Control Manual (DGM QC Guidance)* (USACE, 2003), and *Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response* (Environmental Security Technology Certification Program) (ESTCP, 2011).

4.1.3.2 DIGITAL GEOPHYSICAL MAPPING TECHNOLOGIES AND PERFORMANCE METRICS

Geonics EM61-MK2 - This survey used an EM61-MK2 metal detector deployed using a man-portable platform. Time-domain electromagnetic metal detectors detect shallow metallic objects with good spatial resolution and with minimal interference from adjacent metallic features. The EM61-MK2 is the industry standard metal detector. The instrument generates a transient primary magnetic field, which induces eddy currents in nearby metallic objects. As the eddy currents decay, the instrument measures the secondary magnetic field over four geometrically spaced time windows. The first measurement occurs a relatively long time after the primary pulse. This allows current induced in the ground to dissipate, leaving only the magnetic field produced by nearby metallic objects. The secondary magnetic field induces a current in the coils, which the instrument electronics convert to a voltage. The Data Acquisition System (DAS) timestamps and records the voltage. The instrument collected data at 12 Hertz (Hz) or samples per second. The EM61-MK2 was designed to detect individual small items at shallow depths and relatively larger items (e.g., 155mm projectile) at depths approaching 5 to 7 feet (1.5 to 2.1 meters). The resulting data was used to differentiate, in simplistic fashion, the relative size and distance (or depth) of metal items when the anomaly density is relatively low. In cluttered areas where the anomaly density is relatively high (e.g., burial pits, trenches, etc.) and the anomaly signatures overlap, the determination of size and depth is much more difficult. The data streams from these sensors were collected using a DAS and stored on a computer hard drive. After data collection, the data are downloaded, processed and analyzed, resulting in an anomaly list.

EM61-MK2 Litter - Due to thick vegetation and rough terrain in the Direct Fire Impact Area, the man-portable litter platform was used to collect DGM data. A single EM61-MK2 coil was attached to a fiberglass frame that allowed two geophysical team members to hold the coil, suspended above the ground, while maintaining a distance away from the coil large enough to prevent personnel interference. The coils height above the ground surface was 9-12 inches (30 cm). The orientation of the sensor was controlled by the geophysical technicians manually lifting or lowering the handles of the litter platform. The geophysical technician operating the rear end of the litter used frequent visual checks to maintain a level orientation. A real-time kinematic (RTK) GPS antenna was positioned directly above the center of the coil. Both the GPS antenna and the EM61-MK2 coil were powered by portable batteries located inside of the GPS antenna and backpack worn by the geophysical team member supporting the rear end of the litter. This backpack also contained the EM61-MK2 control box. The geophysical team member supporting the front end of the litter platform wore a harness with a laptop computer attached and was responsible for navigating to the survey lines and controlling the DAS. The geophysical team members also wore a waist strap with loops that attached to the litter platform handles to help maintain a fixed coil height and to allow occasional hands free operation when the front end team member was operating the computer. The litter was not able to survey in areas too difficult to walk through or areas with widespread vegetation that would prevent the coil from maintaining a specified height. **Table 4-1** outlines the DGM DQOs for the litter platform standardization tests.

Trimble Real Time Kinematic Positioning - To position the EM61-MK2 geophysical sensor a GNSS receiver and antenna were utilized. A GNSS receiver is similar to a GPS receiver except that it utilizes multiple satellite constellations, specifically the U.S. GPS satellite constellation and the Russian Global Navigation Satellite System (GLONASS) satellite constellation. GNSS technology used the broadcasts from a minimum of five Earth orbiting satellites to triangulate the antenna's geographical location. A local GNSS base station provided differential corrections via a radio link to correct for systematic errors, such as atmospheric distortions. The rover was typically within 0.5 miles of the base station. Due to dense vegetation and tree canopy at Technical Approach Area 2, a characterization accuracy of +/- 3 feet (1 meter) was utilized.



Man-portable EM61-MK2 litter platform with RTK Positioning

4.1.3.3 DIGITAL GEOPHYSICAL MAPPING QUALITY CONTROL PROCEDURES

Digital Geophysical DQOs are presented in **Table 4-1**. The standardization tests mentioned in the sub-sections below (static background and spike, personnel, cable shake, time calibration, and point position) and the IVS are checked against the DQOs for project QC compliance.

Table 4-1 Digital Geophysical Data Quality Objectives

Data Quality Objective	Test Method	Measurement Performance Criteria
Equipment warm-up (minimum 15 minutes)	A power on, conduct real time monitoring of EM61-MK2 instrument readings. Data is not recorded; this will be a visual check by the field team prior to starting calibration tests.	Drift of less than 3 mV over 3 minutes
Repeatable static data are being obtained from the DGM system	At the beginning and end of day, conduct a static background and spike test for each coil. Data will be collected for at least 60 seconds for each test.	Less than 2.5 mV peak to peak for static background, spike ±10% of standard item response after background corrections
Prevent noise related to loose pins or cable connectors	At the beginning of the day, conduct a cable shake test. Each cable will be tested for at least 5 seconds while monitored by the sensor operator.	Less than 2.5 mV peak to peak
Ensure instrument operators are not carrying any metallic objects that can interfere with the EM61-MK2 readings	At the beginning of the day, conduct a personnel test (applicable to single coil cart systems only).	Less than 2.5 mV peak to peak
Position of GPS is accurate	At the beginning of the day, the GPS unit's position will be compared with a known point during a point position test. Positions will be recorded for at least 60 seconds.	Within 10 cm of known values for point position test. Only positions with a PDOP below 4 and RTK fix value* of 2, 3, or 4 will be accepted for DGM. Brief spikes of PDOP below 6 may be accepted in limited cases.
Repeatable dynamic data are being obtained from the DGM system	At the beginning and end of the day, the geophysical instruments will collect data over an IVS.	± 25% of prior response; position of anomalies repeatable within 10 cm.
Positioning of detected anomalies is accurate	Anomalies selected will be compared with known seed item locations to ensure compliance.	100% of all anomaly locations lie within a 3-6 feet (1-2 meters) radius of a point on the ground surface directly above the source of the anomaly. For seeds outside of the 3-6 feet (1-2 meters) radius, a corrective action will be conducted to determine the appropriate amount of failed data.
Survey coverage is sufficient to meet project objectives	Results of DGM surveys will be evaluated to ensure compliance.	Transect line gaps will not exceed 10 feet (3 meters) for distances > 13 feet (4 meters). Lot size is the survey file.
Consistent detection of blind seed items during dynamic survey	Transects with fixed RTK GPS coverage will be seeded with ISOs or seed items and surveyed by geophysical personnel.	95% of the ISOs or seed items will be detected. Any misses will result in a root cause analysis and may result in a resurvey of all or a portion of the transect.

Note: *RTK fix value deviates from the DQO presented in the RI Work Plan. The RI Work Plan originally stated RTK fix solutions other than 3 would be removed. Per Field Change Request (FCR) #1, the project team accepted RTK fix solutions of 2, 3, and 4. The project team did not include RTK fix solutions of 1. FCR #1 was approved by USACE during the DGM field investigation (**Appendix E**).

cm – centimeter
DGM – Digital Geophysical Mapping
GPS – Global Positioning System
ISO – Industry Standard Object
mV – millivolt
PDOP – Position Dilution of Precision
RTK – Real-Time Kinetic

Drift was observed occasionally on channel one during static background test. Values were marginally outside range for the performance criteria 2. Results from other tests including cable shake, personnel, and IVS anomaly response values confirmed function. The Project Geophysicist therefore concluded that the marginal channel one drift would not affect target picking and that results of all standardization and GSV tests confirm that DQOs were met. The results of the geophysical standardization tests subject to DQOs may be found in **Appendix F**.

4.1.3.3.1 Digital Geophysical Mapping Quality Control - Instrument Verification Strip

An IVS (shown in **Figure 4-3**) was installed onsite in Grid S-07. This site was selected because it was an area void of subsurface metal and electromagnetic interference. The test strip construction followed the guidelines described in *Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response* (ESTCP, 2009).

Four targets were placed for assessment and RTK-GNSS positioning was obtained on each target. Inert 37mm projectiles were used to simulate munitions targets. The inert 37mm projectile was selected because it was the smallest munition of concern (SMC) based on the range of munitions and munitions related items expected to be found during the survey. **Table 4-2** lists the orientations and locations of the inert 37mm projectiles.

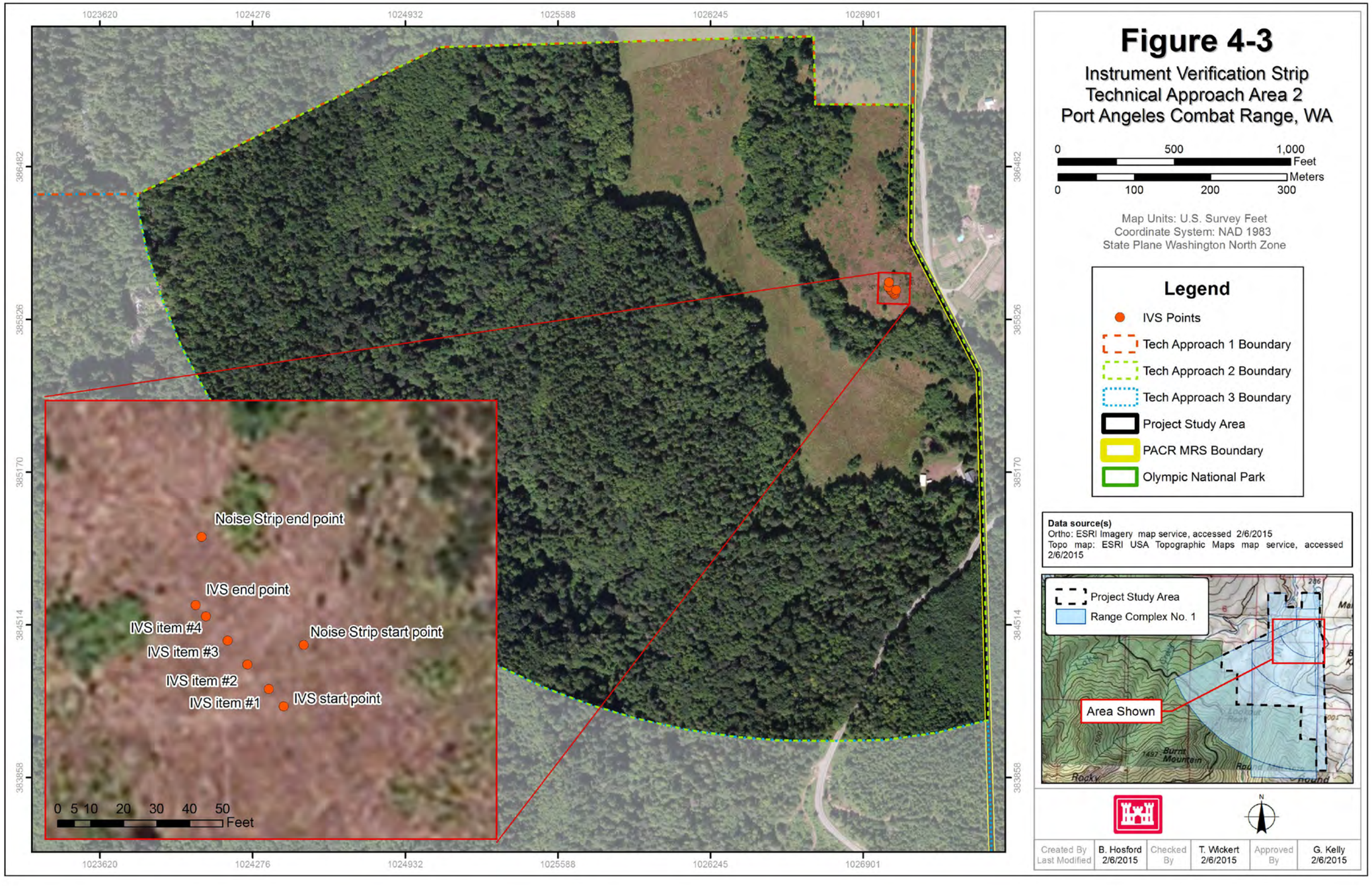
At a minimum, the IVS data was collected twice daily and after any equipment changes. The DQO table (**Table 4-1**) contains the limits for the test, and the Daily Survey and Processing Summary documents the results of the test (**Appendix F**). The inert 37mm projectiles were used to confirm the sensitivity of the geophysical instrumentation and adequacy of the data acquisition parameters (sampling frequency, and positioning system accuracy and precision, and sensor height above the ground surface). This was accomplished by comparing the sensor responses from the inert 37mm projectiles to standardized, physics-based models of the 37mm projectile created specifically for munitions response projects by the Naval Research Laboratory (NRL). Since geophysical measurements of the inert 37mm projectiles in the field varied from the physics-based models, each IVS lane was surveyed multiple times with at least two separate EM61 MK2 systems to establish an average electromagnetic response for each item. This average response was used to determine whether the sensors were functioning properly throughout the duration of DGM activities. Refer to the IVS Memo located in **Appendix G** for further details on IVS objectives, layout, data collection, and data analysis.

The project geophysicist certifies that all DQOs were met during Instrument Verification Strip QC. The results of the geophysical standardization tests subject to DQOs may be found in Attachment A of **Appendix G**.

Table 4-2 Instrument Verification Strip at the Range Complex No. 1 MRS

Item	Burial Depth (feet)	Orientation	Number of Items	UTM Northing (meters)	UTM Easting (meters)	State Plane Northing*	State Plane Easting*
Inert 37mm projectile	0.5	H	1	5319761.216	474599.192	385937.54	1027032.58
Inert 37mm projectile	0.5	V	1	5319763.496	474597.219	385945.20	1027026.32
Inert 37mm projectile	1.0	H	1	5319765.698	474595.386	385952.59	1027020.51
Inert 37mm projectile	1.0	V	1	5319767.953	474593.384	385960.18	1027014.15

Notes:
** U.S. Survey Feet* *H = Horizontal, Across-Track* *V = Vertical* *UTM = Universal Transverse Mercator*


1023620
1024276
1024932
1025588
1026245
1026901
386482
385526
385170
384514
383858
Noise Strip end point
IVS end point
IVS item #4
IVS item #3
IVS item #2
IVS item #1
Noise Strip start point
IVS start point
0 5 10 20 30 40 50
Feet
Figure 4-3
Instrument Verification Strip
Technical Approach Area 2
Port Angeles Combat Range, WA
0 500 1,000
Feet
0 100 200 300
Meters
Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone
Legend
IVS Points
Tech Approach 1 Boundary
Tech Approach 2 Boundary
Tech Approach 3 Boundary
Project Study Area
PACR MRS Boundary
Olympic National Park
Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Project Study Area
Range Complex No. 1
Area Shown
N
Created By
Last Modified
B. Hosford
2/6/2015
Checked By
T. Wickert
2/6/2015
Approved By
G. Kelly
2/6/2015

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4.1.3.3.2 Digital Geophysical Mapping Quality Control - Standardization Tests

In addition to the daily IVS surveys, the following standardization tests were conducted and the results are documented in the Daily Survey and Processing Summary (**Appendix F**).

- The **Static Background** and **Spike Test** checks the instrument's background reading and drift, identifies potential interference, checks the instrument's response against a known standard test item (spike), and checks to make sure the instrument's readings returned to background levels after a spike.
- The **Personnel Test** checks the operators for potential sources of noise, only when a man-portable platform is used for data collection.
- The **Cable Shake Test** measures any anomalous readings caused by cable movement, short circuits, or bad connectors.
- The **Time Calibration Test** measures the time delay (latency) in the instrument readings.
- The **Point Position Test** checks the function and accuracy of the positioning system. Results from the point position test are described below.
- Six survey control points were established by a State of Washington licensed Professional Land Surveyor as a QC measure to ensure that the positional accuracy of the EM61 data met the project DQOs. **Figure 4-4** and **Table 4-3** compares the surveyed locations of the control point with the mapped location of the corresponding geophysical anomaly. Control points 1 and 2 were installed for the base station, therefore they were not placed along EM61 transects. Control point 3 was placed in the open meadow. As expected, the offset between the control point and the corresponding geophysical anomaly was smallest for control point 3 due to the sparse vegetation and open sky visibility. Control points 4 and 6 were in more vegetated areas, and the geophysical anomaly to surveyed position offsets was less than three feet. Control point 5, also located in a vegetated area, had an offset slightly more than three feet. The comparison of the control points established by the licensed Professional Land Surveyor to the geophysical anomalies verified that the DQO for spatial positioning was met.

Table 4-3 Comparative Analysis of Survey Control Point Locations and Associated EM61 Anomaly Response

Description	Control Point Northing* (U.S. Survey feet)	Control Point Easting* (U.S. Survey feet)	Anomaly Northing* (U.S. Survey feet)	Anomaly Easting* (U.S. Survey feet)	Distance Between Control Point and Geophysical Anomaly (U.S. Survey feet)	Sum Channel (mV)
CP-1	385995.85	1027076.41	NA	NA	NA	NA
CP-2	385896.94	1027063.47	NA	NA	NA	NA
CP-3	385822.32	1026558.78	385822.63	1026558.52	0.41	2330.33
CP-4	385726.89	1026407.89	385726.35	1026409.77	1.95	1233.46
CP-5	386479.25	1026434.44	386476.48	1026432.64	3.30	3892.64
CP-6	386194.45	1026097.37	386193.81	1026097.77	0.75	1631.34

Notes: *NA indicates that the control point was placed between planned DGM transects*
**Washington State Plane coordinates (North Zone) U.S. Survey Feet NAD 83*

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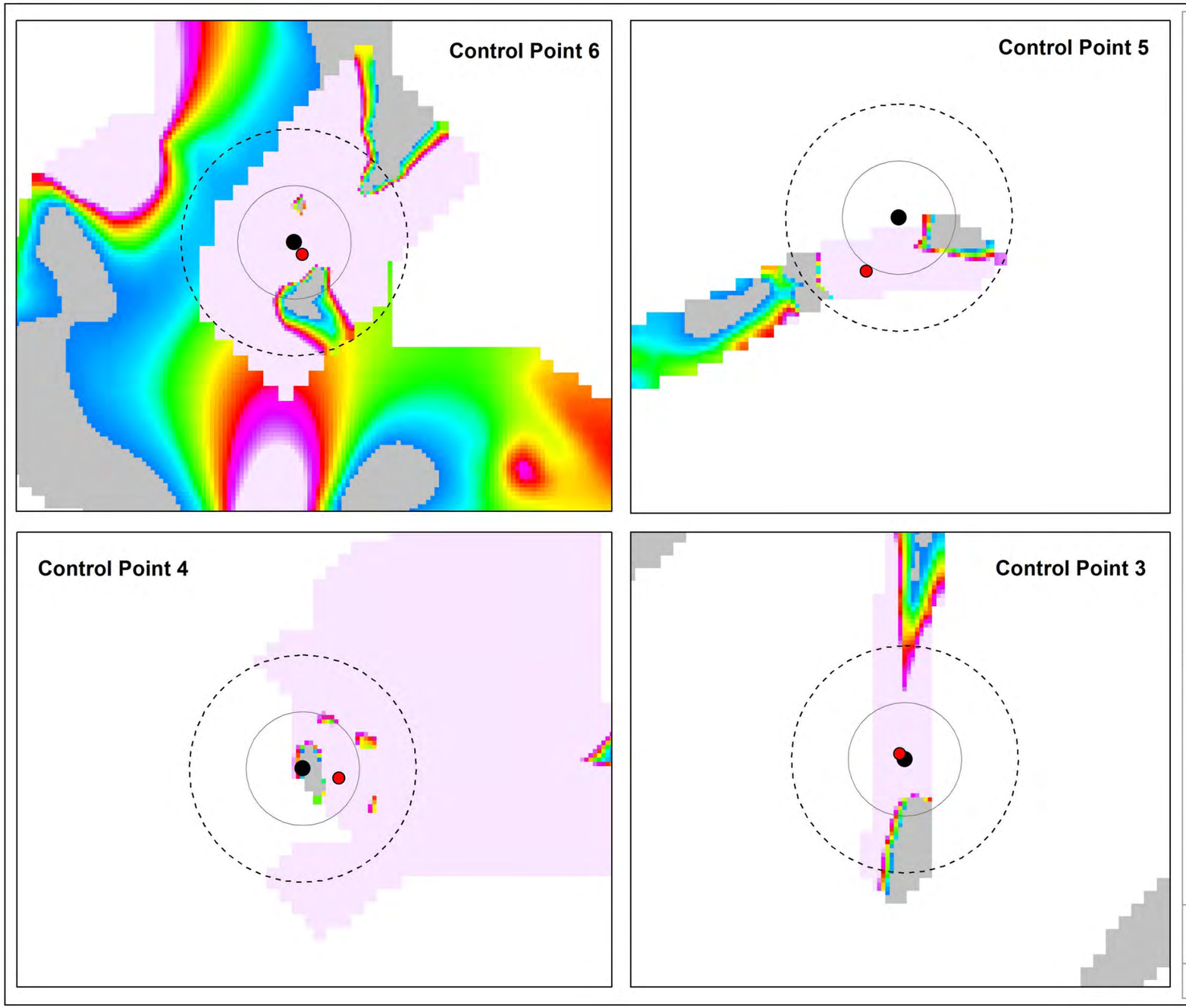
Control Point 6
Control Point 5
Control Point 4
Control Point 3
Figure 4-4
Survey Control Point Locations and EM61 Response
Port Angeles Combat Range, WA
0 2.5 5 10
Feet
0 1 2 4
Meters
Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone
37
29
20
12
4
EM61 Sum Channel (1-4)
(mV)
Legend
Anomaly Location
Control Point
3ft Control Point Buffer
6ft Control Point Buffer
Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Note
The "Open Area" boundary was digitized from historical aerial photography and represents the historical area where targets were likely present.
CP5
CP6
CP1
CP2
CP3
CP4
Legend
Control Point
Open Area
Tech Approach 1 Boundary
Tech Approach 2 Boundary
Project Study Area
PACR MRS Boundary
N
Created By / Last Modified
B. Hosford 2/6/2015
Checked By
T. Wickert 2/6/2015
Approved By
G. Kelly 2/6/2015

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4.1.3.4 DIGITAL GEOPHYSICAL MAPPING DATA COLLECTION AND METHODOLOGY

Raw data files collected by geophysical field personnel were posted to a File Transfer Protocol (FTP) site each day after collection and made available to the USACE for QA inspection.

The data processor performed the following initial data checks and processing using UXOLab:

1. The standardization tests (static background and spike, cable shake, personnel, time calibration, point navigation, and IVS) were checked against the DQOs. The standardization results were reported to the Project Geophysicist. Tests with rejected results were repeated. The accepted test results were plotted and analyzed in the daily data processing report.
2. The raw data files were batch processed with a MATLAB script.
   - The EM61-MK2 sensor and GPS positional data were correlated and merged. The time calibration test generates a time slew value that is used to compensate for instrument lag between the geophysical and GPS instruments. The time slew value was entered manually into the MATLAB batch processing script.
   - The script applied a de-median filter to the EM61-MK2 data to reduce the effects of instrument drift.
   - The script also eliminated data points that were collected while the litter array was stationary. Dynamic positional data was required to calculate the correct azimuth of the sensor. The procedure was not performed on the static/spike, cable shake, or point navigation data files because the litter array is intended to be stationary and the azimuth of the sensor is not significant for these tests.
3. The merged data files were exported to a file in xyz format that can be read by Oasis montaj.

Further data processing steps including target picking were performed within Geosoft's Oasis montaj software platform.

1. A Geosoft database file was created by importing all xyz survey files collected on a single day. This database was gridded for visual inspection by the Data Processor. A line path showing where data were collected was produced to aid in the production of status maps.
2. The original database was copied and renamed. GPS data is expressed as a text string using National Marine Electronics Association (NMEA) formatting. In addition to time and spatial information, the NMEA text string lists the type of GPS correction or fix applied to each GPS position as one of the following values:

   1 = Standard Positioning Service GPS fix
   2 = Differential GPS fix
   3 = Precise Positioning Service GPS fix
   4 = RTK GPS fixed solution

   Data with poor quality GPS positions were eliminated by masking the x coordinate values. The project team accepted RTK fix solutions of 2, 3, and 4. GPS data points were defined as poor in quality if the RTK fix value was equal to 1 or the PDOP value was greater than or equal to 4.

3. Data with PDOP values between 4 and 6 were analyzed. The Data Processor determined that these data points were not just brief spikes; therefore, they were assigned a dummy value. The Sum Channel was also created and populated in this database.

4. The database corrected for poor GPS data was copied and renamed. Data that did not exhibit proper decay were eliminated from target picking by masking the x coordinate values. A decay mask channel was also created in the database such that a dummy value indicates poor decay and a value equal to 3 indicates proper decay.
5. The GPS and decay fixed database was copied and renamed. The resulting database was suitable for target picking using the "Pick Peaks Along Profiles" tool in Oasis montaj. This database was reduced to a target pick list by merging all of the database lines and exporting only the database rows that contained a target pick. The target pick list was sent to the Project Geophysicist, and QC target picks were added to the list.

Data grids and line paths were generated for each stage of processing. Comparing the line paths at each stage helped determine the general quality of the DGM data in terms of how vegetation and terrain affected the RTK fix and proper decay of the EM61-MK2.

For the Technical Approach Area 2 (SR-01), the expected ordnance types and their burial depths were initially unknown. Therefore, the data were analyzed to the noise level. The noise level was determined by computing the mean and standard deviation for the select subsections of data transects, and applying the following formula: Noise threshold = mean + 3 × standard deviation. The final noise threshold used was a weighted average of the noise threshold calculated for each of four subsections acquired on the first day of DGM.

Upon finalization, the target pick list was used to generate a full coverage target density map in the open meadow that historically contained artillery targets. To apply transect data to a full coverage estimate, the target density analysis took into consideration that a transect based, not a full coverage, geophysical survey was performed and that the transect density throughout the meadow was variable. Both the raw and processed geophysical data will be included with the final USACE data deliverable package.

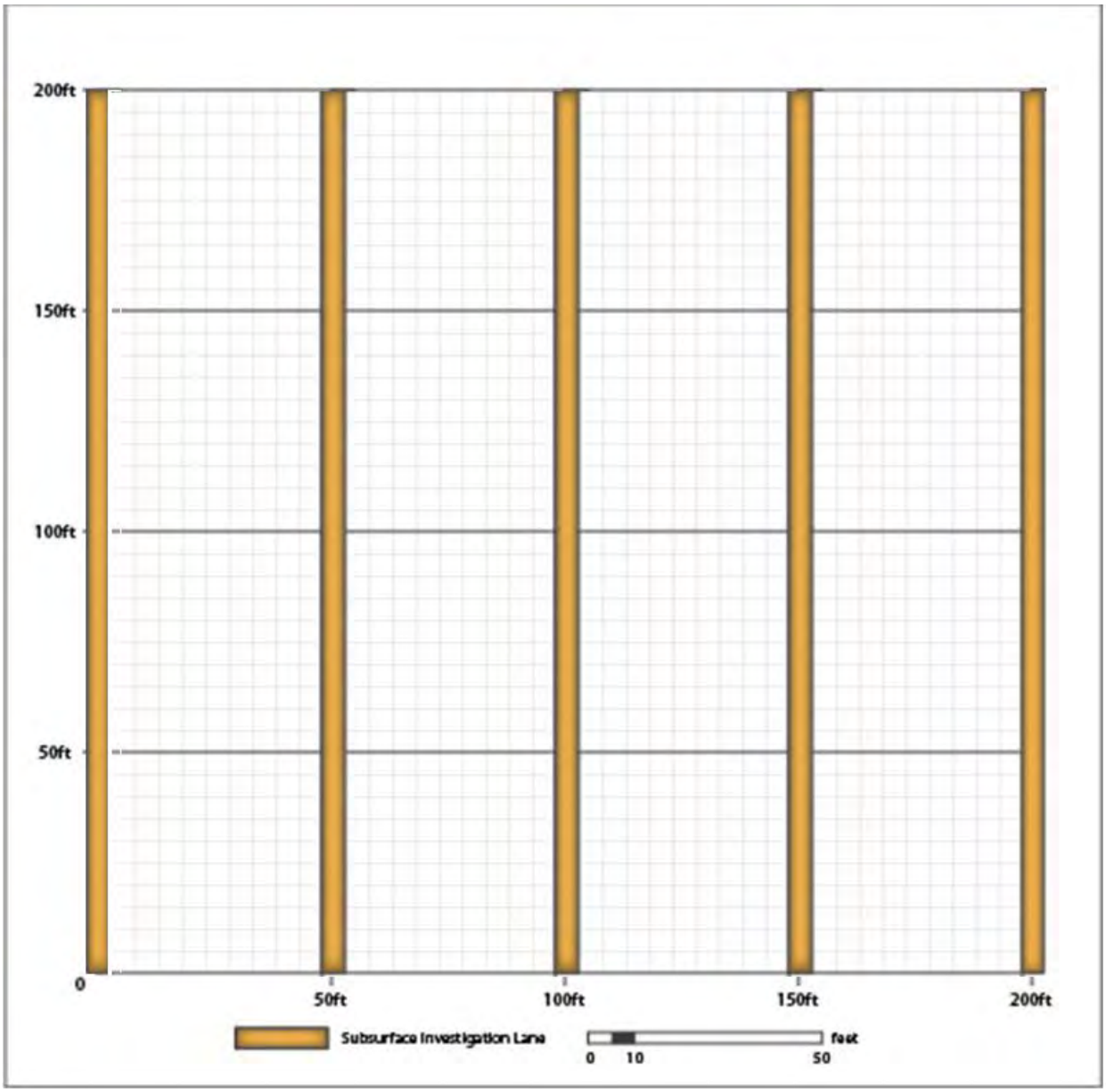
4.1.4 Subsurface Investigation

Once the DGM was completed, and the areas with high anomaly densities (i.e., 250 anomalies per acre or greater) were identified, subsurface investigations were conducted to define the nature and extent of MEC/MD (if present).

4.1.4.1 SUBSURFACE INVESTIGATION METHODOOLOGY

200-foot x 200-foot grids were laid out on each high anomaly density area. Subsurface investigations were performed on a minimum of 10% of the area of each grid. **Figure 4-5** illustrates an example 200-foot x 200-foot grid with 5-foot sweep lanes at the 0-foot, 50-foot, 100-foot, 150-foot, and 200-foot intervals. At every 50 feet on the grid, a 5-foot lane had subsurface anomalies investigated. Contiguous subsurface investigation grids stepping out from high anomaly density areas were established when munitions were observed and until the extent of the munitions were determined. The intrusive investigation did not serve as a removal action but rather to define the nature and extent of MEC/MD.

Figure 4-5 Example of 200-foot x 200-foot Subsurface Investigation Grid



4.1.4.2 SUBSURFACE INVESTIGATION TECHNOLOGIES AND PERFORMANCE METRICS

The same equipment used for the AVS, Schonstedt Model GA-52 Cx Metal Detectors and Trimble Model GeoXH GPS, were used for the subsurface investigations. The same field checks and daily QC checks conducted for the AVS were conducted for the subsurface investigations. Refer to **Section 4.1.2.4** for details. A White's all-metals detector was utilized in the meadow where artillery targets were historically present to look for non-ferrous small arms.

4.1.4.3 SUBSURFACE INVESTIGATION DATA COLLECTION PROCESS/METHODOLOGY

Subsurface investigations commenced on November 14, 2013 and ended on December 11, 2013. A total of 124 grids were investigated. The goal of the operation was to survey at least 10% of the area of each grid. Findings from each grid were recorded using a Trimble GPS. A consolidated summary of MEC, MD, small arms debris, and trash was recorded for each grid.

Subsurface investigations were performed over a period of 15 workdays. As many as 11 UXO Technicians performed the operation. Team members included up to seven UXO Technician IIs and up to four UXO Technician IIIs. A UXO Technician III was team leader. The USACE Ordnance and Explosive Safety Specialist (OESS), a UXO Safety Officer (UXOSO)/UXOQCS, and a Senior UXO Supervisor (SUXOS) were also present at different times to provide oversight, guidance and supervision.

The subsurface investigation consisted of placing a survey stake at the corners (NW, NE, SE, and SW) of each 200-foot by 200-foot (approximately 1 acre) grid using a Trimble GeoXH GPS unit. A section of nylon rope was strung between the corner stakes along the north and south perimeters. In order to survey at least 10% of each grid, the nylon perimeter ropes had metal clips placed on them at 0, 50, 100,150, and 200-foot intervals. Using the clips on the perimeter ropes, 200-foot sections of rope were attached at the clips to create the 5-foot survey lanes in a north to south orientation. A team would walk each 5-foot lane and using a Schonstedt magnetometer or White's all-metals detector (if needed) would identify sub-surface anomalies. The team would then manually excavate the identified anomaly(s) until no additional ferrous items were detected. The team recorded the following information on an Excavation Log for each excavation:

- Whether the item(s) were MEC, MD, Small Arms, or Trash
- Depth of the MEC and MD item(s)
- Consolidated weight of the item(s) per grid in pounds (lbs)
- The number of items
- Comments to further describe the item(s)

A UXO Technician II recorded and photographed the consolidated grid items using the Trimble GeoXH and a digital camera. The UXOSO/UXOQCS and USACE OESS conducted QA/QC review of the activities based on their observations and oversight of selected areas.

4.1.5 MD Handling, MDAS Disposal, and Demolition Operations

During subsurface investigations all Material Potentially Presenting an Explosive Hazard (MPPEH) was inspected in accordance with EM 385-1-97 (USACE, 2008) and EM 1110-1-4009 (USACE, 2007). The MPPEH inspection process is shown in **Figure 4-6** and consisted of the following:

- A UXO Technician II performed a 100% inspection as the item was recovered.
- A UXO Technician III performed a 100% re-inspection.
- The UXOSO/UXOQCS conducted daily audits of the inspection process.
- The UXOSO/UXOQCS insured MPPEH processing was performed safely.
- The SUXOS and UXOSO/UXOQCS performed a 100% inspection at the end of each day to ensure that MD was free of explosive hazards. The resulting MDAS was then secured in a locked container.

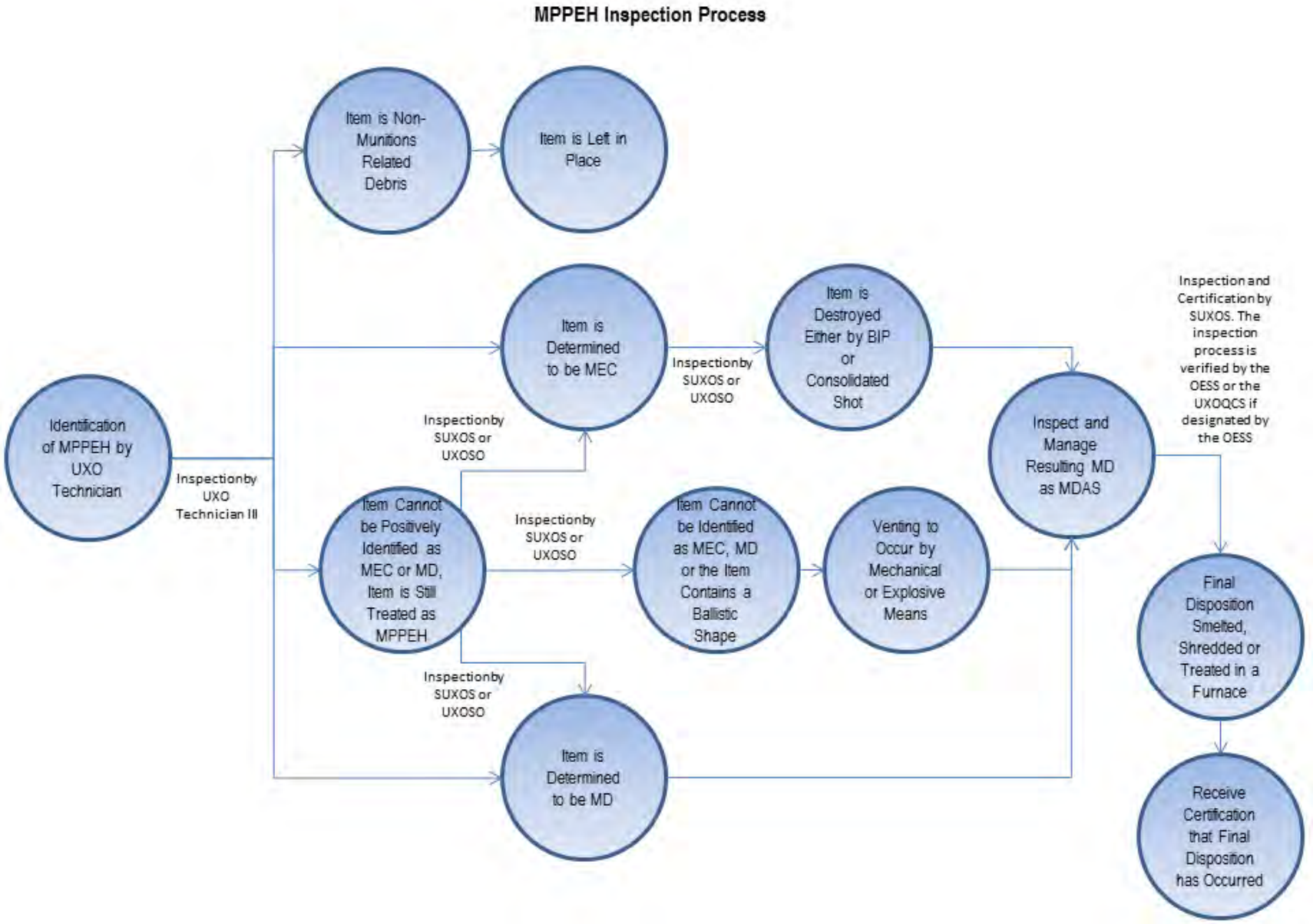
During subsurface investigations, MPPEH was inspected by the SUXOS or UXOSO/UXOQCS to determine if the item was MEC. If the item was determined to be MD, and not MEC, the debris was handled as MDAS. If the items were determined to be non-munitions related debris the items were left in place.

Upon verification of MEC by the SUXOS or the UXOSO/UXOQCS during subsurface investigations, the SUXOS contacted the Project Manager and the Clallam County Sheriff and Fire District #2. The Project Manager then contacted the USACE and relevant stakeholders. Refer to **Section 5.1.1.4** for details regarding demolition of MEC and demilitarization of MD.

The SUXOS and UXOSO/UXOQCS performed a final 100% inspection of the container at the end of the project, completed and sign DD form 1348-1, locked and sealed the container, and arranged for shipping for final treatment. The DD Form 1348-1 was completed to record the items and to certify them as Material Deemed As Safe (MDAS) and establish a chain of custody (**Appendix I**)

All demolition operations were conducted in accordance with the RI Work Plan (HDR, 2013) and the Explosive Site Plan (HDR, 2013a). See **Section 5.1.1.4** for additional information.

Figure 4-6 Material Potentially Presenting an Explosive Hazard - Inspection Process



4.2 Munitions Constituents Characterization

4.2.1 Media Sampling Activities

Media sampling and analysis was included in the RI Work Plan (HDR, 2013) to determine levels of MC contamination if warranted. During the SI, media sampling was performed including surface soil (0-6 inches bgs). The results of the SI indicated that none of the results exceeded regulatory screening values and further MC sampling and analysis was recommended for NDAI. Because the SI did not consider subsurface soil (greater than 6 inches bgs) MC sampling was still considered during the RI. The types of media to be sampled, and locations and numbers of samples and analytes to be evaluated were based on the potential MC sources (refer to **Table 4-4**), as supported by historical records of MEC use, evidence of MEC or small arms debris/activity observed at the MRS during the AVS, and the intrusive investigation. Soil sampling was anticipated to be the primary media investigated, but sediment, surface water, and groundwater sampling were also recommended if it was determined that MC was potentially impacting these media. Media sampling and analysis were to be performed as described in detail in the *Uniform Federal Policy-Quality Assurance Protection Plan UFP-QAPP* (Appendix D of the RI Work Plan).

Table 4-4 Composition of Munitions Potentially Used at the MRS

Size/Type Sub-Range	Nomenclature	Munitions Constituent(s)	Reference
.30 Caliber R01-SR-01	M2/ Ball M/2 AP	Lead; Propellant – single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerin); Tracer composition – strontium nitrate, polyvinyl chloride, strontium peroxide, magnesium powder.	TM 43-0001-27
.30 Caliber	M1 Carbine	Lead; Propellant – single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerin); Tracer composition – strontium nitrate, polyvinyl chloride, strontium peroxide, magnesium powder.	TM 43-0001-27
.45 Caliber R01-SR-01	M1911/ Ball with M1 Tracer	Lead; Propellant – single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerin); Tracer composition – strontium nitrate, polyvinyl chloride, strontium peroxide, magnesium powder.	TM 43-0001-27
.50 Caliber R01-SR-01	M2/Ball M/2 AP with Tracer	Lead; Propellant – single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerin); Tracer composition – strontium nitrate, polyvinyl chloride, strontium peroxide, magnesium powder.	TM 43-0001-27

Table 4-4 Composition of Munitions Potentially Used at the MRS (Continued)

Size/Type Sub-Range	Nomenclature	Munitions Constituent(s)	Reference
Projectile, 37mm All remaining sub-ranges	M/63 HE with fuze M58 w/ Primer w/ Propellant	M63 HE: Steel (chromium, copper, iron, nickel); Explosive – 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).	TM 43-0001-28
	M74/AP w/Tracer w/ Primer w/ Propellant	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 w/Primer M23 w/Propellant	M51 TP: Steel (chromium, copper, iron, nickel); Primer M23 – primer mixture (mercury fulminate, potassium chlorate, antimony sulfide); Propellant – FNH powder (nitrocellulose, dibutylphthalate, dinitrotoluene, diphenylamine).	
Mortar, 60mm All remaining sub-ranges	M49/HE w/ primer w/ Propellant w/ Ignition ctg w/ fuze M52	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, and tetryl.	TM 43-0001-28
Mortar, 60mm All remaining sub-ranges	M50/Practice	M50 practice: Steel (chromium, copper, iron, nickel); Spotting charge – black powder (sulfur, potassium nitrate, charcoal).	TM 43-0001-28
Projectile, 75mm All remaining sub-ranges	M48/HE w/ Propellant w/ Fuze M48 or M54	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.	TM 43-0001-28
	M61/AP Practice w/tracer	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 4-4 Composition of Munitions Potentially Used at the MRS (Continued)

Size/Type Sub-Range	Nomenclature	Munitions Constituent(s)	Reference
Mortar, 81mm All remaining sub-ranges	M43A1/HE Shell w/Primer M33 w/ Propellant w. Ignition Ctg w/ Fuze M52	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, and tetryl.	TM 43-0001-28
	M44/Practice	M44 Practice: Steel (chromium, copper, iron, nickel); Spotting charge – Black powder (sulfur, potassium nitrate, charcoal).	
	M57/WP Smoke	M57 WP: White phosphorus; Steel (chromium, copper, iron, nickel); Propellant – double-base powder (nitrocellulose and nitroglycerin).	
Grenade, Rifle All remaining sub-ranges	M9A1 AT (rifle)	Explosive – TNT;	Various Sources
Mines, AP All remaining sub-ranges	M8/Practice w/ Fuze, M10A1	M8 Practice: Steel (chromium, copper, iron, nickel); Spotting charge – Black powder (sulfur, potassium nitrate, charcoal), red phosphorus.	TM 43-0001-36
Mines, AT All remaining sub-ranges	M1/Practice w/ Fuze, M1	M1 Practice: Steel (chromium, copper, iron, nickel); Spotting charge – Black powder (sulfur, potassium nitrate, charcoal), red phosphorus.	TM 43-0001-36
Rocket, 2.36" Bazooka All remaining sub-ranges	M7/Practice	Steel (chromium, copper, iron, nickel); spotting charge – Black powder (sulfur, potassium nitrate, charcoal),	Various Sources
	M6/HEAT w/ Propellant	Explosive Pentolite – TNT and Pentaerythritol tetranitrate; M7 powder.	

Notes:
AP – Armor Piercing
HE – High Explosive
mm - millimeter
TNT - trinitrotoluene

The analytical methods selected to address munitions-related chemical contaminants were based on the types of items known or suspected to exist at the MRS and the associated MC (see **Table 4-4**).

The potential MC at the MRS included energetics (nitroaromatics, nitramines, and nitrate esters) and lead. Energetics were intended to be analyzed following USEPA SW-846 Method 8330B (mod), (USEPA, 2006) and lead following USEPA SW-846 Method 6010C (USEPA, 2007). Method 8330B is referred to as modified because, although all of the laboratory requirements for implementing SW-846 Method 8330B were to be conducted (e.g., air drying, sub-sampling, etc.), incremental sampling techniques were not incorporated into the RI Work Plan (HDR, 2013). The specific chemicals of concern are listed below in **Table 4-5**.

Propellants from any MC at the MRS would be in the form of single base (artillery), double base (small arms, mortar), or triple base (howitzer) compositions that consist mainly of nitrocellulose (NC) impregnated with 2,4-dinitrotoluene (2,4-DNT single-base), nitroglycerin (NG double-base), or NC and nitroguanidine (NQ triple-base). Residues are usually deposited at the firing points as partially burned particles of the solid propellant and the heterogeneity is much smaller than that for explosives at impact sites. NC has no known health or environmental risks and is usually not a chemical of concern or an analyte listed for analysis. The commercial availability and analytical methods for the analysis of NC and NG is either non-existent or as a specialty item. 2,4-DNT and NC are part of the analyte list for Method 8330 because they are also explosive chemicals used as an energetic. Stabilizers (dibutylphthalate and diphenylamine) are used in some propellants formulations and are usually 5-25% of the entire composition. The presence and concentration of these stabilizers at a specific site depend highly on the age of the site and are directly proportional to the amount of activity at the site for that particular munition. Other than the munitions recovered during the prior clearance efforts (e.g., M51 37mm and M63 HE 37mm projectiles and frag from 81mm mortars), there is no definitive evidence that these munitions were used at the MRS, and the stabilizer analytes associated with them would be negligible (USEPA, 2012), (USACE, 2011). Therefore, propellants were not considered during the RI field investigation.

Table 4-5 Analyte List – Port Angeles Combat Range

Lead – USEPA SW-846 Method 6010C
Lead
Explosives – USEPA SW-846 Method 8330B (modified)
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
1,3,5-Trinitrobenzene (1,3,5-TNB)
1,3-Dinitrobenzene (1,3-DNB)
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)
Nitrobenzene (NB)
3,5-Dinitroaniline
2,4,6-Trinitrotoluene (2,4,6-TNT)
4-Amino-2,6-dinitrotoluene (4-Am-DNT)
2-Amino-4,6-dinitrotoluene (2-Am-DNT)
2,4-Dinitrotoluene (2,4-DNT)
2,6-Dinitrotoluene (2,6-DNT)
2-Nitrotoluene (2-NT)
3-Nitrotoluene (3-NT)
4-Nitrotoluene (4-NT)
Pentaerythritol tetranitrate (PETN)
Nitroglycerin

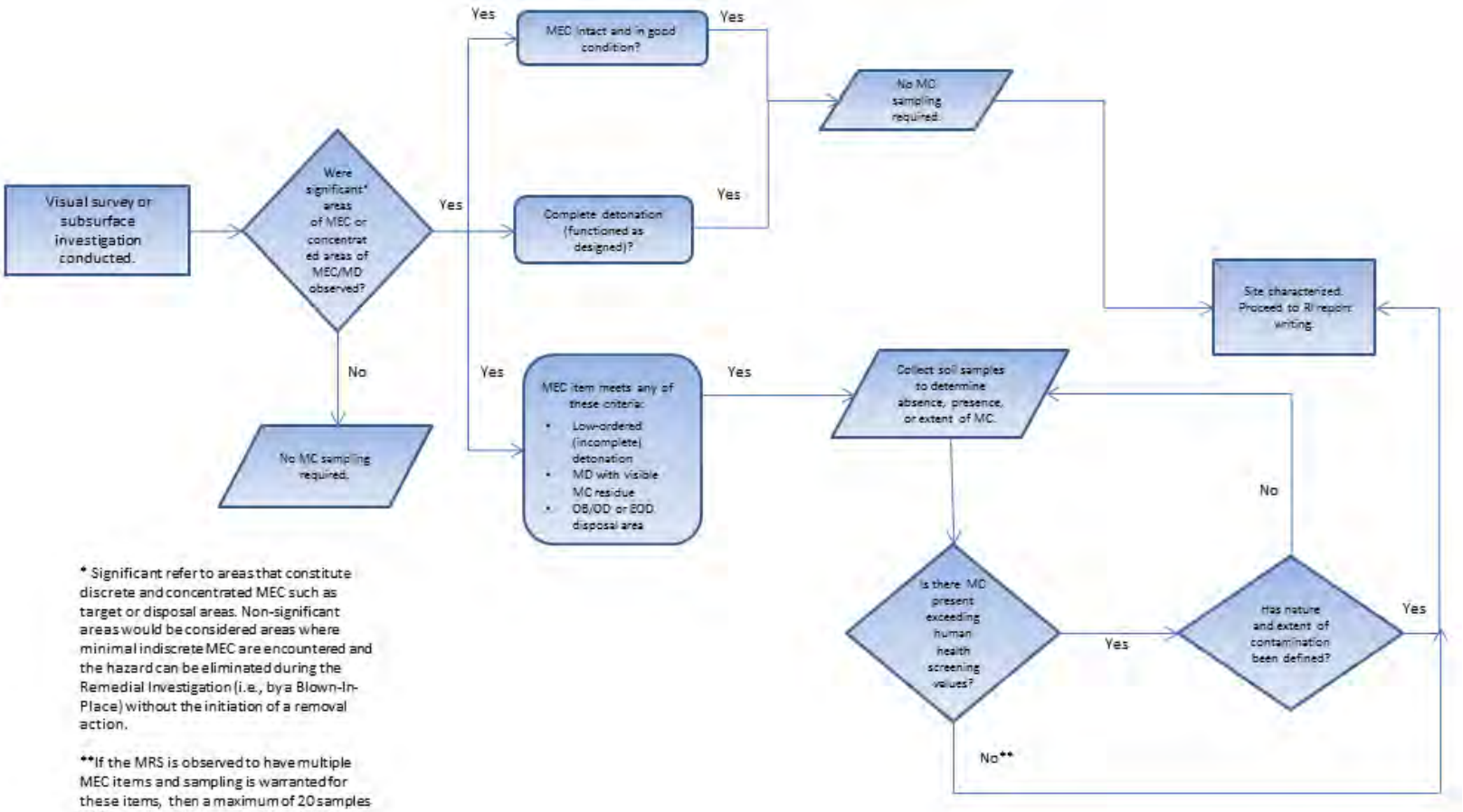
4.2.1.1 MUNITIONS CONSTITUENTS ENERGETICS SAMPLING – SOIL

If concentrations of MEC were sufficient to cause a possible release at the MRS, discrete grab samples for energetics would have been taken and sent to an off-site laboratory for analysis. If there was no significant source (MEC) observed within the MRS, no sampling would be conducted. There were six general situations that could have been encountered during field operations that were evaluated to determine if MC sampling for energetics was required if a MEC item was found as follows:

1. Intact, good condition MEC item – MC sampling was not performed because a release would not have occurred. The UXO team would have disposed of the item.
2. Intact, poor condition MEC item – MC sampling would be performed if an immediate explosive hazard was not present. If an immediate explosive hazard existed, the UXO team would have disposed of the item. MC sampling would have occurred after the disposal operations.
3. A low-ordered (incomplete detonation) MEC item – MC sampling would have been performed if an immediate explosive hazard had not been present. If an immediate explosive hazard existed, the UXO team would have disposed of the item. MC sampling would have occurred after the disposal operations.
4. Munitions debris with visible MC residue – MC sampling would have been performed if an immediate explosive hazard had not been present. If an immediate explosive hazard existed, the UXO team would have disposed of the item. MC sampling would have occurred after the disposal operations.
5. Munitions that have functioned as designed (complete detonation) – MC sampling would not occur because all explosives associated with the munitions would have been consumed during detonation.
6. Open Burn/Open Detonation – MC sampling would have been performed if an immediate explosive hazard was not present.

As described in the first and fifth scenarios above, all MEC and MD found at the MRS during the RI were intact, in good condition, or functioned as designed (complete detonation). MC sampling for energetics was not performed because a MC release would not have occurred. **Figure 4-7** presents the decision logic for conducting MC sampling at the MRS.

Figure 4-7 Decision Logic for Munitions Constituent Sampling for Explosives



* Significant refer to areas that constitute discrete and concentrated MEC such as target or disposal areas. Non-significant areas would be considered areas where minimal indiscrete MEC are encountered and the hazard can be eliminated during the Remedial Investigation (i.e., by a Blown-In-Place) without the initiation of a removal action.

**If the MRS is observed to have multiple MEC items and sampling is warranted for these items, then a maximum of 20 samples will be collected that are geographically dispersed throughout the MRS. Once analyzed for energetics and the results indicate concentrations below the screening levels, then MC sampling will no longer be required for the MRS.

4.2.1.2 MUNITIONS CONSTITUENTS LEAD SAMPLING – SOIL

MC sampling for small arms was included in the RI Work Plan (HDR, 2013) based on the Interstate Technology and Regulatory Council (ITRC) guidance (ITRC, 2003). Lead in a small arms projectile makes up more than 85% of its total weight and is the indicator for all other small arms projectile constituents. Since lead constitutes the greatest environmental concern as documented impacts to human health indicate, and because it is known that lead projectile fragments create dust upon impact at the berm and vapor upon heat of ignition at the firing line, lead in soil was utilized to determine nature and extent within the Range Complex No. 1 MRS for all other metals

In-situ XRF screening was conducted to analyze for lead in soils where natural features (e.g., natural berm feature) or small arms debris was identified. In-situ XRF screening was utilized for information only and to assist the field investigation team determine sampling locations for potential laboratory analysis. Since there could possibly be matrix interference due to the soil moisture content potentially being greater than 20%, per USEPA Method 6200, a conservative in-situ XRF screening level of 125 mg/kg (compared to the State of Washington soil cleanup level of 250 mg/kg) was utilized to evaluate lead concentrations in soils.

In-situ XRF screening measurements were recorded and geo-referenced only to provide information to the field investigation team to collect potential samples for laboratory analysis. The locations were also utilized to document the absence of lead in natural berm like features if there is no evidence of small arms use.

Below are the two general situations that were encountered during field operations that were evaluated to determine if lead sampling and laboratory analysis was required:

1. Small arms debris (casings, projectiles) observed in an area
2. Natural features such as a berm or slope indicating a potential impact zone of a small arms range

If the decision was made that soil sampling was necessary or warranted, discrete surface and subsurface soil samples for lead would have been collected and sent to an analytical laboratory for analysis, per the procedures outlined in the RI Work Plan (HDR, 2013). Sample collection was planned to continue horizontally and vertically until the analytical results were below the WDOE soil cleanup level for Washington Model Toxics Act Soil Cleanup Level under Method A for unrestricted future land use at 250 mg/kg.

4.2.1.3 ENVIRONMENTAL MEDIA SAMPLING – SURFACE WATER AND SEDIMENT

The decision logic to collect sediment and surface water samples was the same as that for soil sampling and was based on the presence of compromised MEC or observed small arms debris.

4.2.1.4 ENVIRONMENTAL MEDIA SAMPLING – GROUNDWATER

No groundwater sampling was anticipated at the MRS based on the groundwater sampling conducted as part of the SI in 2009. All MC concentrations were reported as non-detects in the SI (Shaw, 2009).

During the RI field investigation, field teams noted evidence of seeps, springs, and surface to groundwater communication (i.e., hydrogeological connections).

4.2.1.5 DECONTAMINATION REQUIREMENTS

Decontamination requirements were included in the RI Work Plan (HDR, 2013). Minimal decontamination was required during the RI. Disposable equipment, which did not require decontamination, was used whenever possible. Dry decontamination was performed on reusable sampling and non-sampling equipment to prevent cross-contamination between sampling locations. Stainless steel equipment and testing equipment (e.g., XRF analyzer) were decontaminated in the field by utilizing the dry decontamination method. First, a nylon brush was used to remove any residual soil on the equipment. Disposable hand wipes and paper toweling were then used to clean remaining soil deposits from the stainless steel and testing equipment. All decontamination materials and used personal protective equipment (PPE) were placed into a re-sealable plastic bag and disposed of in a non-hazardous waste municipal dumpster at the conclusion of sampling activities.

4.2.1.6 DATA REVIEW AND VALIDATION

In order to determine the overall usability of proposed analytical laboratory results, data review and validation requirements were also included in the RI Work Plan (HDR, 2013). The Project Chemist was available to review all analytical laboratory data against project specific DQOs and the *DoD Quality Systems Manual (QSM) Environmental Laboratories, Final Version 4.2* (DoD, 2010). The method-specific criteria followed *USEPA Office of Solid Waste and Emergency Response Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846), Update IV*B) (USEPA, 2008a) and the subcontract laboratory SOPs. Data validation was planned to be conducted in accordance with the *National Functional Guidelines for Inorganic Superfund Data Review* (USEPA, 2010) and the *National Functional Guidelines for Superfund Organic Methods Data Review* (USEPA, 2008b).

5.0 Revised Conceptual Site Model and Remedial Investigation Results

Field activities including AVS, geophysical surveys, subsurface investigations, and in-situ XRF screening for lead in soil were conducted as described in **Section 4.0**. The results and discussion of the nature and extent of MEC, MD, and MC contamination discovered are presented in the following subsections. A detailed analysis of the RI findings relative to the historical documentation and the Range Complex No. 1 MRS is presented in **Section 5.2.1.4**.

MEC and MC exposure pathways were evaluated based on the findings from the RI field investigations and updated from the RI Work Plan (HDR, 2013). For discussion in this RI/FS, Range Complex No. 1 MRS has been informally split into three MRSs based on different levels of risk for each area. These three MRSs reflect the information from historical investigation records, AVS, geophysical surveys, the subsurface investigation, and in-situ XRF screening for lead in soil performed during the RI. These MRSs were developed based on the types and distribution of MEC/MD within each MRS and their recommended remedial action alternatives. These are also the same MRSs evaluated in the MEC Hazard Assessment (MEC HA). **Section 8.5.1** summarizes the MRSs, which resulted in the creation of additional CSMs for access and exposure to MEC and MC for all receptors.

5.1 Munitions and Explosives of Concern

MEC investigation results from the AVS, geophysical surveys, and subsurface investigations are presented and evaluated in the following subsections.

5.1.1 MEC Investigation Results

5.1.1.1 ASSISTED VISUAL SURVEY RESULTS

Data were collected utilizing AVS during the RI at the PACR to document observations of surface MD as well as other features relevant to the CSM such as water features, nearby receptors, etc. Due to cliffs or steep slopes, the presence of extensive areas of streams and/or dense vegetation, 567.8 acres of the PACR were unsurveyable and inaccessible. No MEC was recovered during the AVS. A total of 112 miles of AVS transects were walked.

UXO personnel conducted AVS investigations with a Schonstedt magnetometer detector to locate and investigate subsurface anomalies. The depth of detection is limited by the size and orientation of the target and by soil characteristics. The Schonstedt instrument is not capable of classifying anomalies; it will only indicate the presence or absence of a subsurface anomaly. To ensure that the Schonstedt instruments were functioning properly, each instrument operator was required to walk the IVS using the sweep techniques and instrument settings proposed in the RI Work Plan (HDR, 2013), and detect 100% of the items at least once a day.

A total of three hundred and twelve (312) features were logged into Trimble GeoXH GPS units during the AVS. One hundred and thirty-four (134) features document unsurveyable terrain. Fourteen (14) features were non-military related items such as logging industry debris and civilian trash including; metal debris, metal cables, barbed wire, and old automobile wheel hubs.

During the AVS, the field investigation team observed only one MD item (an unidentifiable piece of HE frag) in grid R-01 (**Appendix C**). Initially, there was concern that there was an absence of MD in

Technical Approach Areas 1 and 3. However, the initial concerns were alleviated when all of the RI data were collected and the munitions related features corresponded with the location of the targets and impact areas identified in the ASR.

The AVSs that were performed in Technical Approach Area 2 were primarily reserved for anomaly avoidance and the identification of metallic features that would interfere with the DGM. While portions of the MRS were unsurveyable, the areas that were surveyed in combination with the other RI activities (e.g. analysis of historic information and line of sight modeling) were sufficient to meet the goals of the RI. The AVS proved to be an effective tool during the RI, as the AVS teams did identify subsurface MD and other metallic debris while assisting the DGM survey teams.

Appendix C presents the photograph documentation log showing the site features and unsurveyable terrain encountered during the AVS within the MRS. **Figure 5-1** through **Figure 5-3** show the location the AVS transects completed for each Technical Approach Area, parcels where a ROE could not be obtained and the extent of areas that were determined to be unsurveyable.

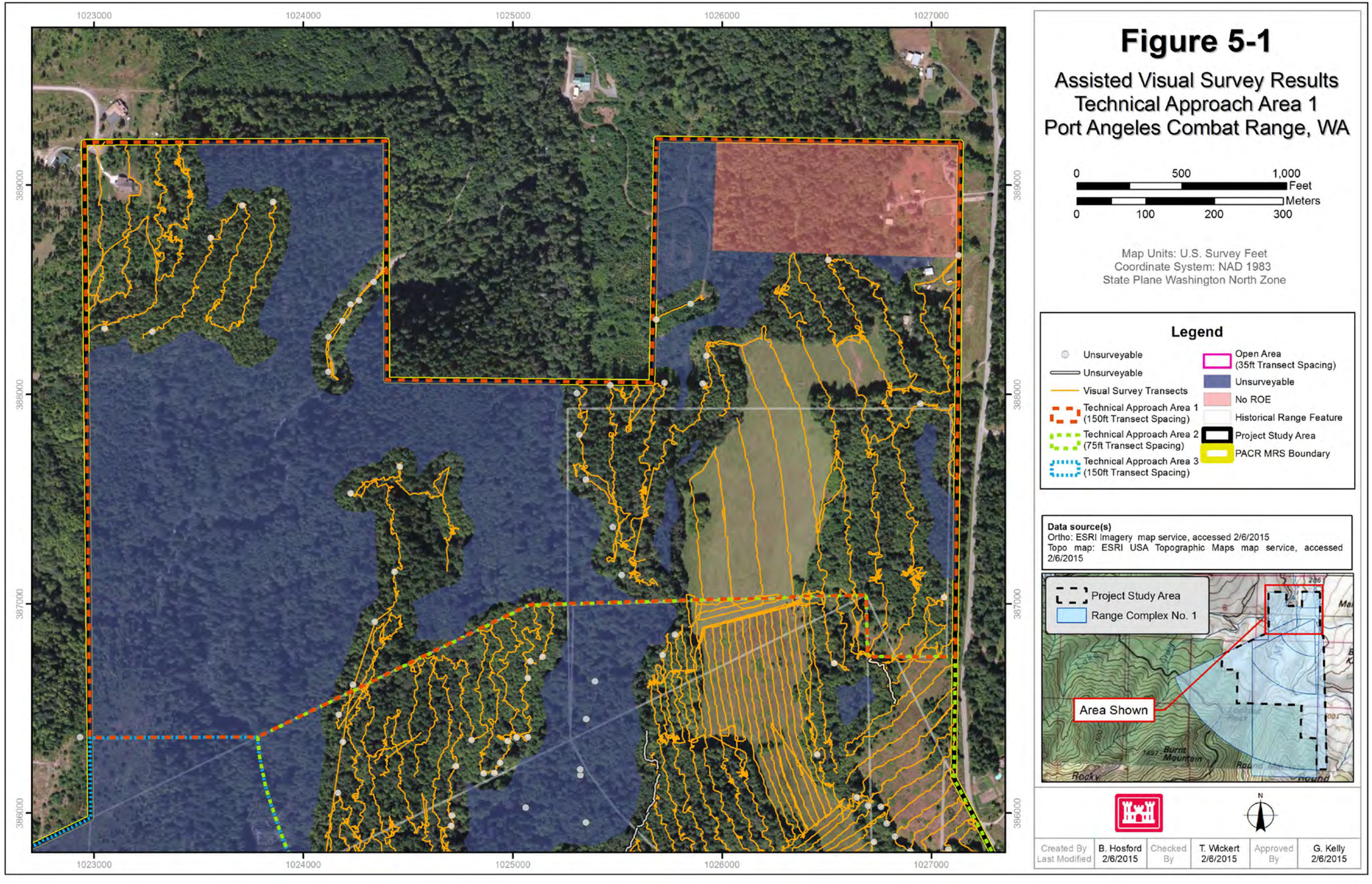
5.1.1.2 DIGITAL GEOPHYSICAL MAPPING RESULTS

DGM data were collected with an EM61-MK2 litter over a period of ten survey days from October 28, 2013 to November 12, 2013 in Technical Approach Area 2. A portion of Technical Approach Area 2 was surveyed along transects spaced 35-feet apart and the remainder of the accessible portions of Technical Approach Area 2 were surveyed along transects with 75-foot spacing. The 35-foot spaced transects were collected within the area that was historically an open meadow that contained artillery target features. The open meadow area was determined from a historical aerial photograph analysis. The historical photograph analysis utilized the dataset closest to the ranges post operational status (i.e., 1956).

Several acres were determined to be unsurveyable by DGM techniques due to the impassable vegetation, downed trees, slippery slopes, and other environmental hazards. Field Change Request (FCR) #2 (**Appendix E**) was submitted requesting that this unsurveyable acreage be completed utilizing AVS with real time excavation techniques to fill the data gaps. FCR #2 was approved by the USACE during the DGM field investigation.

After the first day of data collection, the DGM data were analyzed to calculate the noise threshold used for target picking. Four transect subsections were picked out that appeared to exhibit typical EM61-MK2 background noise by the data processor. Noise and target picking threshold of 12 mV, sum channel, was calculated using the formula described in **Section 4.1.2.4**. The geophysical field team collected at total of 17.6 miles DGM data shown on **Figure 5-4**. Targets were picked over data that had acceptable GPS data quality and exhibited proper decay. In total 3,123 targets were picked automatically by Geosoft Oasis montaj Version 8.0.1 (**Figure 5-5**). The four control points surveyed with the litter produced geophysical anomalies that validated the positional accuracy of the DGM data and the accuracy of the control point coordinates measured by the Washington State licensed land surveyor (**Figure 4-4**).

The USACE was briefed on the results of the DGM investigation and approved the results of the DGM prior to demobilization. The areas containing greater than 250 geophysical anomalies per acre were also investigated as described below. The project geophysicist certifies that all established DQOs were met and that the DGM data is useable for its intended purposes.


1023000
1024000
1025000
1026000
1027000
389000
388000
387000
386000
Figure 5-1
Assisted Visual Survey Results
Technical Approach Area 1
Port Angeles Combat Range, WA
0
500
1,000
Feet
0
100
200
300
Meters
Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone
Legend
Unsurveyable
Unsurveyable
Visual Survey Transects
Technical Approach Area 1 (150ft Transect Spacing)
Technical Approach Area 2 (75ft Transect Spacing)
Technical Approach Area 3 (150ft Transect Spacing)
Open Area (35ft Transect Spacing)
Unsurveyable
No ROE
Historical Range Feature
Project Study Area
PACR MRS Boundary
Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Project Study Area
Range Complex No. 1
Area Shown
N
Created By
Last Modified
B. Hosford
2/6/2015
Checked By
T. Wickert
2/6/2015
Approved By
G. Kelly
2/6/2015

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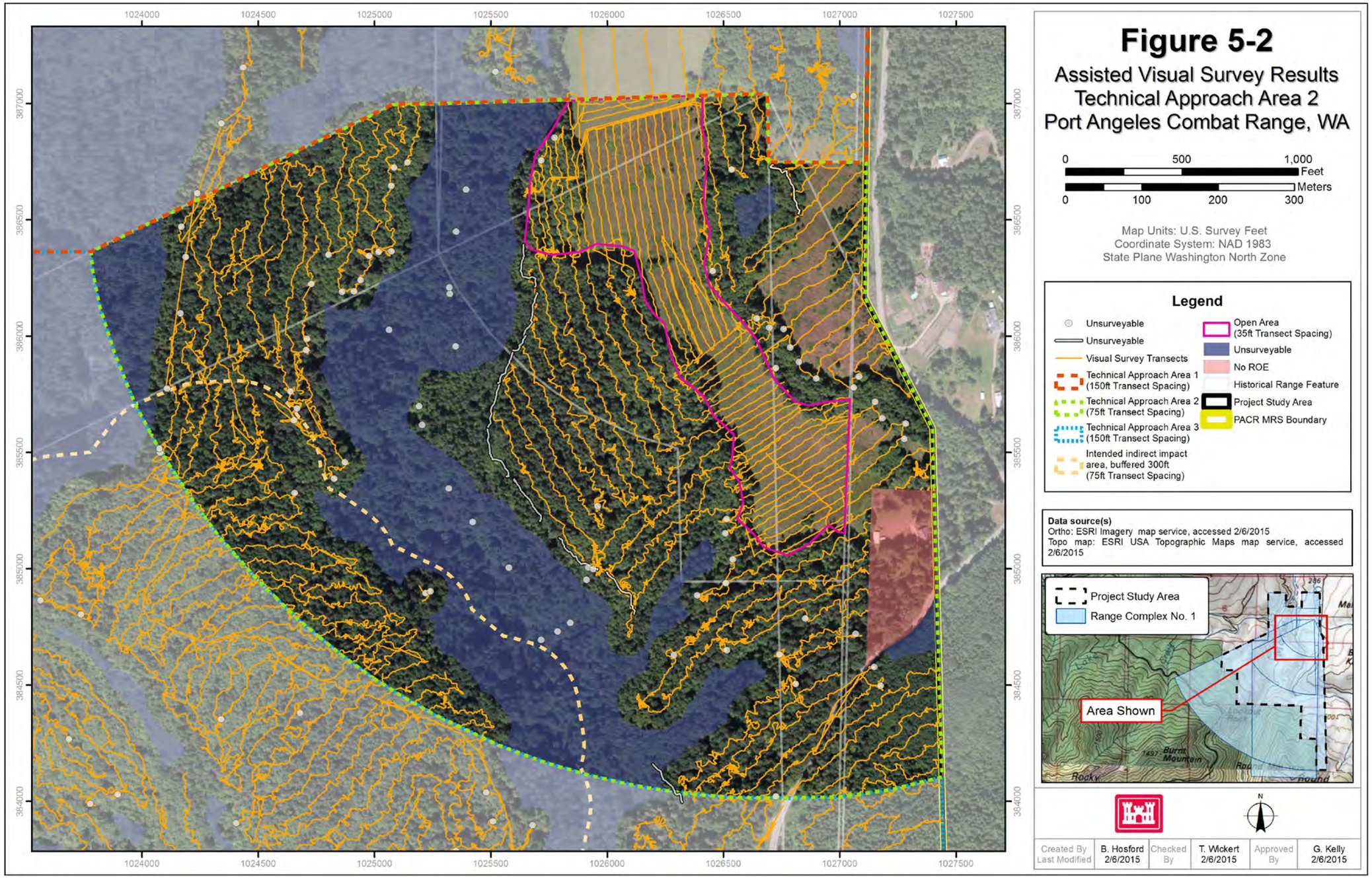
1024000
1024500
1025000
1025500
1026000
1026500
1027000
1027500
387000
386500
386000
385500
385000
384500
384000
Figure 5-2
Assisted Visual Survey Results
Technical Approach Area 2
Port Angeles Combat Range, WA
0
500
1,000
Feet
Meters
0
100
200
300
Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone
Legend
Unsurveyable
Unsurveyable
Visual Survey Transects
Technical Approach Area 1 (150ft Transect Spacing)
Technical Approach Area 2 (75ft Transect Spacing)
Technical Approach Area 3 (150ft Transect Spacing)
Intended indirect impact area, buffered 300ft (75ft Transect Spacing)
Open Area (35ft Transect Spacing)
Unsurveyable
No ROE
Historical Range Feature
Project Study Area
PACR MRS Boundary
Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Project Study Area
Range Complex No. 1
Area Shown
Burns Mountain
N
Created By
Last Modified
B. Hosford
2/6/2015
Checked By
T. Wickert
2/6/2015
Approved By
G. Kelly
2/6/2015

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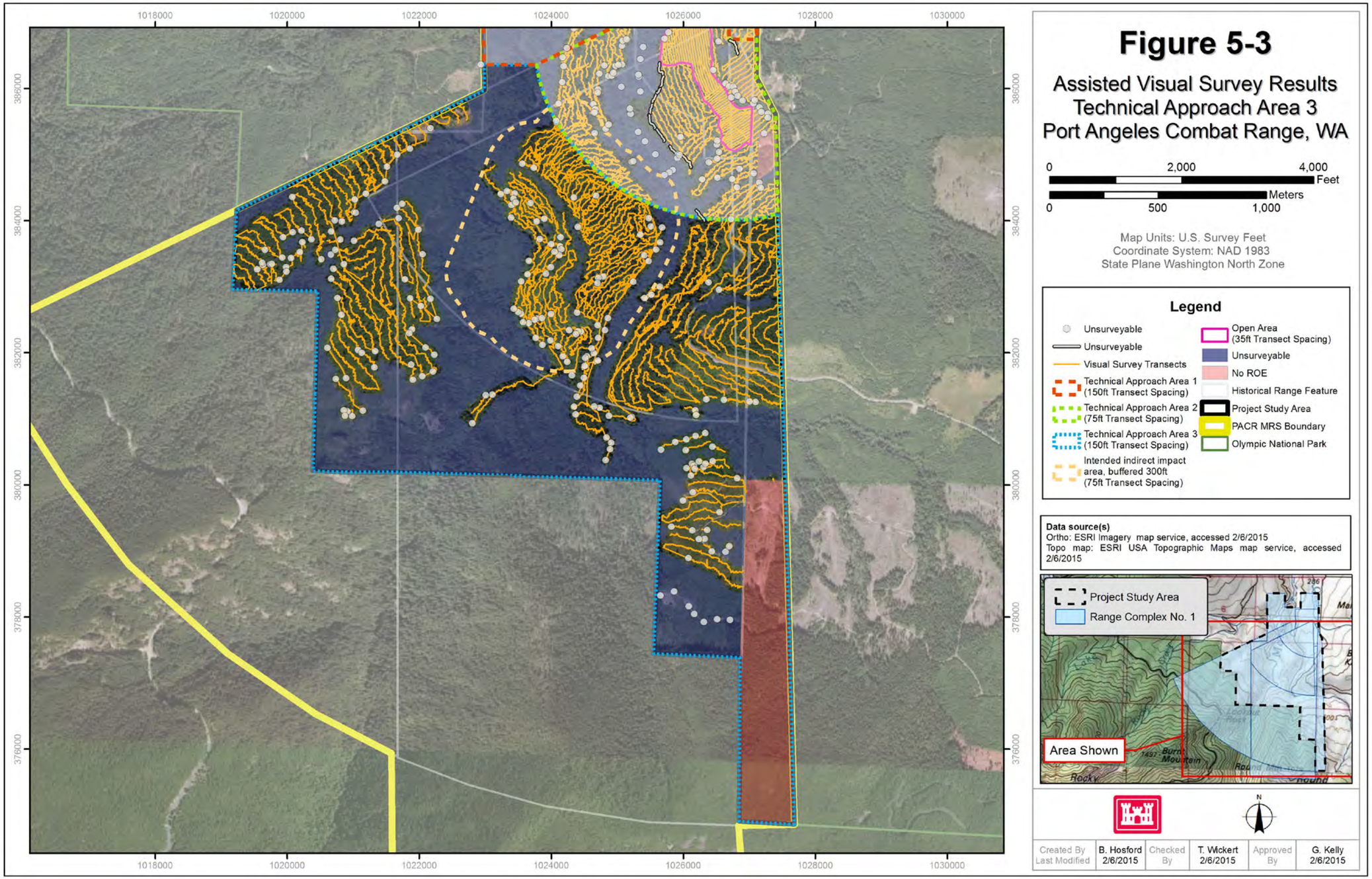

Figure 5-3

Assisted Visual Survey Results
Technical Approach Area 3
Port Angeles Combat Range, WA

0 2,000 4,000 Feet

0 500 1,000 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- Unsurveyable
- Unsurveyable
- Visual Survey Transects
- Technical Approach Area 1 (150ft Transect Spacing)
- Technical Approach Area 2 (75ft Transect Spacing)
- Technical Approach Area 3 (150ft Transect Spacing)
- Intended indirect impact area, buffered 300ft (75ft Transect Spacing)
- Open Area (35ft Transect Spacing)
- Unsurveyable
- No ROE
- Historical Range Feature
- Project Study Area
- PACR MRS Boundary
- Olympic National Park

Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015

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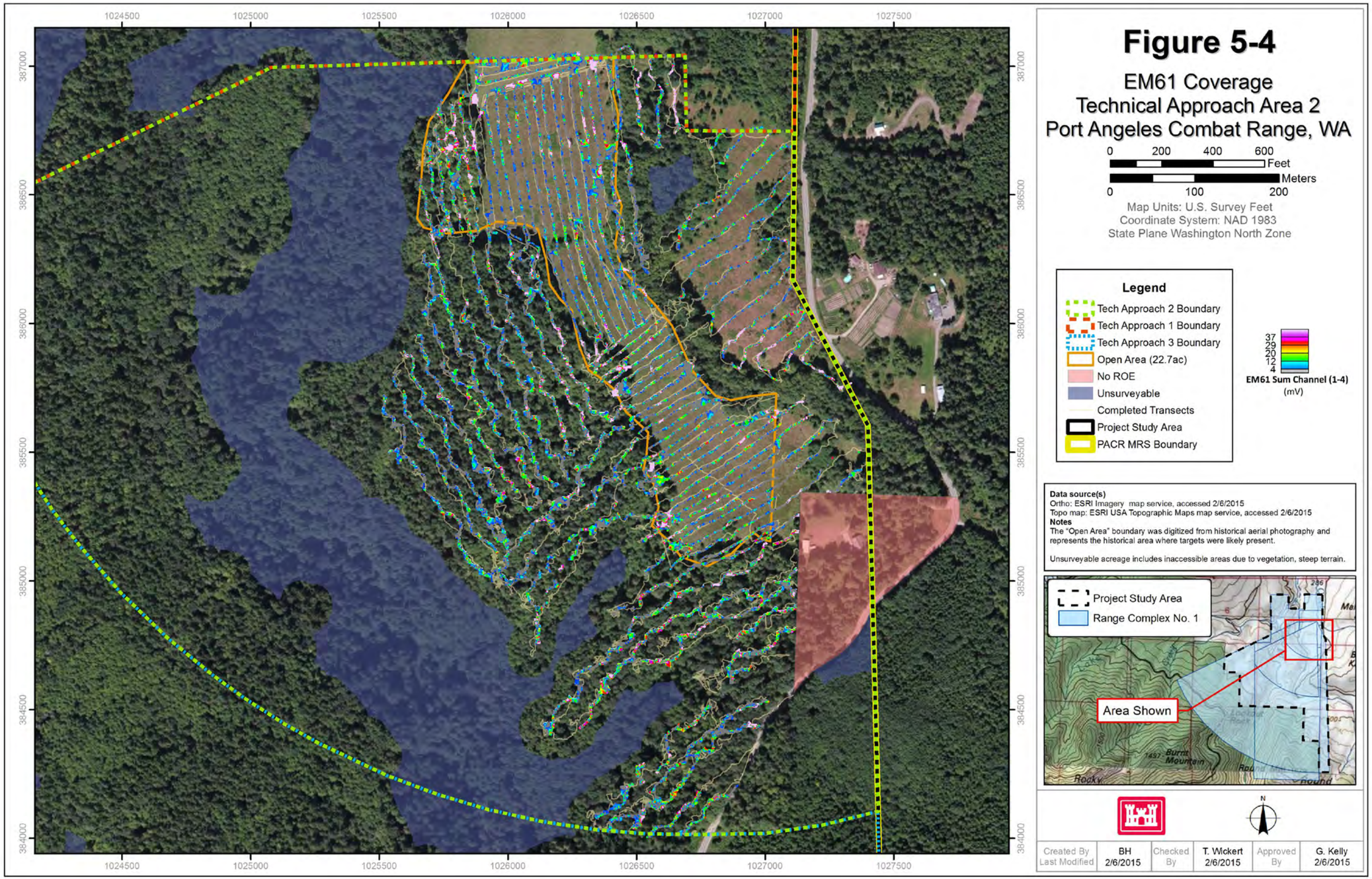

Figure 5-4

EM61 Coverage
Technical Approach Area 2
Port Angeles Combat Range, WA

0 200 400 600 Feet
0 100 200 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- Tech Approach 2 Boundary
- Tech Approach 1 Boundary
- Tech Approach 3 Boundary
- Open Area (22.7ac)
- No ROE
- Unsurveyable
- Completed Transects
- Project Study Area
- PACR MRS Boundary

37
29
20
12
4
EM61 Sum Channel (1-4)
(mV)

Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Notes
The "Open Area" boundary was digitized from historical aerial photography and represents the historical area where targets were likely present.

Unsurveyable acreage includes inaccessible areas due to vegetation, steep terrain.

N

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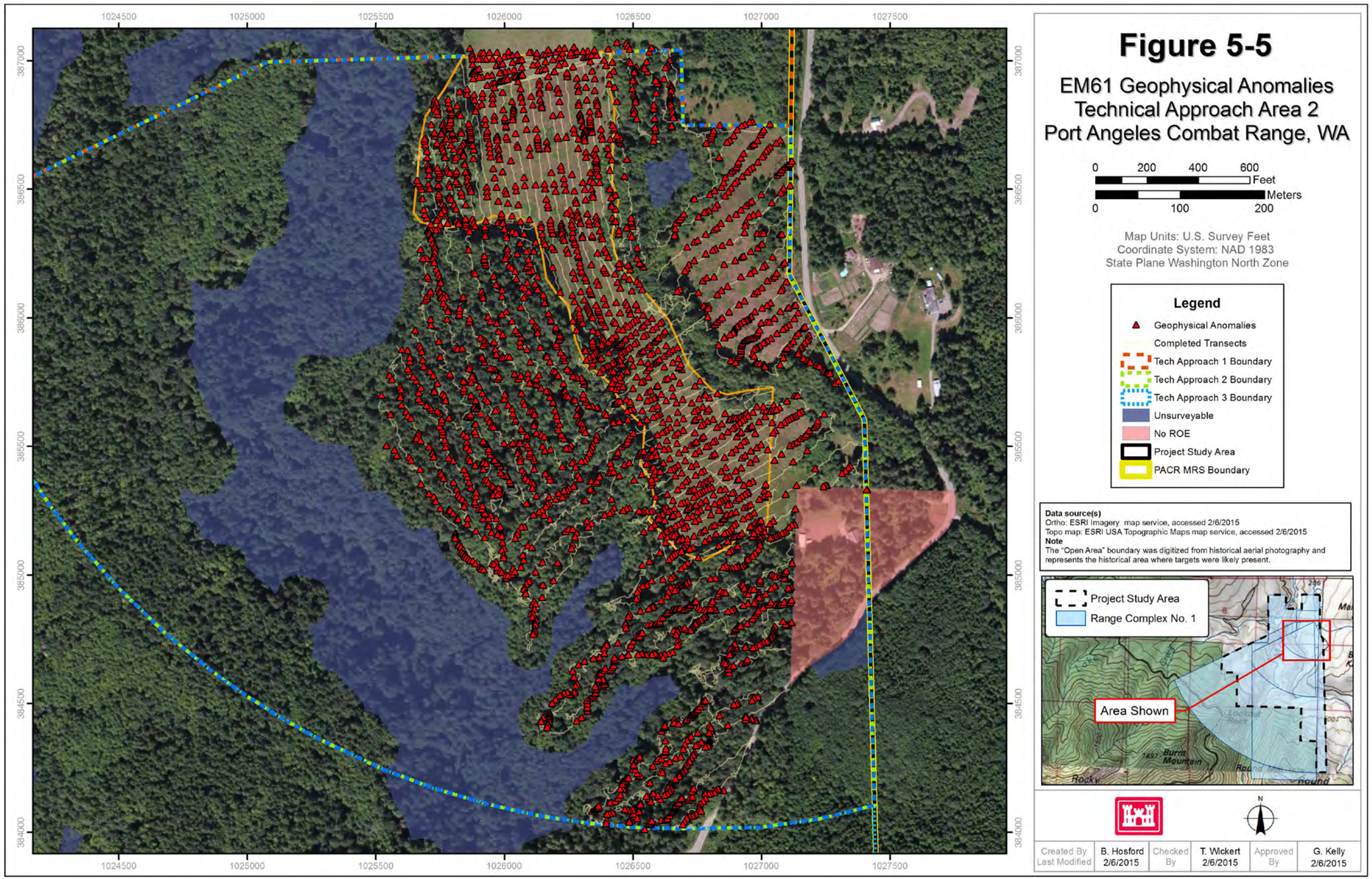

Figure 5-5

EM61 Geophysical Anomalies
Technical Approach Area 2
Port Angeles Combat Range, WA

0 200 400 600 Feet
0 100 200 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- Geophysical Anomalies
- Completed Transects
- Tech Approach 1 Boundary
- Tech Approach 2 Boundary
- Tech Approach 3 Boundary
- Unsurveyable
- No ROE
- Project Study Area
- PACR MRS Boundary

Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Note
The "Open Area" boundary was digitized from historical aerial photography and represents the historical area where targets were likely present.

N

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5.1.1.3 SUBSURFACE INVESTIGATION RESULTS

Prior to the subsurface investigation, anomaly densities were computed for each 200-foot x 200-foot grid. Density analysis of the geophysical anomaly dataset was performed using a weighted KDE analysis utilizing the ESRI Spatial Analyst toolbox. This process is commonly used to generate a probability density function for point datasets. An initial KDE raster was generated over the entire survey footprint utilizing the anomaly from the DGM process. The initial KDE raster was weighted to account for coverage bias. This was done by buffering the central GPS course-over-ground data to model the actual sensor footprint. Footprints were assumed to be one-meter across for the litter (**Figure 5-6**).

Percent coverage was determined for each one-meter kernel location in the KDE by creating a regularly spaced dense grid of points. These points were selected and retained where they intersected the actual transect swath from the survey. A KDE was then performed on the selected points and the output was normalized to values between zero, (no coverage) and one (100% coverage). This value was then applied to the original density calculation to provide final estimates of actual target densities throughout the DGM survey area. Density values were then applied to individual grids by assigning the mean anomaly density calculated within the grid extent (**Figure 5-7**). Based on the anomaly density analysis 119 grids were selected for subsurface investigation.

A subsurface investigation using hand-held analog geophysical instruments was conducted in Technical Approach Area 2 as described in **Section 4.1.4**. The objective of the subsurface investigation was to determine the nature and extent of subsurface MEC and MD. A grid system was established within the MRS at the completion of the DGM survey. The grid system was generally centered over Technical Approach Area 2. Grids of approximately 1-acre (200-foot x 200-foot) were established (**Figure 5-8**). The corners of each grid were temporarily established utilizing a Trimble GeoXH GPS unit. The results of the DGM survey were utilized to determine which grids were initially selected for the subsurface investigation. Anomaly densities were computed for each grid; grids having an anomaly density greater than 250 per acre were selected.

In addition to the original 119 grids, five grids were investigated as step-out grids. Step-out grids were established until the extent of munitions debris was determined. Complete delineation utilizing this methodology was achieved with the exception of grid S-05. No step-out investigations were conducted to the east of Deer Park Road, as an ROE was not obtained by the USACE for parcels 47420 and 47384. Grid S-05 contained three small pieces of MD weighing less than 0.25 lbs and is located just west of a road and the location of the old school house that was described in the ASR. Numerous interviews in the ASR indicated that firing had taken place on the west side of the road and that the direction of fire had been to the south/southwest (USACE, 1996). Based on typical and historic range usage it is unlikely that munitions were fired towards the old school house described in the ASR or across the only access road to the MRS. Because of the range configuration and the limited amounts of MD, the extent of potential MEC and MD is presumed to be to the western edge of Deer Park Road.

Approximately 10% of each grid was investigated and items were recorded as described in **Section 4.1.4**. The typical field layout for the sweep lanes within the grids is illustrated in **Figure 4-5**.

The subsurface investigation teams recorded any items that were classified as MEC, MD, small arms, and trash. Identifiable MD items (i.e., expended mortar body) and MEC were recorded individually. **Table 5-1** summarizes the MEC, identifiable MD, small arms, and trash recorded during the subsurface investigations. Weights of the recovered MEC, MD and small arms debris items were measured utilizing a hand held spring scale. Since the trash observed was not managed, the weights for the trash were estimated by visual observation. The subsurface investigation summary for each grid is displayed in **Figure 5-9**. The composition of munitions recovered during the subsurface investigation are presented in **Table 5-2; Appendix C** presents the photograph documentation log showing the MEC and MD features. Ordnance technical data sheets for the munitions recovered are presented in **Appendix H**.

One-hundred and forty-seven MD features were recovered during the subsurface investigation. Identifiable MD included:

- Thirteen M51 37mm Armor Piercing (AP) projectiles
- One M48 75mm projectile point detonating fuze (expended)
- One M44 81mm practice mortar
- Three M43A1 81mm HE mortar pieces
- Three M57 81mm WP mortar bodies
- Four 81mm mortar tail fin pieces
- One 81mm motor tail fin
- One 75mm practice projectile, and one half of 75mm projectile (empty)

Twenty-five small arms debris features (twenty unfired .50 caliber projectiles and five links) were recorded. Due to the presence of the .50 caliber links and the lack of rifling striations it is believed the small arms were likely unfired and deposited in the area, as there are no indications of a separate small arms impact area. If small arms were used at the PACR they were likely fired at the artillery and mortar targets.

Five MEC items were found during the RI field activities (**Figure 5-10**). Four MEC items were discovered in grid K-03 and one MEC item within grid M-11. All five MEC items were M63 37mm HE projectiles. All of these features were found in the Direct Fire Impact Area and the Buffer Zone and Combat Training Area (sub-ranges SR-01 and SR-05). These locations are consistent with the historical documentation available that indicated that the firing point was located in the northeast of the MRS, the direction of fire was south/southwest, and that the entire area was used extensively for training and maneuvers.

The first four M63 37mm HE projectiles were destroyed in consolidated disposal operations within grid Q-09. The fifth M63 37mm HE projectile was destroyed separately in a nearby location within grid Q-09.

In addition, as discussed in **Section 2.4.9,** on September 29, 2011, during an ESTCP geophysical survey, a UXO technician found a 37mm projectile as depicted on **Figure 2-9**. The UXO technician immediately notified the Clallam County Sheriff's office. A Washington State Police bomb technician safely disposed of the item explosively on September 29, 2011 (ESTCP, 2011).

Table 5-1 MEC, Munitions Debris, Small Arms, and Trash Recovered per Grid

Grid	Number of MEC Items	Number of MD Items	Description	Number of Small Arms Debris Items	Estimated weight (lbs) of MEC/MD/SA	Number of Trash Items	Estimated weight (lbs) of Trash
I-08	0	1	1 piece of HE frag	0	0.25	1	0.5
J-07	0	0		0	0	1	1
J-08	0	1	1 piece of HE frag	0	0.25	0	0
J-09	0	0		0	0	0	0
K-02	0	0		0	0	17	42
K-03	4 M63 37mm HE projectiles	8	8 pieces of HE frag	2 .50 caliber projectiles	10	9	18
K-04	0	10	1 M51 37mm AP projectile and 9 pieces of HE frag	5 .50 caliber projectiles	1.5	8	19
K-05	0	0		0	0	25	70
K-06	0	1	1 piece of HE frag	0	0.25	4	40
K-07	0	1	1 piece of HE frag	0	0.25	0	0
K-08	0	2	1 piece of HE frag	0	0.25	2	10
K-09	0	1	1 piece of HE frag	0	0.25	1	0.25
K-10	0	0		0	0	5	3
L-00	0	0		0	0	13	3
L-01	0	0		0	0	6	3
L-02	0	3	3 pieces of HE frag	0	0.5	14	22
L-03	0	12	1 M57 81mm WP mortar body and 11 pieces of HE frag	6 .50 caliber projectiles	1	10	16
L-04	0	10	1 M57 37mm AP projectile, 9 pieces of HE frag	7 .50 caliber projectiles and 5 links	4	0	0
L-05	0	3	1 M51 37mm AP projectile and 2 pieces of HE frag	0	1	10	10
L-07	0	0		0	0	0	0
L-08	0	0		0	0	0	0
L-09	0	6	2 M51 37mm projectiles and 4 pieces of HE frag	0	4.75	0	0
L-10	0	1	1 piece of HE frag	0	0.25	1	5
L-11	0	0		0	0	1	0.25
M-00	0	0		0	0	14	8
M-01	0	2	1 M51 37mm AP projectile and 1 piece of HE frag	0	1	0	1

Table 5-1 MEC, Munitions Debris, Small Arms, and Trash Recovered per Grid (Continued)

Grid	Number of MEC Items	Number of MD Items	Description	Number of Small Arms Debris Items	Estimated weight (lbs) of MEC/MD/SA	Number of Trash Items	Estimated weight (lbs) of Trash
M-02	0	0		0	0	7	2
M-03	0	3	1 M44 81mm practice mortar and 2 pieces of HE frag	0	5	4	6
M-04	0	4	1 81mm mortar tail fin piece and 3 pieces of HE frag	0	0.5	0	0
M-05	0	0		0	0	100	5
M-06	0	2	1 M57 81mm WP mortar body and 1 piece of HE frag	0	3	4	3
M-07	0	3	3 pieces of HE frag	0	0.25	3	1
M-08	0	2	1 M51 37mm projectile and 1 piece of HE frag	0	1.25	5	0.5
M-09	0	1	1 piece of HE frag	0	0.25	0	0
M-10	0	2	2 pieces of HE frag	0	0.25	0	0
M-11	1 M63 37mm HE projectile	0		0	1	5	5
M-12	0	0		0	0	6	25
N-01	0	0		0	0	7	10
N-00	0	0		0	0	3	2
N-02	0	0		0	0	5	3
N-03	0	5	1 M51 37mm AP projectile and 4 pieces of frag	0	2	0	0
N-04	0	3	1 M51 37mm AP projectile, 1 81mm mortar tail fin piece, and 1 M43A1 81mm HE mortar base	0	4.5	0	0
N-05	0	1	1 piece of HE frag	0	0.25	0	0
N-06	0	1	1 piece of HE frag	0	0.25	0	0
N-07	0	1	1 M51 37mm AP projectile	0	1.5	3	8
N-08	0	4	2 M43A1 81mm HE mortar pieces and 2 pieces of HE frag	0	2	4	0.5
N-09	0	1	1 M51 37mm AP projectile	0	1	2	1
N-10	0	0		0	0	0	0
N-11	0	0		0	0	2	3.5
N-12	0	1	1 75mm practice projectile	0	10	11	300
N-13	0	0		0	0	0	0
N-14	0	0		0	0	1	1

Table 5-1 MEC, Munitions Debris, Small Arms, and Trash Recovered per Grid (Continued)

Grid	Number of MEC Items	Number of MD Items	Description	Number of Small Arms Debris Items	Estimated weight (lbs) of MEC/MD/SA	Number of Trash Items	Estimated weight (lbs) of Trash
N-15	0	0		0	0	2	25
N-16	0	0		0	0	0	0
P-01	0	0		0	0	15	10
P-02	0	1	1 piece of HE frag	0	0.25	75	83
P-03	0	1	1 81mm mortar tail fin	0	0.5	14	1
P-04	0	2	1 M51 37mm AP projectile and 1 piece of HE frag	0	1.25	1	0.25
P-05	0	0		0	0	12	60
P-06	0	0		0	0	1	10
P-07	0	1	1 piece of HE frag	0	0.25	0	0
P-08	0	1	1 M57 81mm WP mortar body	0	0.5	13	5
P-09	0	0		0	0	4	2
P-10	0	2	2 piece of HE frag	0	0.25	1	0.25
P-11	0	0		0	0	0	0
P-12	0	1	1 M51 37mm AP projectile	0	1	2	40
P-13	0	0		0	0	0	0
P-14	0	0		0	0	2	2
P-15	0	0		0	0	0	0
P-16	0	1	1 M48 point detonating fuze (expended)	0	1	0	0
Q-01	0	0		0	0	62	30
Q-02	0	2	2 81mm mortar tail fin pieces	0	0.25	11	0.5
Q-03	0	0		0	0	13	30
Q-04	0	0		0	0	10	15
Q-05	0	0		0	0	6	15
Q-06	0	0		0	0	7	20
Q-07	0	1	1 piece of HE frag	0	0.25	0	4
Q-08	0	0		0	0	4	1
Q-09	0	0		0	0	1	3
Q-10	0	8	8 pieces of HE frag	0	1	3	1
Q-11	0	14	14 pieces of frag	0	1	10	4
Q-12	0	2	1 half of 75mm projectile (empty) and 1 piece of HE frag	0	5.25	1	0.25
Q-13	0	0		0	0	3	1
Q-14	0	0		0	0	2	1
Q-16	0	0		0	0	1	5
Q-17	0	0		0	0	1	0.25

Table 5-1 MEC, Munitions Debris, Small Arms, and Trash Recovered per Grid (Continued)

Grid	Number of MEC Items	Number of MD Items	Description	Number of Small Arms Debris Items	Estimated weight (lbs) of MEC/MD/SA	Number of Trash Items	Estimated weight (lbs) of Trash
R-01	0	1	1 piece of HE frag	0	0.25	6	5
R-02	0	0		0	0	1	1
R-03	0	1	1 piece of HE frag	0	0.25	5	2
R-04	0	0		0	0	5	6
R-05	0	0		0	0	1	1
R-06	0	0		0	0	0	0
R-07	0	0		0	0	12	30
R-08	0	0		0	0	3	30
R-09	0	2	2 pieces of HE frag	0	1	0	2
R-10	0	1	1 piece of HE frag	0	1	0	2
R-11	0	0		0	0	13	4
R-12	0	0		0	0	5	25
R-13	0	0		0	0	1	1
R-14	0	0		0	0	6	2
R-15	0	0		0	0	8	3
R-16	0	0		0	0	3	5
S-02	0	0		0	0	0	0
S-03	0	0		0	0	2	0.25
S-04	0	0		0	0	0	0
S-05	0	3	3 pieces of HE frag	0	0.25	0	0
S-06	0	0		0	0	1	0.25
S-07	0	1	1 piece of HE frag	0	0.25	3	10
S-08	0	0		0	0	112	311
S-09	0	0		0	0	3	17
S-10	0	0		0	0	2	3
S-11	0	1	1 piece of HE frag	0	0.5	3	2
S-12	0	2	2 pieces of HE frag	0	0.5	7	3
S-13	0	0		0	0	0	0
T-07	0	0		0	0	3	10
T-08	0	0		0	0	2	0.5
T-09	0	0		0	0	0	0
T-10	0	0		0	0	100	20
T-11	0	0		0	0	3	1
T-12	0	0		0	0	0	0
T-13	0	0		0	0	10	2
Total	**5**	**147**		**25**	**76.5**	**924**	**1523**

Table 5-2 Composition of Munitions Recovered during the Subsurface Investigation, Range Complex No. 1 MRS

Size/Type Sub-Range	Nomenclature	Munitions Constituent(s)	Reference
Ctg, .50 caliber R01-SR-01	M2/Ball	Lead; Propellant – single-base (nitrocellulose) or double-base (nitrocellulose and nitroglycerin).	TM 43-0001-27
Shell, 37mm All remaining sub-ranges	M/63 HE with fuze M58 w/ Primer w/ Propellant	M63 HE: Steel (chromium, copper, iron, nickel); Explosive – TNT: Fuze M58 – lead azide, tetryl; Primer M23 – Black powder (sulfur, potassium nitrate, charcoal), primer mixture (mercury fulminate, potassium chlorate, antimony sulfide).	TM 43-0001-28
	M51/TP w/Primer M23 w/Propellant	M51 TP: Steel (chromium, copper, iron, nickel); Primer M23 – primer mixture (mercury fulminate, potassium chlorate, antimony sulfide).	TM 9-1901
Mortar, 81mm All remaining sub-ranges	M43A1/HE Shell w/Primer M33 w/ Propellant w. Ignition Ctg w/ Fuze M52	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); Ignition cartridge – double-base powder (nitrocellulose and nitroglycerin); Fuze M52– Mercury fulminate, lead azide, and tetryl.	TM 43-0001-28
	M44/ Practice	M44 Practice: Steel (chromium, copper, iron, nickel); Spotting charge – Black powder (sulfur, potassium nitrate, charcoal).	TM 9-1904
	M57/ WP Smoke	M57 WP: White phosphorus; Steel (chromium, copper, iron, nickel).	TM 9-1904

Notes:
HE – High Explosive
mm - millimeter
TNT - trinitrotoluene

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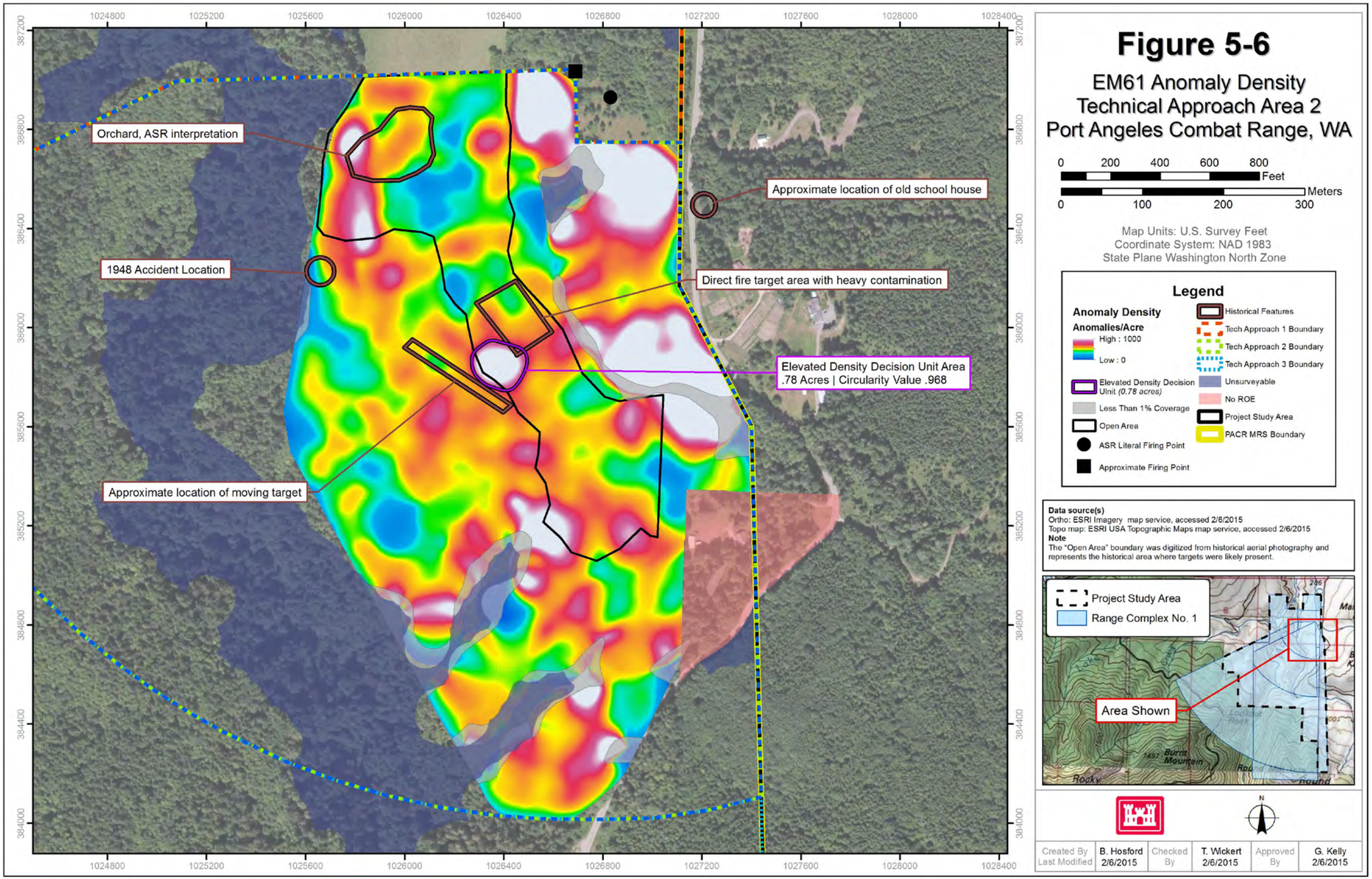

Figure 5-6

EM61 Anomaly Density
Technical Approach Area 2
Port Angeles Combat Range, WA

0 200 400 600 800 Feet
0 100 200 300 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

Anomaly Density
Anomalies/Acre
High : 1000
Low : 0

Elevated Density Decision Unit *(0.78 acres)*
Less Than 1% Coverage
Open Area
ASR Literal Firing Point
Approximate Firing Point

Historical Features
Tech Approach 1 Boundary
Tech Approach 2 Boundary
Tech Approach 3 Boundary
Unsurveyable
No ROE
Project Study Area
PACR MRS Boundary

Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Note
The "Open Area" boundary was digitized from historical aerial photography and represents the historical area where targets were likely present.

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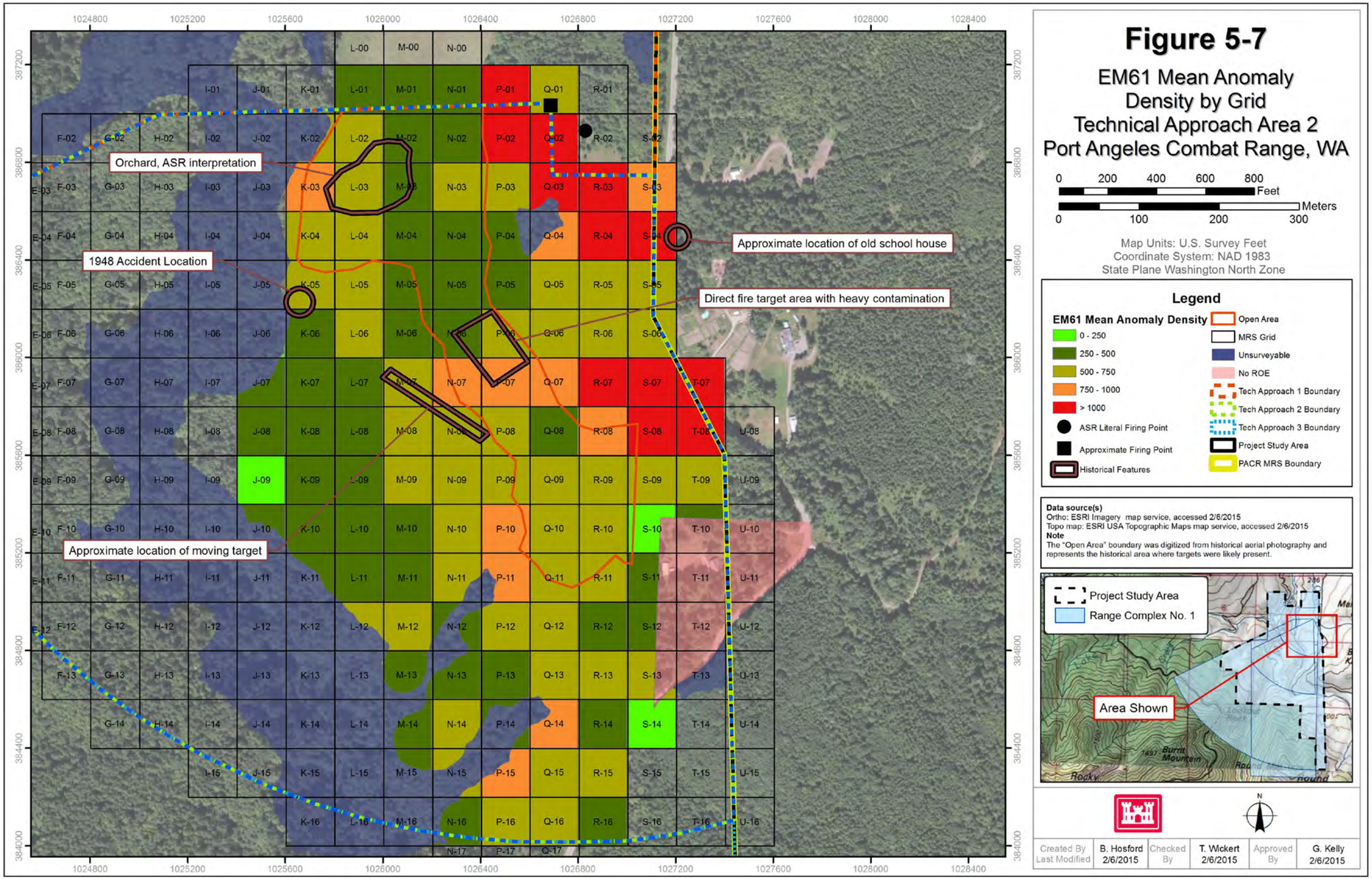
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1025200
1025600
1026000
1026400
1026800
1027200
1027600
1028000
1028400
387200
386800
386400
386000
385600
385200
384800
384400
384000
Orchard, ASR interpretation
1948 Accident Location
Approximate location of moving target
Approximate location of old school house
Direct fire target area with heavy contamination
Figure 5-7
EM61 Mean Anomaly Density by Grid
Technical Approach Area 2
Port Angeles Combat Range, WA
0 200 400 600 800
Feet
0 100 200 300
Meters
Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone
Legend
EM61 Mean Anomaly Density
0 - 250
250 - 500
500 - 750
750 - 1000
> 1000
ASR Literal Firing Point
Approximate Firing Point
Historical Features
Open Area
MRS Grid
Unsurveyable
No ROE
Tech Approach 1 Boundary
Tech Approach 2 Boundary
Tech Approach 3 Boundary
Project Study Area
PACR MRS Boundary
Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Note
The "Open Area" boundary was digitized from historical aerial photography and represents the historical area where targets were likely present.
Project Study Area
Range Complex No. 1
Area Shown
Created By / Last Modified
B. Hosford 2/6/2015
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T. Wickert 2/6/2015
Approved By
G. Kelly 2/6/2015

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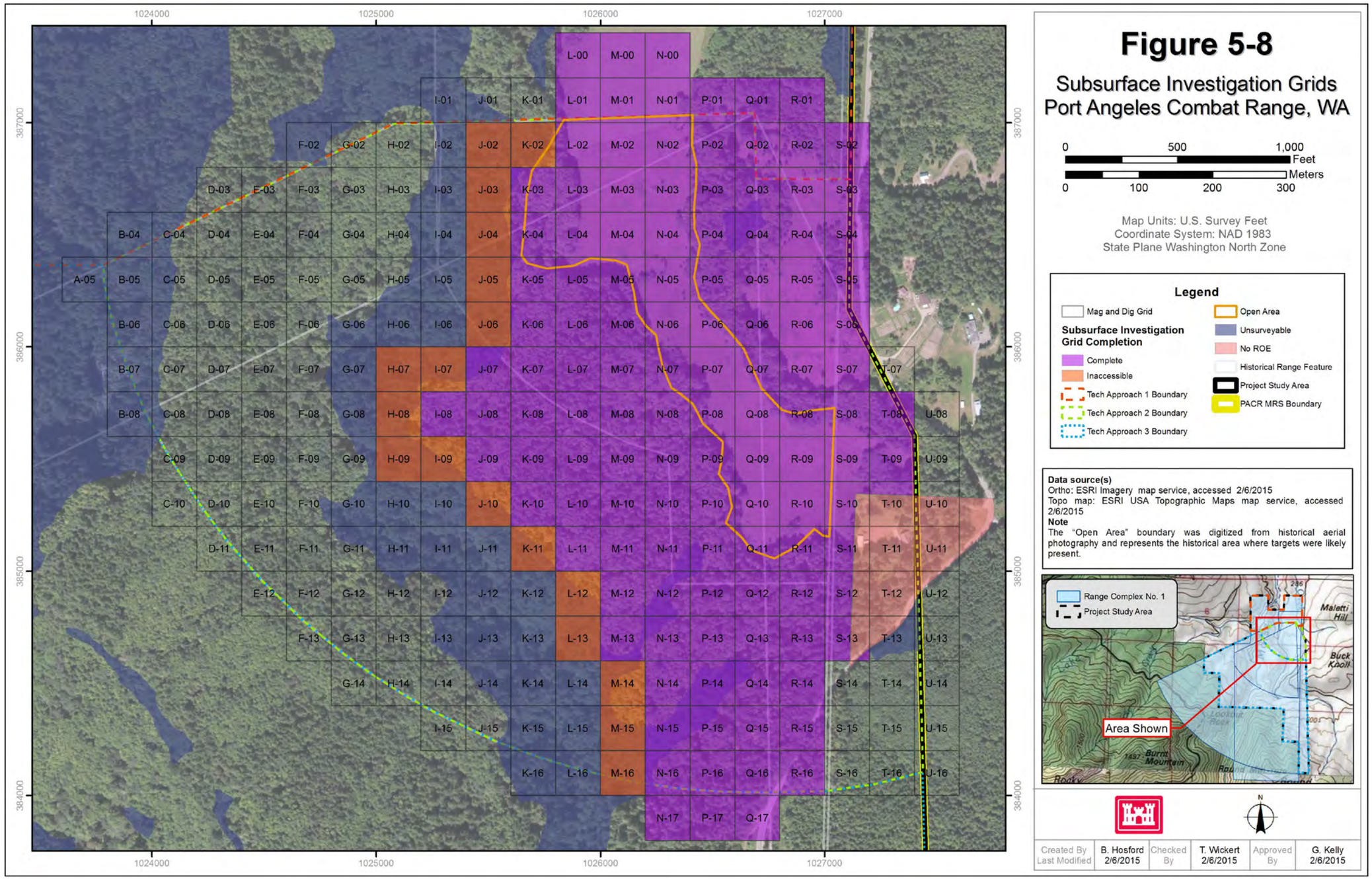

Figure 5-8

Subsurface Investigation Grids
Port Angeles Combat Range, WA

0 500 1,000 Feet
0 100 200 300 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- Mag and Dig Grid
- **Subsurface Investigation Grid Completion**
  - Complete
  - Inaccessible
- Tech Approach 1 Boundary
- Tech Approach 2 Boundary
- Tech Approach 3 Boundary
- Open Area
- Unsurveyable
- No ROE
- Historical Range Feature
- Project Study Area
- PACR MRS Boundary

Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015

Note
The "Open Area" boundary was digitized from historical aerial photography and represents the historical area where targets were likely present.

N

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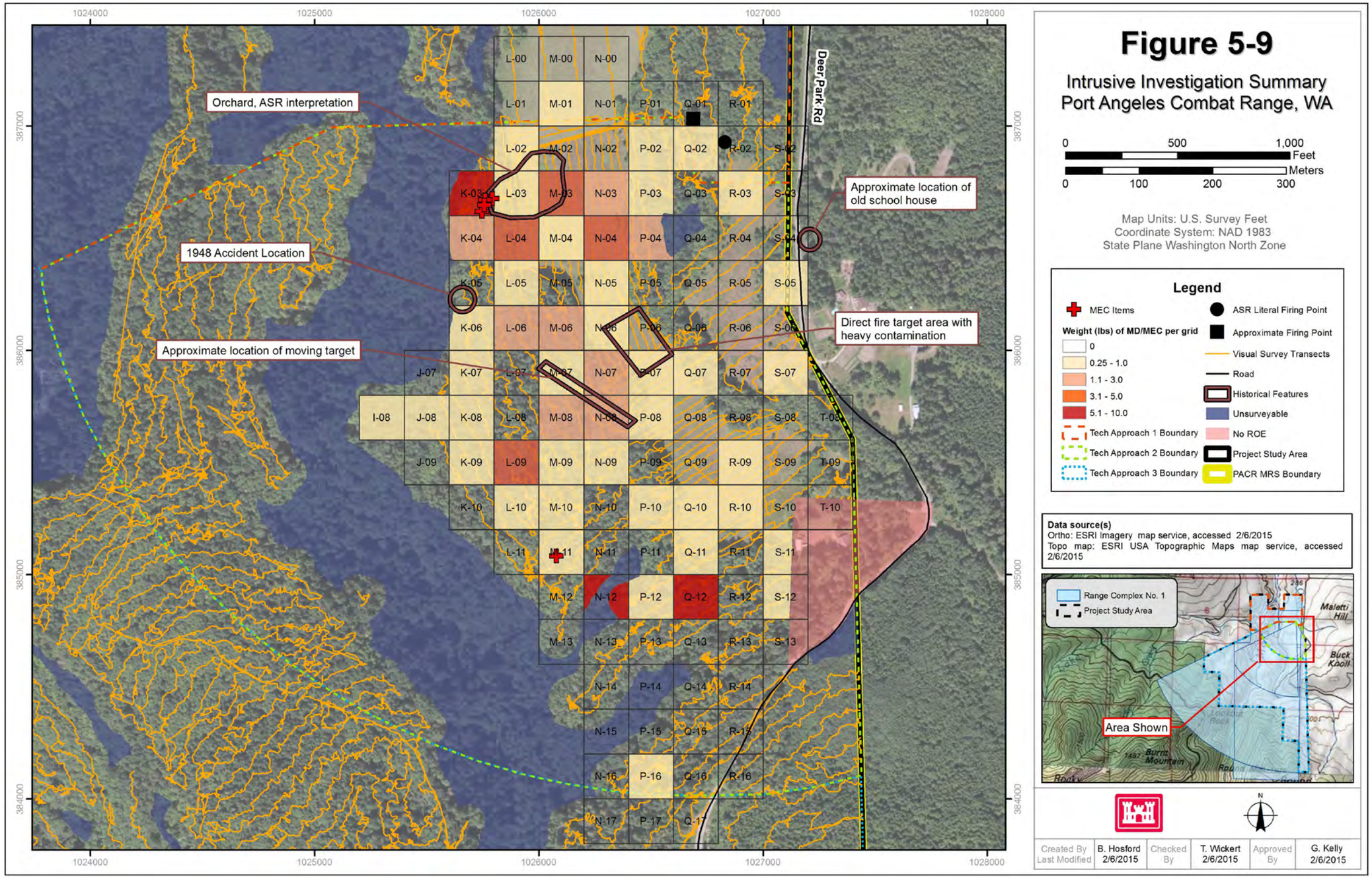

Figure 5-9

Intrusive Investigation Summary
Port Angeles Combat Range, WA

0 500 1,000 Feet
0 100 200 300 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- MEC Items
- ASR Literal Firing Point
- Approximate Firing Point
- Visual Survey Transects
- Road
- Historical Features
- Unsurveyable
- No ROE
- Project Study Area
- PACR MRS Boundary

Weight (lbs) of MD/MEC per grid

- 0
- 0.25 - 1.0
- 1.1 - 3.0
- 3.1 - 5.0
- 5.1 - 10.0

- Tech Approach 1 Boundary
- Tech Approach 2 Boundary
- Tech Approach 3 Boundary

Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015

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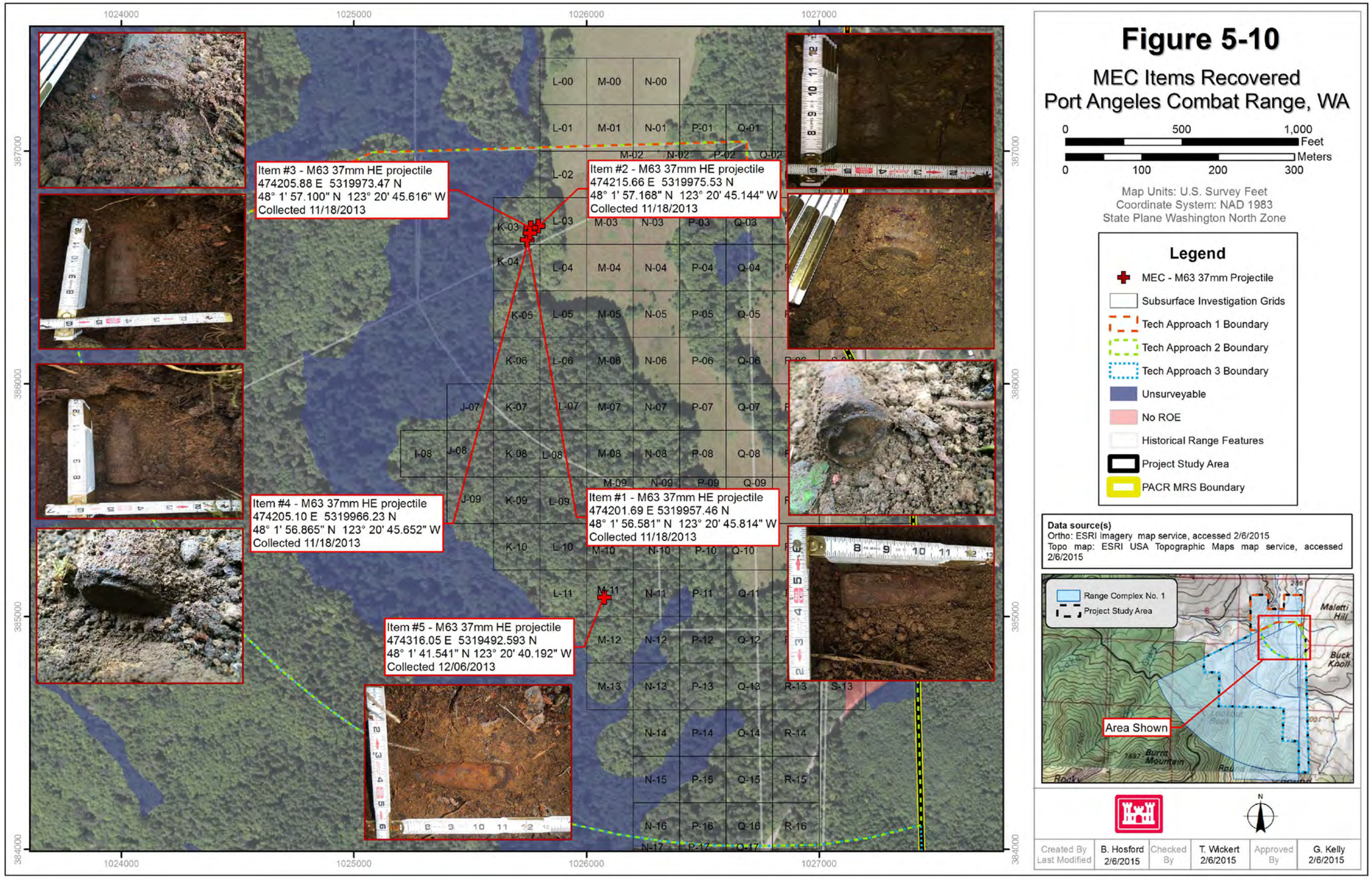

Figure 5-10

MEC Items Recovered
Port Angeles Combat Range, WA

0 500 1,000 Feet
0 100 200 300 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- MEC - M63 37mm Projectile
- Subsurface Investigation Grids
- Tech Approach 1 Boundary
- Tech Approach 2 Boundary
- Tech Approach 3 Boundary
- Unsurveyable
- No ROE
- Historical Range Features
- Project Study Area
- PACR MRS Boundary

Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015

N

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The depths of MD excavated from the subsurface investigation grids varied from 0.5-foot to 1.5-feet. The presence of more deeply buried items in some areas most likely reflects both the variation in soil types and depths, the types of training and firing activities conducted, and types of munitions used.

The combined amounts and numbers of MEC/MD items found in these areas during the AVS and subsurface investigation meet the DQO for identifying surface and subsurface MEC at the PACR. These results, in combination with the degree of corroboration with the historical documentation about the types of activities conducted in these areas are considered sufficient to define the nature and extent of MEC and MD.

5.1.1.4 MD HANDLING, DEMOLITION OPERATIONS, AND MDAS DISPOSAL

During subsurface investigations all MPPEH was inspected in accordance with EM 385-1-97 (USACE, 2008) and EM 1110-1-4009 (USACE, 2007). The MPPEH inspection process is shown in **Figure 4-6** and consisted of the following:

- A UXO Technician II performed a 100% inspection as the item was recovered.
- A UXO Technician III performed a 100% re-inspection.
- The UXOSO/UXOQCS conducted daily audits of the inspection process.
- The UXOSO/UXOQCS insured MPPEH processing was performed safely.
- The SUXOS and UXOSO/UXOQCS performed a 100% inspection at the end of each day to insure that MD was free of explosive hazards. The resulting MDAS was then secured in a locked container.

During subsurface investigations, MPPEH was inspected by the SUXOS or UXOSO/UXOQCS to determine if the item was MEC. If the item was determined to be MD, and not MEC, the debris was handled as MDAS. If the items were determined to be non-munitions related debris the items were left in place.

Upon verification of MEC by the SUXOS or the UXOSO/UXOQCS during subsurface investigations, the SUXOS contacted the Project Manager and the Clallam County Sheriff and Fire District # 2. The Project Manager contacted the USACE and relevant stakeholders.

For the demolition operation, explosives were drawn from the on-site Type II portable magazines located 380 feet south of Deer Park road. Demolition explosives were transported by two UXO Technician IIs on foot to the demolition site in grid Q-09. One of the UXO Tech IIs held a Washington State Blasters Permit. There were three demolition operations required during the field investigation. All MEC items were moved and destroyed in grid Q-09 located in the southern part of the open meadow within Technical Approach Area 2. Demolition operations were conducted on the following dates:

- November 18, 2013 - Four M63 37mm HE projectiles, found during subsurface investigations
- December 6, 2013 - One M63 37mm HE projectile, found during subsurface investigations
- December 12, 2012 - Two pieces of MD (one practice 81mm mortar and one practice 75mm projectile) found during subsurface investigations required demilitarization (demil) to expose internal filler. All remaining project explosives were also destroyed.

MD handling and inspection was required following the demolition operations and at the end of each day during the subsurface investigations. The MD was recovered after the demolition operations, re-inspected and the resulting MDAS was placed in a secure container.

The SUXOS and UXOSO/UXOQCS performed a final 100% inspection of the container at the end of the project, completed and signed DD form 1348-1, locked and sealed the container, and arranged for shipping for final disposition. The DD Form 1348-1 was completed to record the items and to certify them as MDAS and establish a chain of custody. The shipment was delivered to Timberline Environmental Services, an authorized demil contractor via FedEx. The contractor then shredded or smelted the MDAS (50 lbs) and returned official disposition paperwork. These procedures are in accordance with EM 385-1-97 (USACE, 2008). The documentation related to the MD handling and demilitarization is provided in **Appendix I**.

5.1.2 MEC Revised Conceptual Site Model

MEC exposure pathways were evaluated based on the findings from the RI field investigations and updated from the RI Work Plan (HDR, 2013). **Section 8.5.1** summarizes the MRSs, which resulted in the creation of additional CSMs for access and exposure to MEC and MC for all receptors. Range Complex No. 1 and Range Complex No. 1 (a) collectively represent an area of 1,392.2 acres. Range Complex No 1 (b) includes the area within ONP, which is an additional 1,238.5 acres. Additional information was needed to characterize the MRS for nature and extent of MEC and MD, and nature and extent of MC contamination, if any.

5.1.2.1 MEC HUMAN RECEPTORS

Human receptors included in the baseline Human Health Risk Assessment (HHRA) (**Section 7.1**) were as follows:

- Current and Future Recreational User (adult and child)
- Current and Future Outdoor Worker (adult only)
- Current and Future Trespasser (adult and child)
- Current and Future Resident (adult and child)

5.1.2.2 MEC ECOLOGICAL RECEPTORS

Ecological receptors are not assessed for explosive hazards due to MEC; however, consideration must be given to T&E species since loss of an individual animal or plant is considered a “taking” under the U.S. Endangered Species Act of 1973, Prohibited Acts 16 USC § 1538(a) (USC, 2002).

5.1.2.3 MEC TRANSPORT PROCESS

In general, the potential for transport of MEC from one location to another is based on the amount of precipitation, stabilization in soil, the steepness of the slope, and weight of the item. In areas that have steep, open slopes, MEC could be transported by erosion, heavy precipitation events, or possibly by avalanche depending on the slope and cover. There are some smaller surface water features in the Range Complex No. 1 MRS; therefore, MEC transport from initial source locations to surface water or sediment and other areas within the MRS Range Complex No. 1 is possible, although unlikely. Over time, soils, rocks, and organic debris tend to accumulate around stationary items thereby inhibiting movement.

MEC could also be disturbed by intentional or unintentional excavation or digging. Currently, there are no mining operations within the PACR MRSs nor are there any apparent mineral claims (USGS, 2013).

The presence of MD also indicates the potential presence of MEC to at least 18 inches bgs. **Section 5.1.1.3** presents the MD recovered during the RI in detail.

5.1.2.4 MEC MEDIA AND ACCESSIBILITY

The majority of the acreage within the MRSs is undeveloped and privately held; however; limited areas are open to the public for recreational activities. Although recreational use is primarily limited to hunting, other recreational use scenarios were considered. Therefore, recreational users could possibly encounter sub-surface soils during their activities. A few dilapidated fences could effectively limit site access from Deer Park Road. The primary barriers to limit public access to the sites are related to terrain features such as steep cliffs, dense vegetation, wetlands, fallen timber, and lack of trails or roads. Permission from property owners to enter private land also limits access in some areas.

Access to MEC can be limited by the steepness of terrain in portions of the MRSs. Human and mobile ecological receptors could encounter MEC in any accessible area. Although the MMRP focuses on the explosive hazard of MEC to humans, it is noted that any livestock in the MRSs have commercial value to owners as do the abundant wildlife using or inhabiting the area. Some T&E species could possibly contact MEC although this is likely an insignificant exposure scenario.

Exposure media for MEC included surface and subsurface soil. No other environmental media were assessed during the RI; however, both sediment and surface water were considered during CSM development. Surface and subsurface soil were investigated for the presence of MEC during the subsurface investigation described in **Section 5.1.1.3**. The MEC items discovered during the RI (**Table 5-1**) were found in reasonably accessible areas during the subsurface investigation. All MEC items recovered were located on City of Port Angeles property (parcels 47419 and 47490). The MEC found in each of the sampling areas were as follows:

- **Grid K-03**—Four M63 37mm projectiles with residual HE were found in surface soil partially obscured by soil and leaf litter in a predominantly level but heavily forested area, accessible on foot. The general location of items was approximately 50 yards due west of the edge of a meadow (see **Figure 5-10**). Terrain due west of the MEC items (approximately 30 yards) drops off steeply into a ravine.
- **Grid M-11**—One M63 37mm projectile with residual HE was found in surface soil partially obscured by soil and leaf litter in a relatively flat but heavily vegetated area accessible on foot. The general location of this item was approximately 50 yards due west of the edge of a meadow (see **Figure 5-9**), and about 430 yards west of a private residence. Terrain due west of the MEC item (approximately 70 yards) drops off steeply into a ravine.

While MEC was not identified in areas outside of grids K-03 and M-11, MD was recovered throughout the Range Complex No. 1 MRS; therefore, MRS Range Complex No. 1 may potentially contain MEC.

The MEC CSMs for the MRSs are shown in **Figure 5-11** through **Figure 5-13**.

Figure 5-11 Updated Conceptual Site Model for Access to MEC at the Port Angeles MRS Range Complex No. 1 MRS

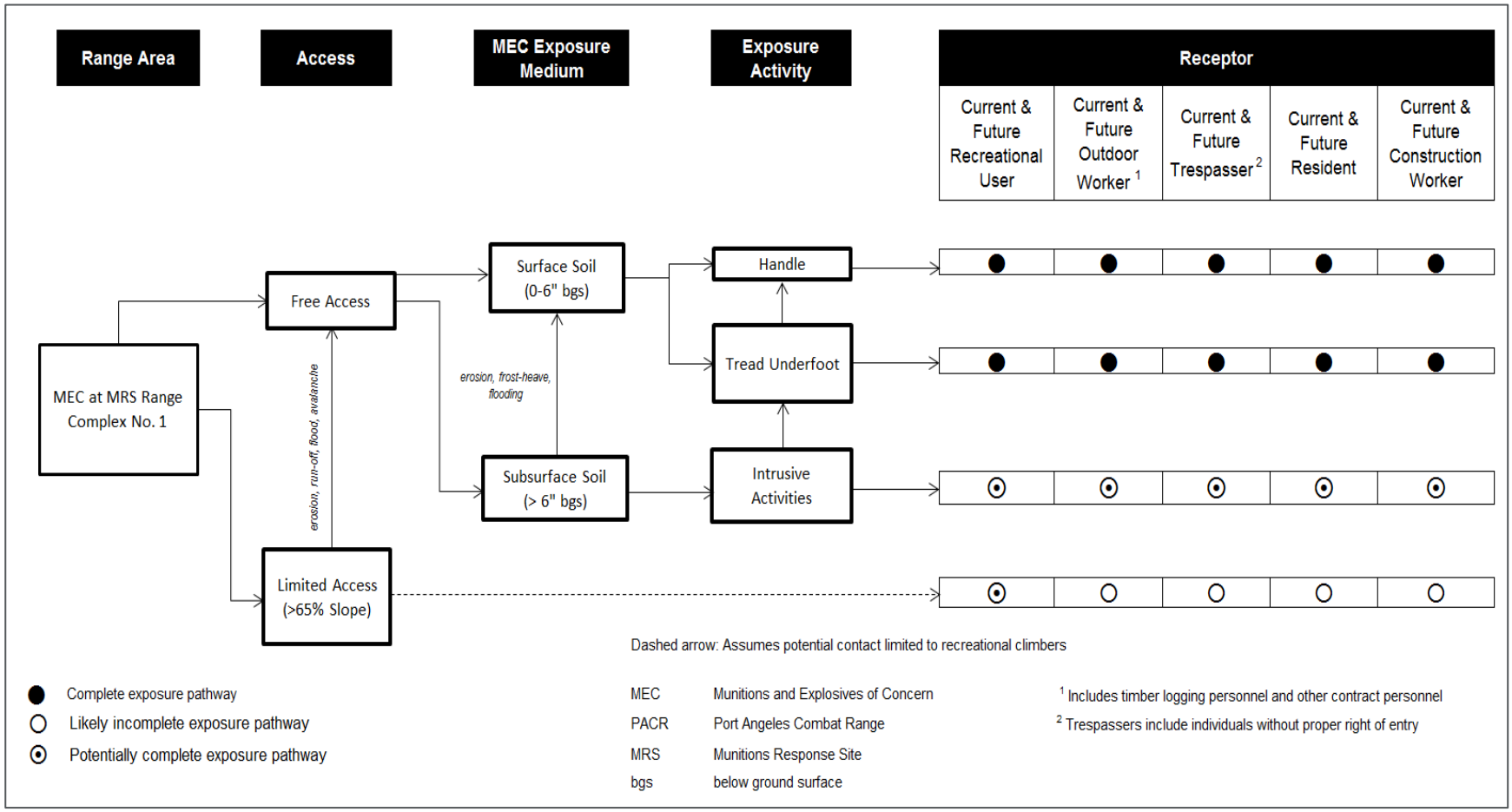


Figure 5-12 Updated Conceptual Site Model for Access to MEC at the Port Angeles MRS Range Complex No. 1 (a)

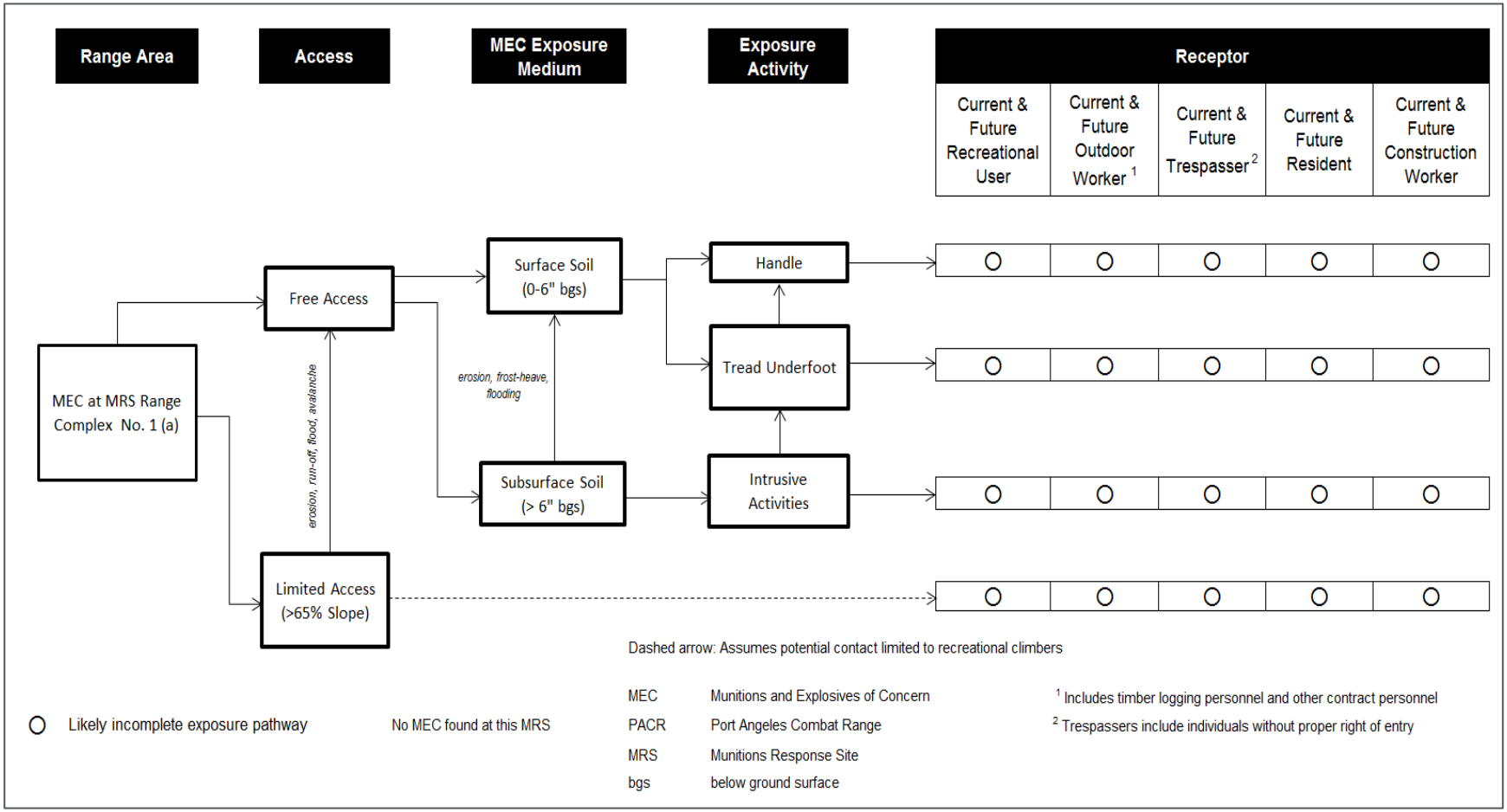
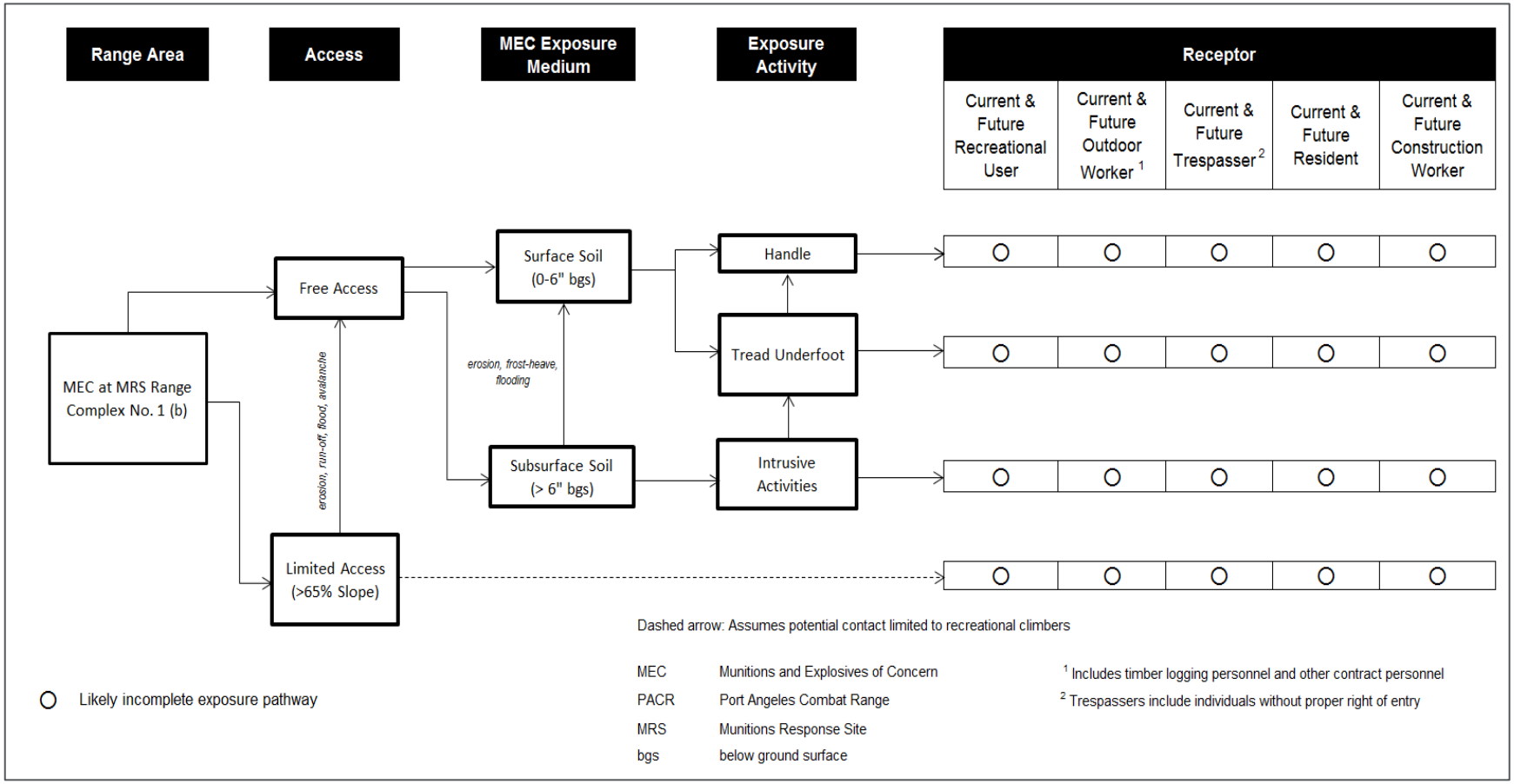


Figure 5-13 Updated Conceptual Site Model for Access to MEC at the Port Angeles MRS Range Complex No. 1 (b)



5.1.2.5 MEC EXPOSURE CONCLUSIONS

There is the potential for human and ecological receptors to access MEC at the Range Complex No. 1 MRS in surface and subsurface soil. Five MEC items were found during the RI field activities; consequently, all soil exposure pathways for access and exposure to MEC in these MRSs are complete for all receptors. Based on the recovery of semi-buried MEC items (i.e., the M63 37mm HE projectiles at grids K-03 and M-11), surface soil exposure pathways to MEC remain complete. All recovered MEC items were located in shallow surface soil (0-6 inches bgs). MD were present in many areas which suggests that other MEC may be present but not visible. No CWM or evidence of CWM was observed within the MRSs. Range Complex No. 1 (a) and Range Complex No. 1 (b) MRSs are no longer being considered as potentially impacted by MEC.

Munitions debris were recovered to a depth of 18 inches bgs (**Section 5.1.1.3**) which indicates the potential for subsurface MEC as well.

Domestic animals and wildlife are not included as separate receptor categories on the MEC CSMs since they are not assessed for explosive hazards under FUDS.

The following conclusions were reached from the 2013 RI investigation as discussed below.

5.1.2.5.1 Human Receptors (Surface Soil)

Free Access to MEC on or in the surface soil is complete for the following receptors only at MRS Range Complex No. 1:

- Current and Future Recreational Users (Adult and Child)
  - includes hunters, anglers, hikers, backpackers, off – highway vehicle users, et al.
- Current and Future Outdoor Workers (Adult)
  - includes, but not limited to, forest and watershed management personnel
- Current and Future Trespassers (Adult and Child)
- Current and Future Residents (Adult and Child)
- Current and Future Construction Workers (Adult Only)

5.1.2.5.2 Humans Receptors (Subsurface Soil)

Outdoor workers, construction workers, and residents might dig below six inches bgs in the normal course of their activities. It was assumed that intrusive activities would not extend to greater than six inches bgs for recreational users and trespassers, and that these receptors would not dig deeper than six inches bgs under normal circumstances. Intrusive activities initiated by outdoor and construction workers as well as residents may potentially access MEC below six inches bgs since MD was recovered down to 18 inches bgs.

Free Access to MEC in subsurface soil is complete for the following receptors only at MRS Range Complex No. 1:

- Current and Future Outdoor Workers (Adult Only)
  - Includes but not limited to forest and watershed management personnel
- Current and Future Residents (Adult and Child)
- Current and Future Construction Workers (Adult Only)

Under restricted access due to terrain steepness (>65% slope), access to MEC in surface and subsurface soil is potentially complete for the following receptors:

- Current and Future Recreational Users (climbers)

As discussed above, under FUDS, MEC explosive hazard is typically not evaluated for wildlife receptors. If a T&E species is present, injury or mortality is evaluated for an individual of that species rather than a population.

5.2 Munitions Constituents

No environmental sampling for MC analysis was performed during the RI because the conditions that would have warranted the collection of samples for laboratory analysis, as described in **Section 4.2.1**, were not observed during the field investigation.

In-situ sampling for lead utilizing an XRF analyzer was performed to assist the field investigation team to identify any natural features that may have been used for small arms training (e.g., a natural berm feature utilized as a small arms back stop).

5.2.1 MC Investigation Results

5.2.1.1 MUNITIONS CONSTITUENTS – XRF SCREENING RESULTS – LEAD IN SOILS

In-situ XRF screening was conducted to analyze for lead in soils where natural features (i.e., natural berm feature) or small arms debris was identified. In-situ XRF screening was utilized to assist the field investigation team to determine sampling locations for laboratory analysis. A conservative in-situ XRF field screening level of 125 mg/kg (compared to the State of Washington soil cleanup level of 250 mg/kg) was utilized to evaluate lead concentrations in soils.

In-situ XRF screening for lead in soil was conducted in two locations where natural features (i.e., natural berm features) where found, and in one location where small arms debris was found. Sixty-eight (68) in-situ XRF screening locations were sampled in two natural features (**Figure 5-14** through **Figure 5-16**). Forty-five (45) in-situ XRF screening locations were also sampled where small arms debris was found (**Figure 5-17**). A total of one-hundred and thirteen (113) in-situ XRF screening samples were collected from the three locations. All in-situ XRF sample results for lead were below the conservative field screening level of 125 mg/kg (**Appendix J**). Thus, no soil samples were collected for laboratory analysis.

The small arms debris included unfired .50 caliber projectiles and links. Due to the presence of the .50 caliber links and the lack of rifling striations it is believed the small arms were likely unfired and deposited in the area, as there are no other indications of an impact area.

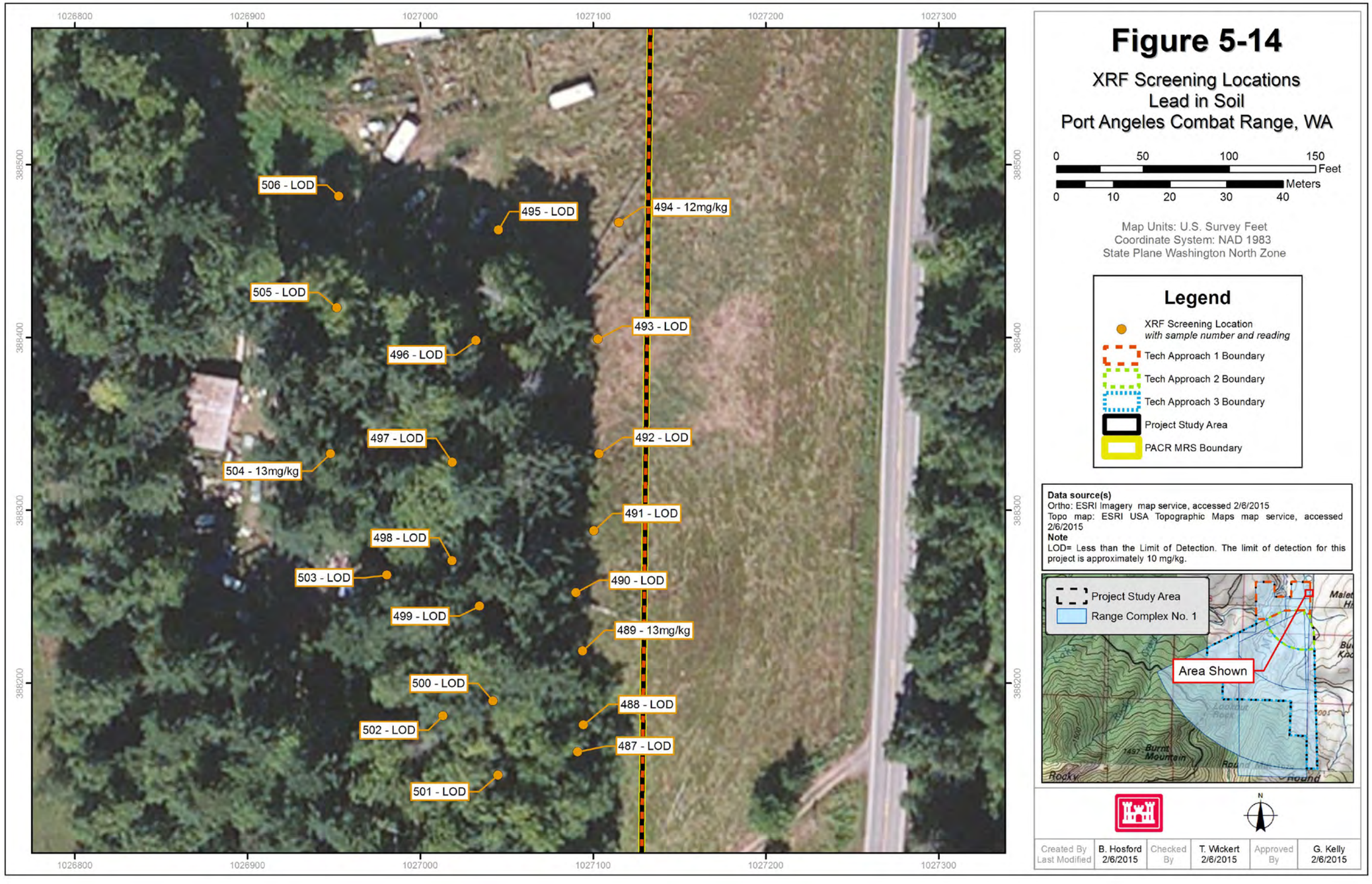


Figure 5-14

XRF Screening Locations
Lead in Soil
Port Angeles Combat Range, WA

0 50 100 150 Feet
0 10 20 30 40 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- XRF Screening Location *with sample number and reading*
- Tech Approach 1 Boundary
- Tech Approach 2 Boundary
- Tech Approach 3 Boundary
- Project Study Area
- PACR MRS Boundary

Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Note
LOD= Less than the Limit of Detection. The limit of detection for this project is approximately 10 mg/kg.

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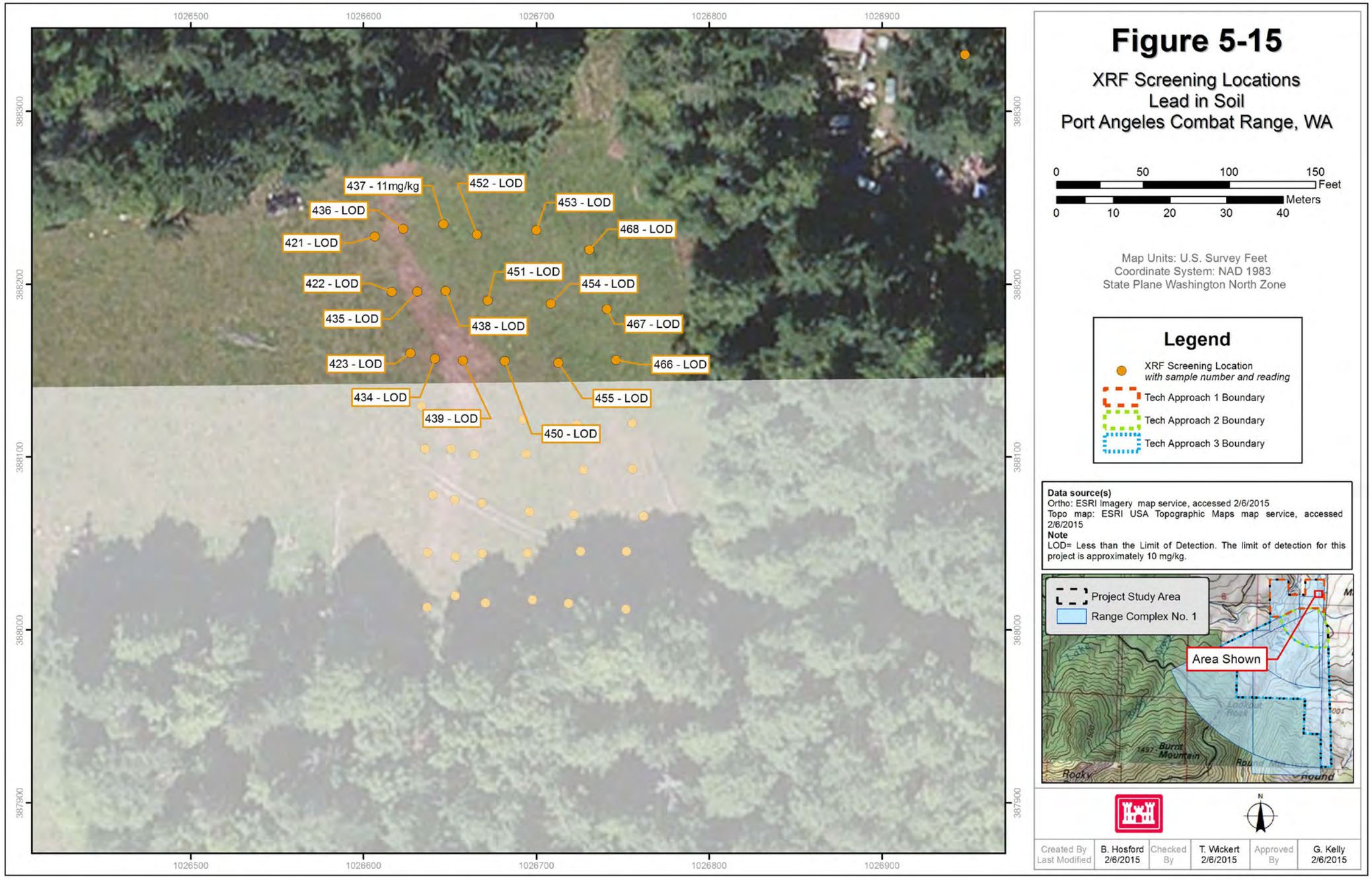

Figure 5-15

XRF Screening Locations
Lead in Soil
Port Angeles Combat Range, WA

0 50 100 150 Feet
0 10 20 30 40 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- XRF Screening Location *with sample number and reading*
- Tech Approach 1 Boundary
- Tech Approach 2 Boundary
- Tech Approach 3 Boundary

Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Note
LOD= Less than the Limit of Detection. The limit of detection for this project is approximately 10 mg/kg.

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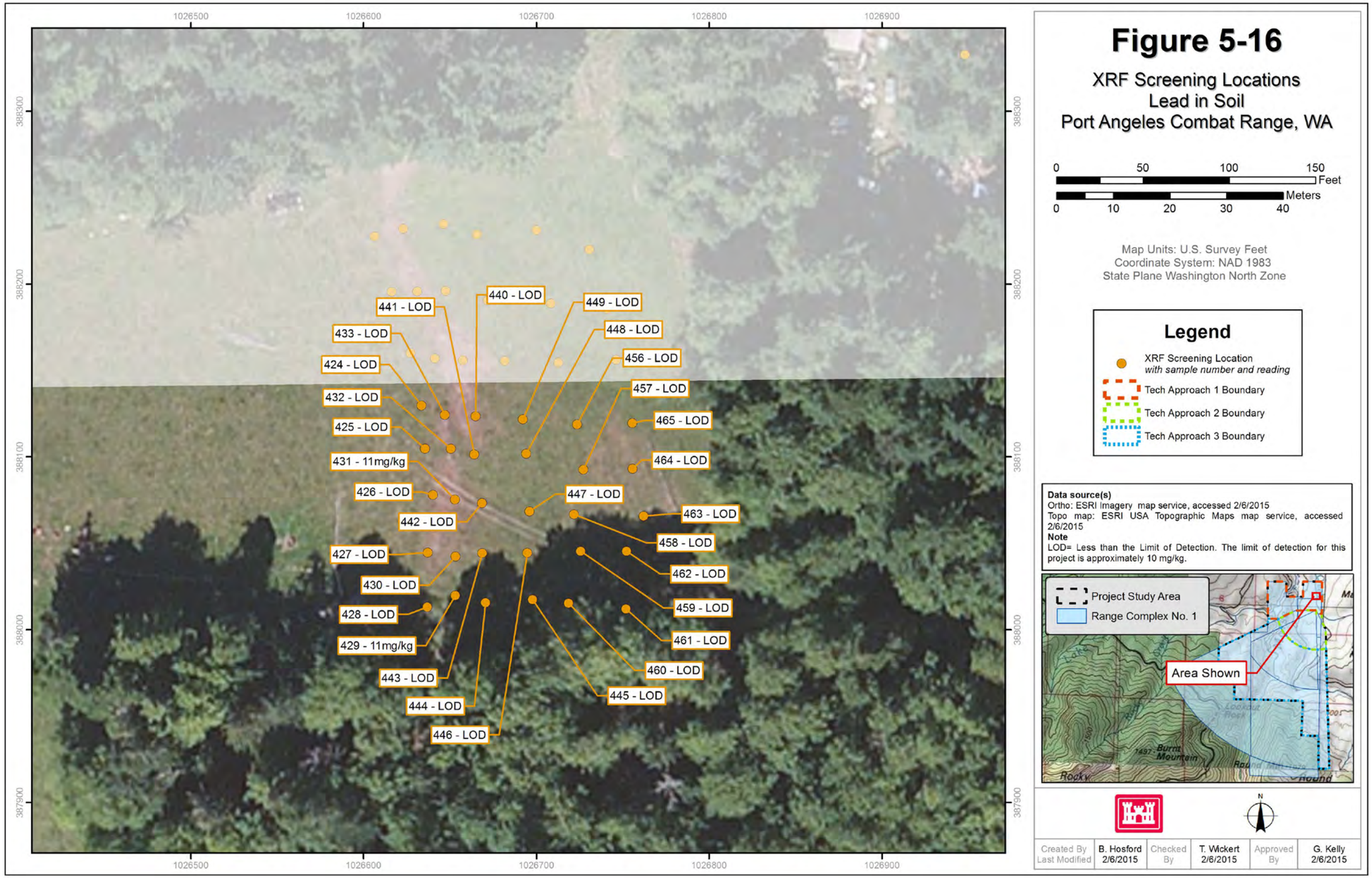

Figure 5-16

XRF Screening Locations
Lead in Soil
Port Angeles Combat Range, WA

0 50 100 150 Feet
0 10 20 30 40 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- XRF Screening Location *with sample number and reading*
- Tech Approach 1 Boundary
- Tech Approach 2 Boundary
- Tech Approach 3 Boundary

Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Note
LOD= Less than the Limit of Detection. The limit of detection for this project is approximately 10 mg/kg.

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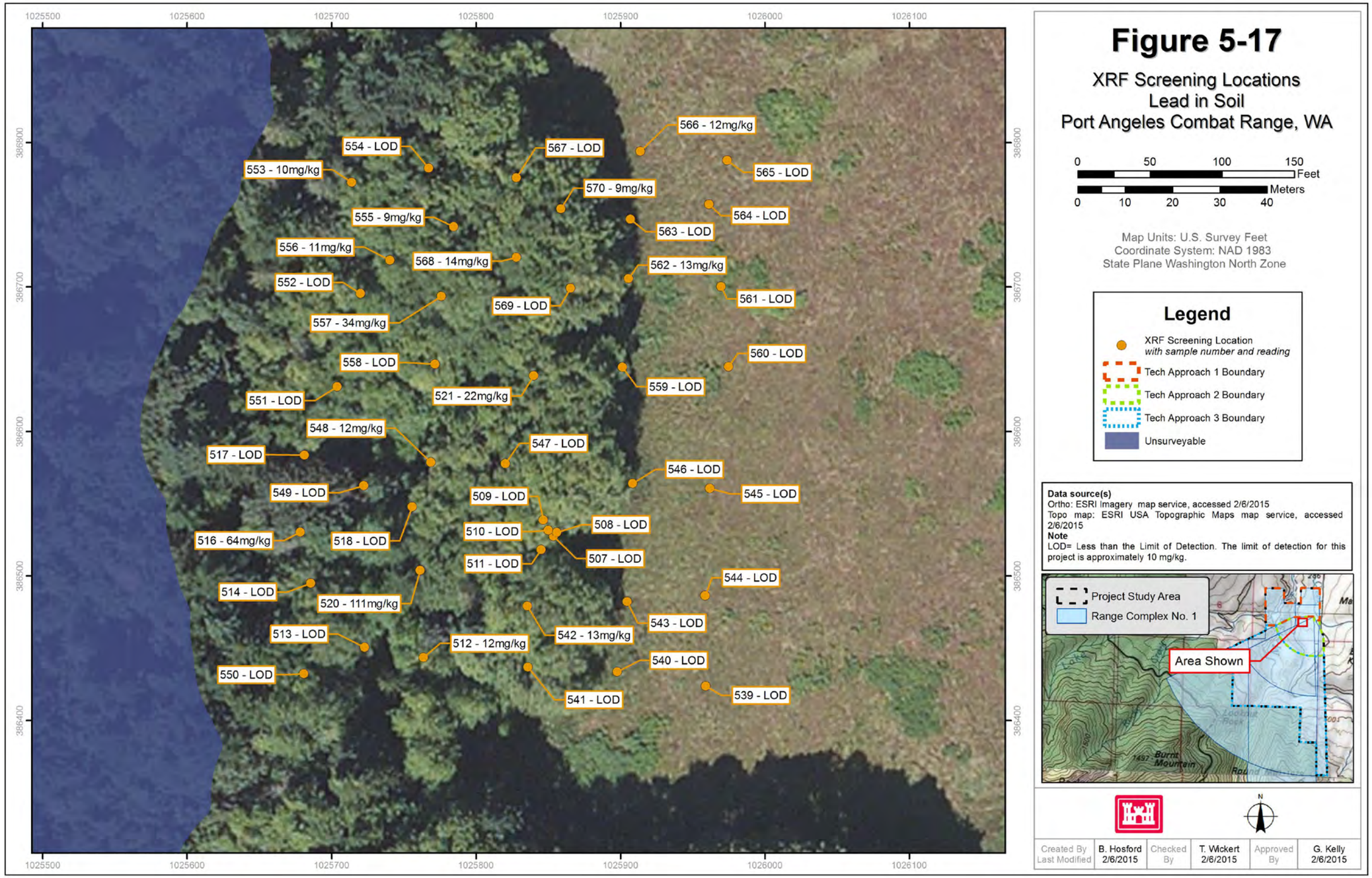

Figure 5-17

XRF Screening Locations
Lead in Soil
Port Angeles Combat Range, WA

0 50 100 150 Feet
0 10 20 30 40 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- XRF Screening Location *with sample number and reading*
- Tech Approach 1 Boundary
- Tech Approach 2 Boundary
- Tech Approach 3 Boundary
- Unsurveyable

Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015
Note
LOD= Less than the Limit of Detection. The limit of detection for this project is approximately 10 mg/kg.

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5.2.1.2 MUNITIONS CONSTITUENTS – ENERGETICS SAMPLING – SOIL

Section 4.2.1 and **Figure 4-7** describe the following proposed conditions under which sampling for energetic material and explosives residue would occur:

- Damaged MEC is found, potentially leaching MC into the environment
- A low-order detonation is found, potentially leaching MC into the environment
- MD with visible MC residue is found, potentially leaching MC into the environment

All recovered MEC items were intact and in good condition. MC sampling for energetics and explosives residue was not conducted because a release would not have occurred. All recovered MD items functioned as designed (complete detonation). MC sampling for energetics and explosives residue was not conducted because all explosives associated with the munitions would be consumed during detonation.

5.2.1.3 MUNITIONS CONSTITUENTS – SURFACE WATER, SEDIMENT, AND GROUNDWATER

The decision logic to collect sediment and surface water samples was the same as that for soil sampling and was based on the presence of compromised MEC or observed small arms debris. No MEC, MD, or small arms debris was found in areas of standing or flowing water. Therefore, no surface water or sediment samples were collected during the RI.

During the RI field investigation, field teams noted evidence of seeps, springs, and surface to groundwater communication (i.e., hydrogeological connections). No MEC, MD, or small arms debris were found in saturated areas. Therefore, no groundwater sampling was conducted during the RI.

5.2.1.4 ANALYSIS AND INTERPRETATION OF VISUAL SURVEY AND SUBSURFACE INVESTIGATION RESULTS

The results of the AVS, geophysical surveys, subsurface investigation, and the XRF analysis conducted during the RI field effort comprise a comprehensive data set that can be compared with historical information about the ranges and munitions use to provide a more probable representation of how the MRS was configured. This information was used to assess the potential for remaining explosive hazards, as described in the following discussion.

5.2.1.4.1 Impact and Target Areas

Based on the results of the AVS and the subsurface investigation, target and impact areas were confirmed to exist within the MRS. These areas contained MEC, MD, or small arms debris as well as evidence of old target features such as vehicle and other metallic debris. The areas that were investigated as part of the subsurface investigation located all of the impact and target areas within the MRS. Because there were two fatalities when timber was harvested (i.e. MEC embedded in trees) and trees still exist within the MRS there are likely additional MEC embedded within the tree trunks. The presence of MEC embedded in the tree trunks would be limited to those trees that were present when the range was operational.

There were three general locations that contained higher densities of MD relative to the rest of the MRS. **Figure 5-9** depicts the weights of MD, MEC, and small arms debris removed from each grid. The summarized weight of the items is only representative of approximately 10% of each subsurface investigation grid; however, the relative density of MD in each grid was still assessed.

The first area is located in the north central portion of Technical Approach Area 2 in the proximity of grid L-04. This impact and target area contained evidence of artillery (37mm projectiles and HE frag), mortars (81mm) and small arms (.50 caliber).

The second area is located in the central portion of Technical Approach Area 2 in the proximity of grid N-07. Within this impact and target area similar evidence was found as described above including artillery (37mm projectiles and HE frag), mortars (81mm) and small arms (.50 caliber).

The third area is located in the southern portion of Technical Approach Area 2 in the proximity of grid P-12. Evidence of munitions in this area was limited to artillery (75mm projectiles and HE frag). The distance from the firing point to the furthest location where MD was recovered is approximately 1,000 yards. The ASR noted that the distances of 500 yards to 1,000 yards from the firing point likely contain the “over fired” munitions. Therefore the third area may be an impact area with “over fired” munitions.

All of the munitions identified during the RI are effective up to a distance of 1,000 yards; therefore, all types of munitions are estimated to be present within each impact and target area. The depth of subsurface MD varied from 0.5-foot to 1.5 feet bgs.

While distinct impact and target areas containing higher relative densities of MD were observed, the areas adjacent to and between these target features are also estimated to contain MEC and MD.

The small arms debris located in grids K-03 and K-04 included unfired .50 caliber projectiles. Grid L-04 contained unfired .50 caliber projectiles and links. Due to the presence of the .50 caliber links and the lack of rifling striations it is believed the small arms were likely unfired and deposited in the areas, as there are no indications of a separate small arms impact area. If small arms were used at the MRS they were likely fired at the artillery and mortar targets.

5.2.1.4.2 Comparison of RI Findings with Historical Information

The locations of the impact and target areas described above in **Section 5.2.1.4.1** were compared to the locations of the historic features identified in the ASR. The ASR identified the following locations of historic munitions related features either textually or graphically (**Figure 2-8**) including:

- Intended indirect fire impact area
- An orchard which mortars were fired over
- 1948 Accident Location (location where two youths were killed in 1948)
- Direct fire target area with heavy contamination
- A moving target
- An old school house
- Firing point

The historical context of the intended Indirect Fire Impact Area was mortars were fired over the orchard and into the impact area. During the AVS within Technical Approach Area 3 which contained the anticipated location of the area of intended indirect fire impact there were no MD or other evidence of munitions identified. Initially this was a concern because the project team expected to find mortars within this area. Subsequent to the completion of the AVS within this area, mortar debris was identified to the west and south of the historical location of the orchard. The historical context that mortars were fired over the orchard in the ASR was correct; however, the initial locations of the

associated impact areas were incorrect. The impact areas associated with the mortars were closer to the firing points than initially anticipated. Based on the results of the RI field investigation the location of the intended Indirect Fire Impact area presented on **Figure 2-8** is no longer considered relevant.

The results of the RI field investigation corroborated the locations of the 1948 Accident Location, the location of the direct fire target area with heavy contamination, and the moving target. These areas were confirmed based on the MD and MEC recovered near these locations. In addition to the anticipated locations of the historical features an additional impact and target area was identified which was not previously discussed in the ASR.

The location of the old school house is relevant to confirm the direction of fire. It is unlikely that munitions would have been fired in the direction of the schoolhouse. The locations of the MD and MEC recovered during the RI confirmed that the direction of fire was from the firing point to the south.

The historical location of the firing point is discussed below in **Section 5.2.1.4.3**, firing point and range analysis.

Historical features that could not be located include:

- A potential small arms range
- A potential maneuver area containing practice land mines

Small arms debris (.50 caliber) were identified within the impact and target areas as described above in **Section 5.2.1.4.1**. In-Situ XRF samples were also analyzed at the natural topography features that could have been utilized as a small arms range berm. During the XRF analysis and the AVS there were no small arms debris observed at the natural topographic features. All of the XRF results were either below the limit of detection (approximately 10 mg/kg) or significantly below regulatory screening levels. Based on these results there was likely never a separate small arms range and the mortar and artillery targets described above in **Section 5.2.1.4.1** were utilized for small arms training.

The AVSs were performed throughout the accessible areas of the possible maneuver area identified in the ASR (Technical Approach Area 1) that could potentially contain landmines. There was no evidence of landmines identified including the presence of landmines, packaging material (e.g., crates) or dunnage. In addition, there was no other evidence that indicated the area was used for maneuvers or an infiltration course such as communication wire, c-ration cans, fox-holes, barbed wire obstacles, etc. If landmines did exist at the MRS it is possible that they could have been removed during the previous clearance efforts since they are readily visible. The information within the ASR indicated that the use of land mines was not confirmed. Based on the lack of evidence indicating the use of land mines during the field investigation and that the ASR could not confirm that land mines were actually used, it is unlikely land mines are present within the MRS.

5.2.1.4.3 Firing Point and Range Analysis

The configuration of the MRS was analyzed based on the results of the field investigation. Distances that munitions can travel and the typical deployment of the munitions were compared to the locations

of the MEC and MD recovered during the RI. The following munitions and firing distances were included based on MEC/MD discovered during the RI and previous investigations:

- M43A1 81mm mortar, maximum firing distance of 565 yards (ignition cartridge only) to 4,050 yards (ignition cartridge and eight increment charges)
- M47 75mm projectile, maximum firing distance 9,620 yards
- M63 37 HE mm projectile, maximum firing distance 4,980 yards

It should be noted that the maximum firing distance does not coincide with the maximum effective range. The maximum firing distance is the extent that a munitions item can physically travel. The maximum effective range is typically much less (e.g., a small arms pistol is only effective to 25 yards but the bullet could potentially travel 2,500 yards). The maximum effective range was considered when evaluating the firing points and the configuration of the MRS.

Based on the locations of the impact and/or target areas that were identified it is believed that the ASR firing point was located incorrectly or that they were limited to a secondary firing position (**Figure 5-18**). Based on the ASR interviews and distances to the targets the firing point was likely located in the larger meadow further to the west and north. Direct fire exercises would have also likely been performed in areas with open line-of-sight. Positioning the firing point in the larger meadow meets the typical deployment of weapons used at that time and corroborates the interviews from the ASR. The fragmentation distances of the munitions were compared to the distance between the ASR firing point and the target and impact areas. The distance between the ASR firing point and the target and impact areas are less than the munitions fragmentation distances (i.e., HE frag would impact the ASR firing points). The incorrect location of the ASR firing point is further evidenced by the fact that munitions debris was identified in grids directly adjacent to the ASR firing point (grids Q-02 and R-03). The precise location of the firing point does not directly affect the location of MEC/MD; however, it allows for a more robust analysis and supports the absence of MEC in other areas. A line of sight analysis was performed utilizing the target and firing point locations determined during the RI (**Figure 5-19**). The line of sight conservatively assumed a two degree elevation angle (angle off of the horizon) during the analysis, which equals approximately 50 feet above a target at 500 yards and 70 feet above a target at 700 yards. Areas within the line of sight model and outside of the impact and target areas were investigated during the AVS. No MEC or MD was identified within these areas which corroborates it is not probable for MEC or MD to be present outside of the impact and target areas.

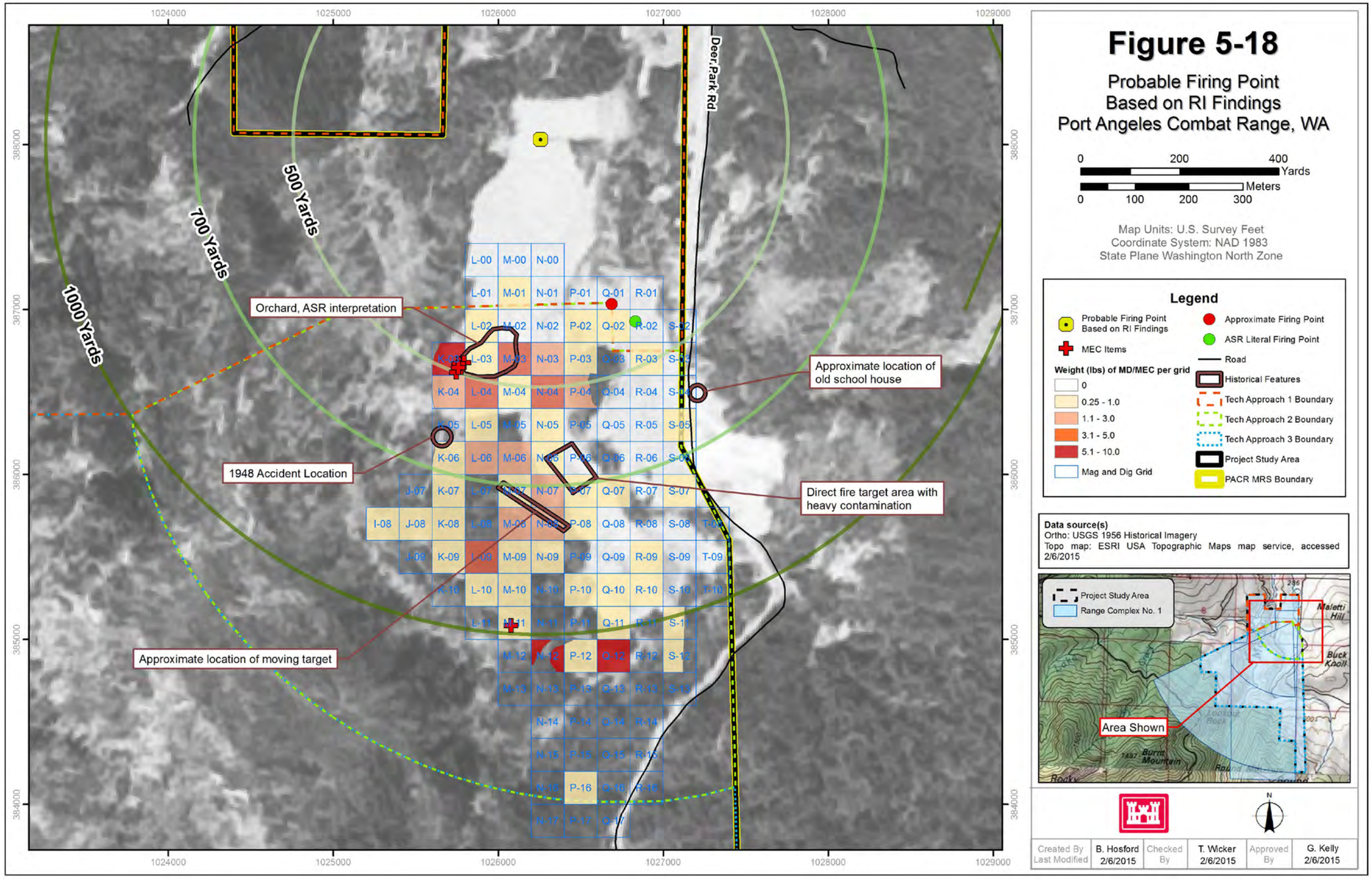

Figure 5-18

Probable Firing Point Based on RI Findings Port Angeles Combat Range, WA

0 200 400 Yards
0 100 200 300 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- Probable Firing Point Based on RI Findings
- MEC Items
- Approximate Firing Point
- ASR Literal Firing Point
- Road
- Historical Features
- Tech Approach 1 Boundary
- Tech Approach 2 Boundary
- Tech Approach 3 Boundary
- Project Study Area
- PACR MRS Boundary

Weight (lbs) of MD/MEC per grid

- 0
- 0.25 - 1.0
- 1.1 - 3.0
- 3.1 - 5.0
- 5.1 - 10.0
- Mag and Dig Grid

Data source(s)
Ortho: USGS 1956 Historical Imagery
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015

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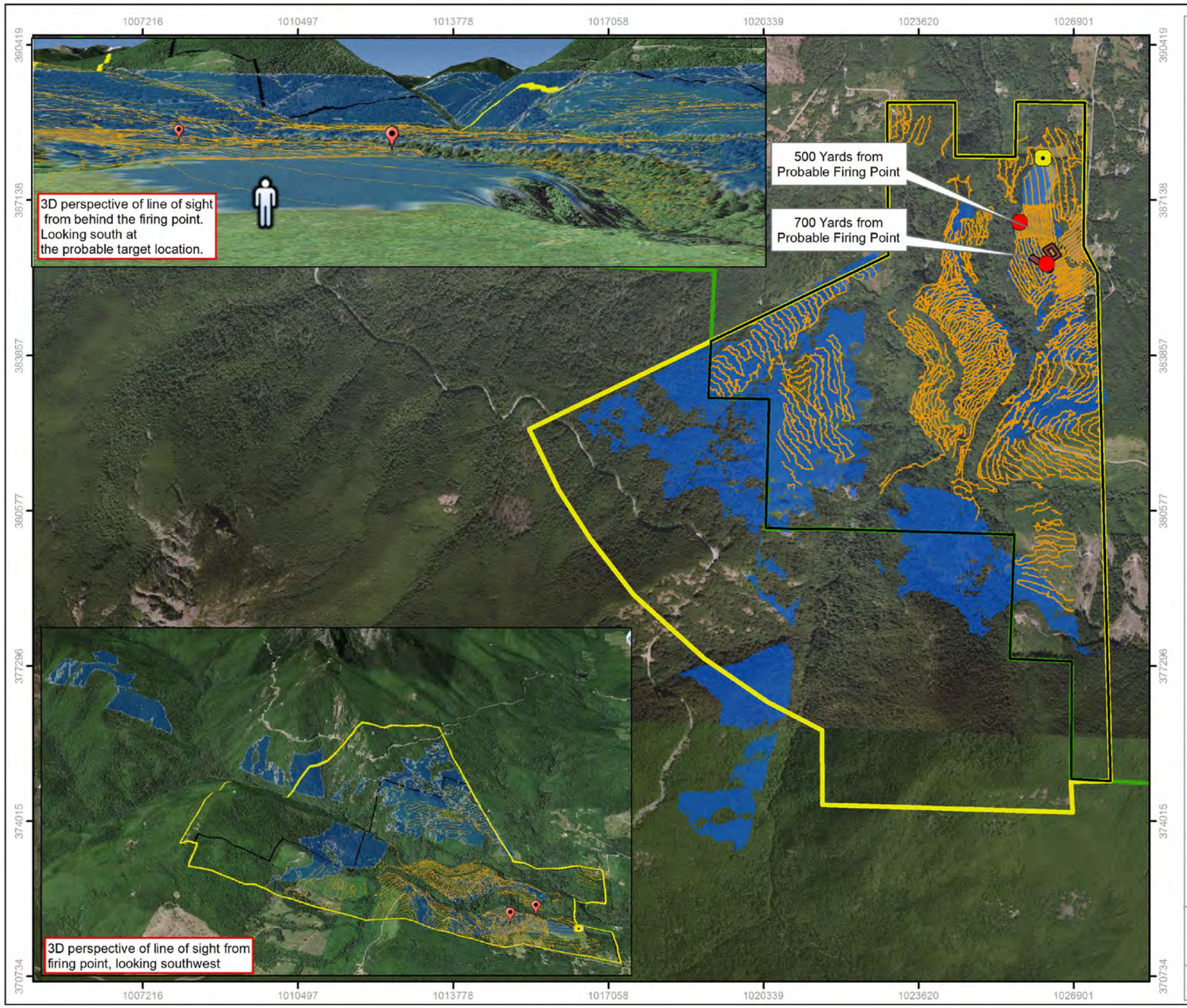


Figure 5-19

Line of Sight
Port Angeles Combat Range, WA

0 2,000 4,000 Feet

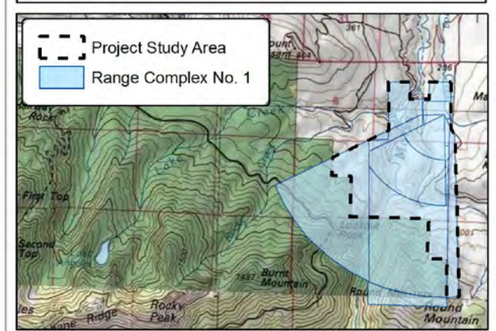
0 500 1,000 1,500 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- Probable Firing Point Based on RI Findings
- Approximate Target Location Based on RI Findings
- Visual Survey Transects
- Target Locations Identified in ASR
- Line of Sight Based on Observed Target Features
- Project Study Area
- PACR MRS Boundary
- Olympic National Park

Data source(s)
Ortho: ESRI Imagery map service, accessed 07/17/2013
Topo map: ESRI USA Topographic Maps map service, accessed 03/31/2014. 3D Imagery generated in Google Earth Pro.



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5.2.1.5 VISUAL SAMPLING PLAN ANALYSIS

A VSP analysis was performed to provide a statistical basis for determining the extent of possible MEC/MD contamination and to determine whether additional target or impact areas may have been missed at the MRS. The visual sampling plan reports are provided in **Appendix K**.

The VSP application was developed by Pacific Northwest National Laboratory with support from the Department of Energy (DOE), the USEPA, the DoD, the Department of Homeland Security (DHS), the Centers for Disease Control (CDC), and the United Kingdom (PNNL, 2011). The stated objective of the software development is "to ensure that the right type, quality, and quantity of data are gathered to support confident decisions." For the PACR RI, VSP was used to develop transect spacing to ensure proper survey methodologies were applied to historical site use patterns. For the assessment, two VSP modeling workflows were considered:

1. **Workflow 1** - Probability of traversal utilizes a Monte Carlo simulation to model the probability that transects would intersect a target area of a given size and shape (represented by a circularity value between 0.2 for an ellipse and 1 for a circle).
2. **Workflow 2** - Probability of traversal and detection utilizes the same methodology as the first workflow with the additional ability to model detection rates for geophysical sensors at specified confidence levels.

For activities at the MRS, three scenarios were considered for VSP modeling, in all scenarios unsurveyable areas shown in **Figure 4-2** were masked and not considered in the modeling results:

Scenario 1: In the open meadow where target features were historically located, 35-foot AVS and DGM transects were collected. This allowed for the assessment of probability of traversal and detection (Workflow 2). The underlying purpose of the DGM survey was to determine the appropriate follow on activity and to delineate regions of high density (greater than 250 anomalies per acre) from a nominal background density level that could be expected in the environment. Within Technical Approach Area 2, this occurred with the intent that high-density areas identified in the DGM process would be subject to subsequent intrusive investigations. However, the result of the DGM transects indicated elevated density levels throughout the open meadow and thus necessitated an intrusive subsurface investigation of the entire open meadow. The intrusive subsurface investigation determined nature and extent of the areas impacted by MD/MEC. This eliminates the underlying need to perform an assessment of the probability of a target area being detected by VSP modeling. **Figure 5-8** shows the extent of the subsurface investigation in relation to the open meadow.

One important ancillary outcome of the density analysis is that the presumption of the original decision unit of a 0.7 acre target area was tested against the actual density data from the DGM as centered on grids P-07 and N-07. This elevated area was selected due to its proximity to the area described as "Direct Fire Target Area with Heavy Contamination" in the ASR. The outcome of this test empirically derived the decision unit for a target area at the Range Complex No. 1 MRS is 0.783 acres with a circularity value of 0.968 (circularity = 4pi [area/perimeter^2]). These parameters were used as test values for the following two inputs; this area is shown in **Figure 5-7**.

Scenario 2: The surveyable 75-foot transect spacing areas were tested for probability of traversal (Workflow 1) at the decision unit acreage of 0.783 acres with a circularity value of 0.968. This test unit represents the decision unit polygon discussed in the previous paragraph. A VSP Monte Carlo

simulation of the area indicated a 100% probability of traversal of these areas given 10,000 randomly placed sample locations.

Scenario 3: The surveyable 150-foot transect spacing areas were tested for probability of traversal (Workflow 1) at the decision unit acreage of 0.783 acres with a circularity value of 0.968. This test unit represents the decision unit polygon discussed in the previous paragraph. A VSP Monte Carlo simulation of the area indicated a 99% probability of traversal of these areas given 10,000 randomly placed sample locations.

It should be noted that the targets utilized during direct fire exercises are anticipated to be smaller than indirect fire targets because of the method of deployment (i.e., indirect fire targets will inherently be larger). Therefore, utilizing the decision unit of 0.783 acres is a conservative measure and all targets within the MRS have been detected. The results of the three scenarios are presented in **Table 5-3**.

Table 5-3 VSP Results for Scenarios 1-3

Name	Description	VSP Traversal Result
Scenario 1	DGM performed 35-foot Transect Spacing	Not considered due to subsequent intrusive investigation activities
Scenario 2	Assisted Visual Surveys 75-foot Transect Spacing	100% Traversal
Scenario 3	Assisted Visual Surveys 150-foot Transect Spacing	99% Traversal

The VSP application was also utilized to compare anticipated traversal rates from the project planning phase with the actual coverage achieved in the surveyable areas of the site. During the RI Work Plan (HDR, 2013) development process, VSP was utilized to provide transect spacing to match the known historical site use. For planning purposes, idealized straight line surveys were modeled. Due to the heavy vegetation and extreme topography at the MRS, meandering transects were utilized in the field. It should also be noted that VSP was utilized as an input in the planning process that ultimately determined the 0.7-acre decision unit utilized in the RI Work Plan (HDR, 2013) modeling and adjusted to field results for the final VSP analysis. This analysis incorporated VSP models generated for theoretical targets from the very small (0.1-acre), to a comparatively large (1.0-acre) target area. The following results demonstrate that the outcomes from the visual surveys were consistent with project planning activities (**Table 5-4**).

Table 5-4 Comparison of VSP Results of Planning Outputs Compared to Field Data

Transect Spacing	75-foot	75-foot	150-foot	150-foot
Target Area Size and Shape	**Planned/straight**	**Actual/meandering**	**Planned/straight**	**Actual/meandering**
1-acre circle	100%	100%	100%	100%
1-acre/ellipse	100%	100%	98%	99%
0.5-acres/circle	100%	100%	100%	99%
0.5-acre/ellipse	100%	99%	93%	97%
0.25-acre/circle	100%	100%	81 %	89%
0.25-acre/ellipse	98%	97%	87%	92%

5.2.2 MC Revised Conceptual Site Model

The graphical CSMs developed for the RI Work Plan (HDR, 2013) have been revised by incorporating the results from the 2013 RI fieldwork. **Section 8.5.1** summarizes the MRSs, which resulted in the creation of additional CSMs for access and exposure to MEC and MC for all receptors. Range Complex No. 1 and Range Complex No. 1 (a) collectively represent an area of 1392.2 acres. Range Complex No. 1 (b) includes the area within ONP, which is an additional 1238.5 acres. Additional information was needed to characterize the MRS for nature and extent of MEC and MD, and nature and extent of MC contamination, if any. CSMs for human and ecological receptors potential exposure to MC are presented inn the CSMs that follow (**Figure 5-20** through **Figure 5-25**).

5.2.2.1 HUMAN RECEPTORS POTENTIALLY EXPOSED TO MC

The potential remains for human receptors to encounter both MEC and possibly MC in compromised munitions at the MRS Range Complex No. 1. Consequently, all human receptors are potentially exposed to MC in surface soil; other receptors might conduct intrusive activities into the subsurface soil.

Based on the results of the sampling conducted in the SI (i.e. stakeholders agreed that further MC sampling is not warranted) and the lack of MEC requiring MC sampling during the RI the exposure pathways to MC are considered incomplete and thus there are no receptors for the Range Complex No. 1 (a) and Range Complex No. 1 (b) MRSs.

5.2.2.2 ECOLOGICAL RECEPTORS POTENTIALLY EXPOSED TO MC

Ecological receptors potentially evaluated for exposure to MC in the Baseline Ecological Risk Assessment (BERA) (**Section 7.2**) included:

- Terrestrial plants
- Terrestrial soil invertebrates (soil fauna)
- Terrestrial birds
- Terrestrial mammals
- Aquatic receptors (plants, invertebrates, vertebrates, aquatic-dependent mammals and birds)

5.2.2.3 MC EXPOSURE MEDIA AND ACCESSIBILITY

Soil, sediment, surface water, and groundwater sampling data from the SI (Shaw, 2009) reported that the results were associated with naturally occurring background concentrations or were below relevant human health and ecological screening values.

The five MEC items removed from the MRS Range Complex No. 1 appeared intact such that additional environmental sampling for MC was deemed unnecessary. The potential exists for additional surface and subsurface MEC, which can result in potential MC contamination; however, based on the types and densities of the MD observed it is likely insignificant. Consequently, most of the soil exposure pathways are potentially complete in the absence of environmental sampling.

None of the recovered MEC were compromised to the extent that MC was likely released to the environment. Consequently, no environmental media sampling and analysis was conducted.

There have been multiple range clearances on the PACR since WWII; however, due to steep terrain features and lack of ROE of four parcels including the ONP, areas remain which have not been

evaluated. MEC and MC are potentially present in those areas as well as locations that were unsurveyable due to dense vegetation. Based on the line of sight analysis and the proximity of the ONP in relation to the identified target and impact areas it is unlikely that MEC are present in the ONP.

The potential remains for human receptors to encounter both MEC and MC at the MRS Range Complex No. 1. For MRS Range Complex No. 1, exposure pathways are potentially complete (**Figure 5-20**). Human receptors are unlikely to be exposed to MC in soils at the Range Complex No. 1 (a), and Range Complex No. 1 (b) (**Figure 5-21** and **Figure 5-22**, respectively). Based on the results of the RI field investigation it is unlikely that MEC and MC are present in Range Complex No. 1 (a) and Range Complex No. 1 (b).

Exposure parameters and toxicity data for reptiles are very limited. Any possible evaluation of risks to mammals and birds would likely be protective of terrestrial reptiles.

5.2.2.4 MC POTENTIAL ROUTES OF MIGRATION

Environmental media concentrations from the SI (Shaw, 2009) were reported as naturally occurring and/or below human health and ecological screening values.

During the RI, no MEC or MD constituting an MC source (for criteria, see **Section 0**), were observed, analyzed, or assessed; therefore, potential routes of migration are likely non-existent or potentially complete though likely insignificant.

5.2.2.5 MC CONTAMINANT PERSISTENCE

The environmental media concentrations from the SI (Shaw, 2009) were reported as naturally occurring and/or below human health and ecological screening values. There is likely no contamination present.

During the RI, no MEC or MD constituting an MC source (for criteria, see **Section 0**) were observed, analyzed, or assessed; therefore, a discussion of contaminant persistence is not relevant.

5.2.2.6 MC EXPOSURE CONCLUSIONS

Based on the number of current and previous field investigations, particularly the SI (Shaw, 2009) and the 2013 RI field investigation, the potential for human and ecological exposure to MC is likely very low. There is some degree of uncertainty associated with other MEC items (source of MC) which remain buried (if any). However, all information to date suggests that the soil exposure pathway for human receptors for MC is potentially complete at the Range Complex No. 1 MRS (**Figure 5-20**) and likely incomplete for Range Complex No. 1 (a) and Range Complex No. 1 (b) (**Figure 5-21** and **Figure 5-22**, respectively). Range Complex No. 1 (a) and Range Complex No. 1 (b) MRSs are no longer being considered as potentially impacted by MC.

There was no evidence of leaking MC associated with the MEC items recovered from MRS Range Complex No. 1. Consequently, contamination of soil and other environmental media is unlikely and no soil samples were collected for chemical analysis. For MRS Range Complex No. 1, some exposure pathways are potentially complete though likely insignificant simply because MEC was found and other MEC could possibly be present. Based on the absence of MEC at the other two MRSs, all MC exposure pathways are likely incomplete.

There is likely no potential for unacceptable exposure to MC anywhere for ecological receptors at the Port Angeles Range Complex MRSs. **Figure 5-23**, **Figure 5-24**, and **Figure 5-25** present the updated CSMs for ecological receptors. If damaged MEC were present (currently an unknown situation), MC could potentially be released to the environment. The potential for MC releases appears to be low based on the limited locations of the MEC recovered in MRS Range Complex No. 1 and the lack of MEC recovered elsewhere.

Figure 5-20 Updated Conceptual Site Model for MC Exposure to Human Receptors at the Port Angeles MRS Range Complex No. 1

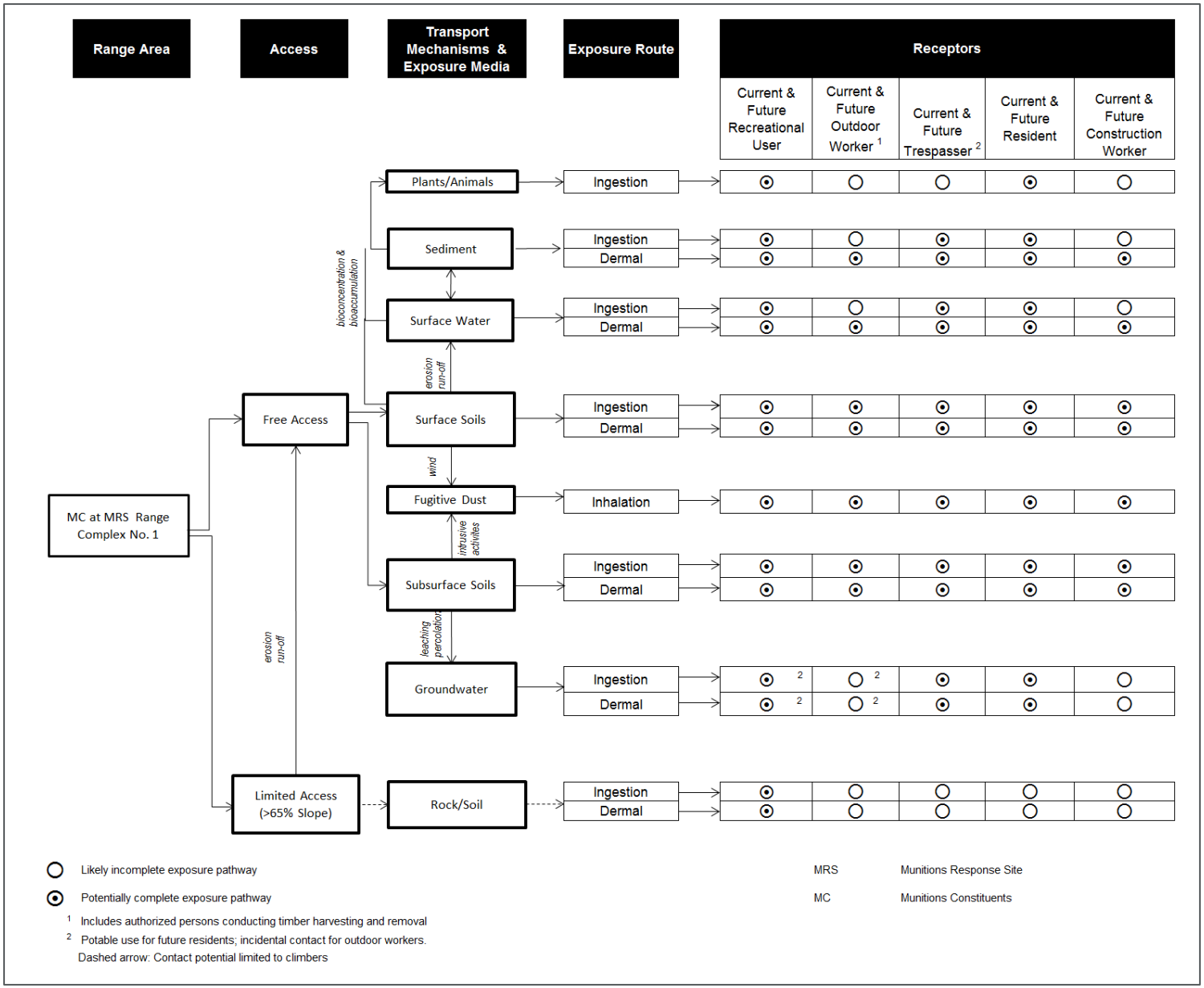


Figure 5-21 Updated Conceptual Site Model for MC Exposure to Human Receptors at the Port Angeles MRS Range Complex No. 1 (a)

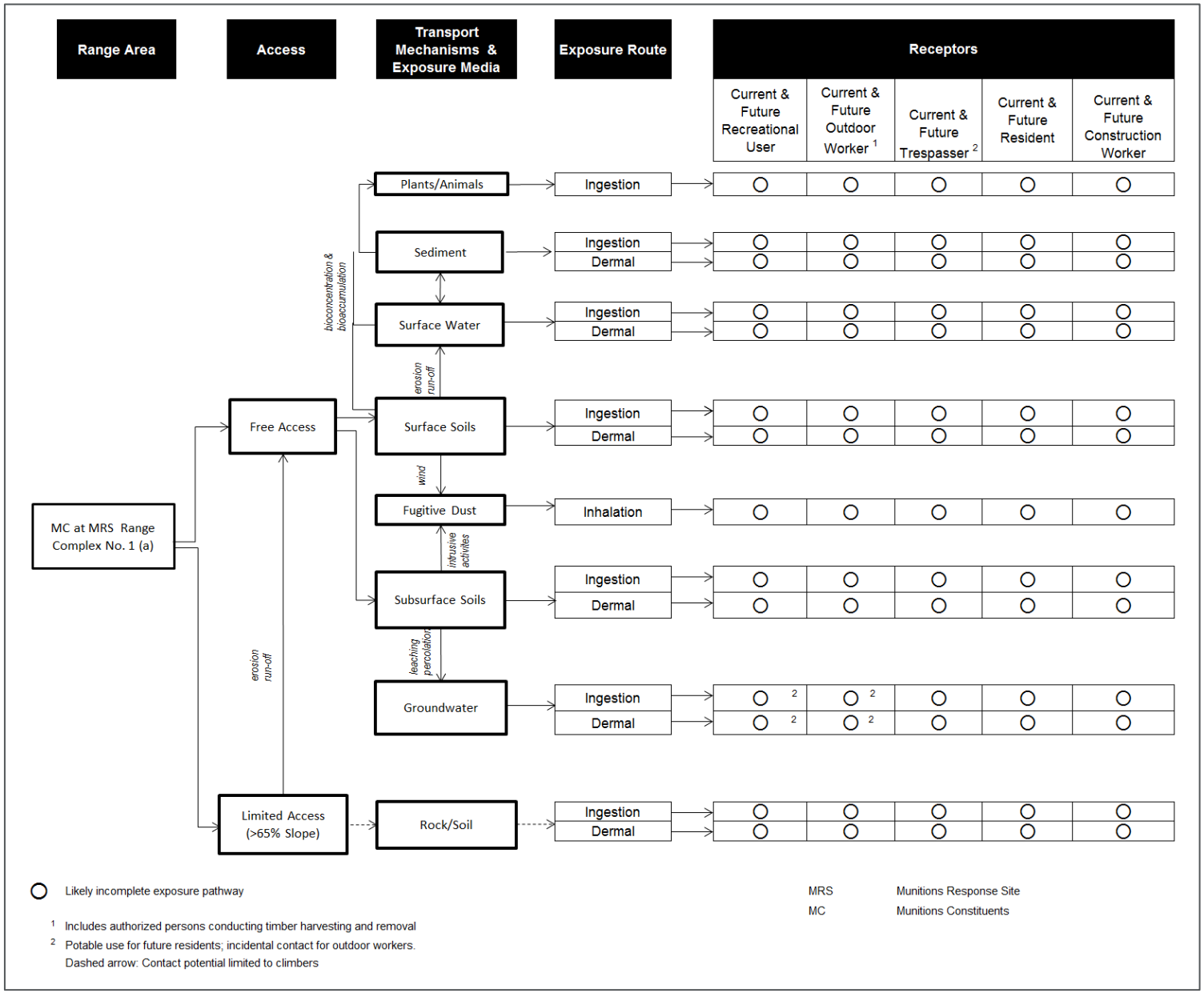


Figure 5-22 Updated Conceptual Site Model for MC Exposure to Human Receptors at the Port Angeles MRS Range Complex No. 1 (b)

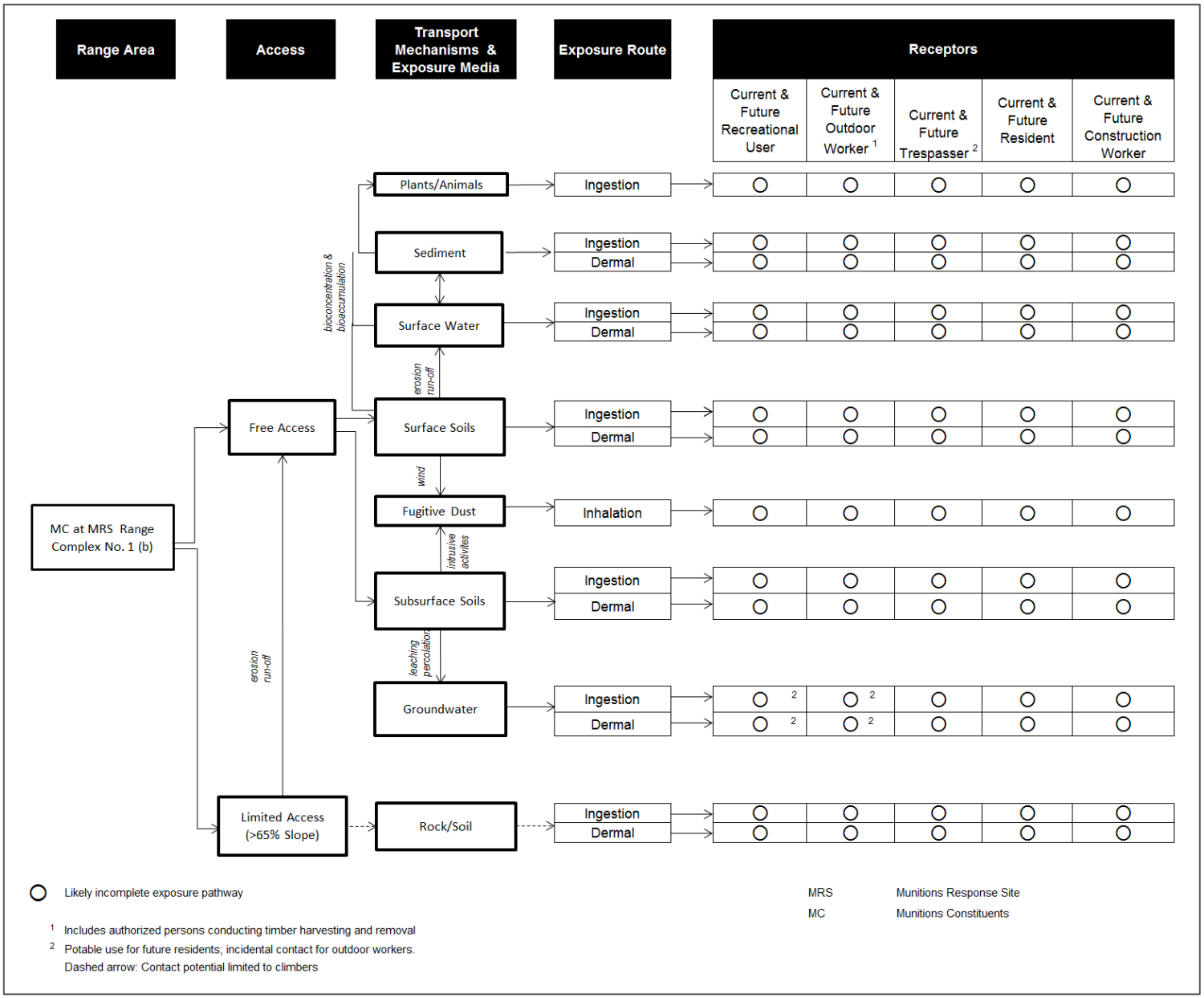


Figure 5-23 Updated Conceptual Site Model for MC Exposure to Ecological Receptors at the Port Angeles MRS Range Complex No. 1

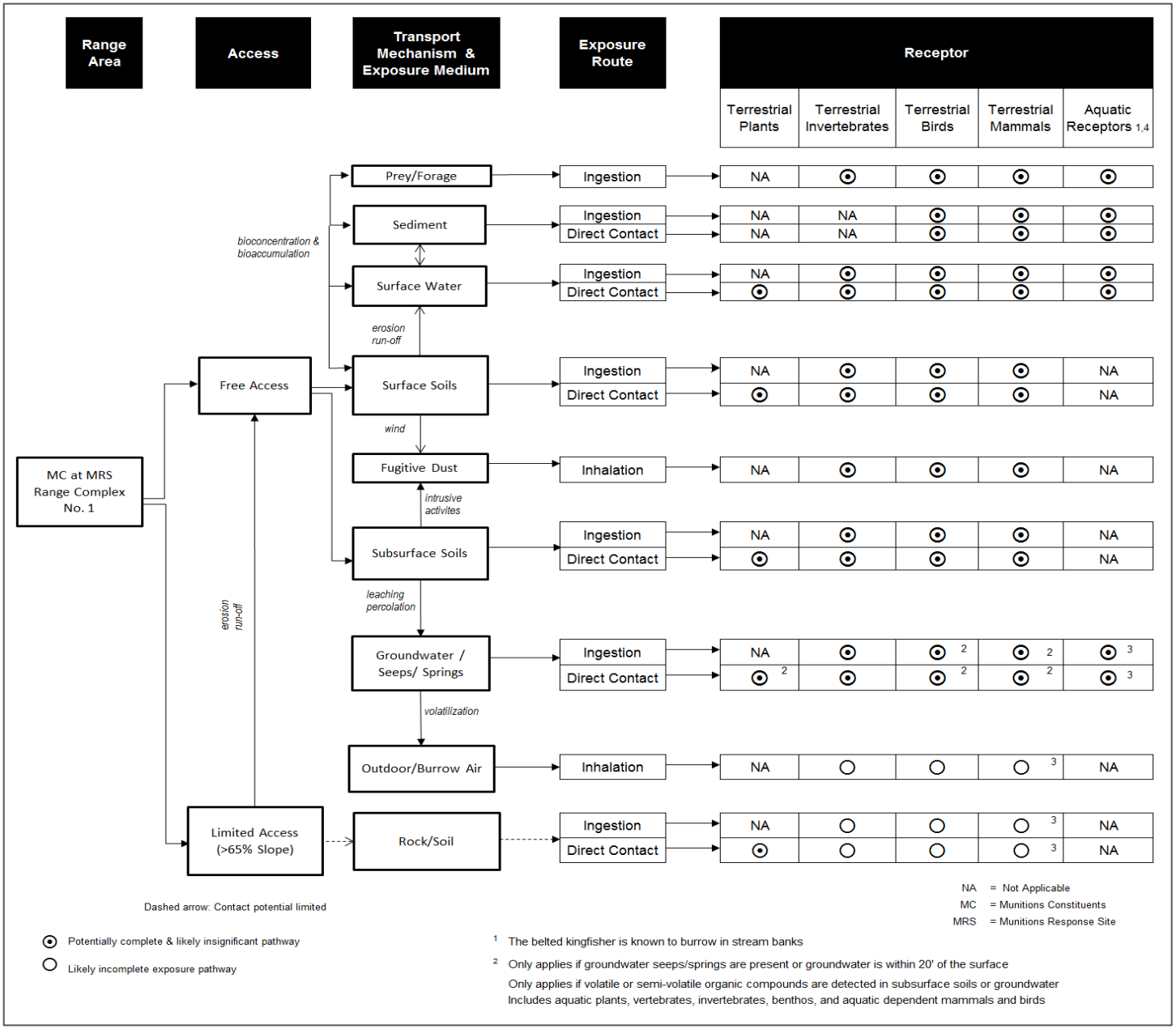


Figure 5-24 Updated Conceptual Site Model for MC Exposure to Ecological Receptors at the Port Angeles MRS Range Complex No. 1 (a)

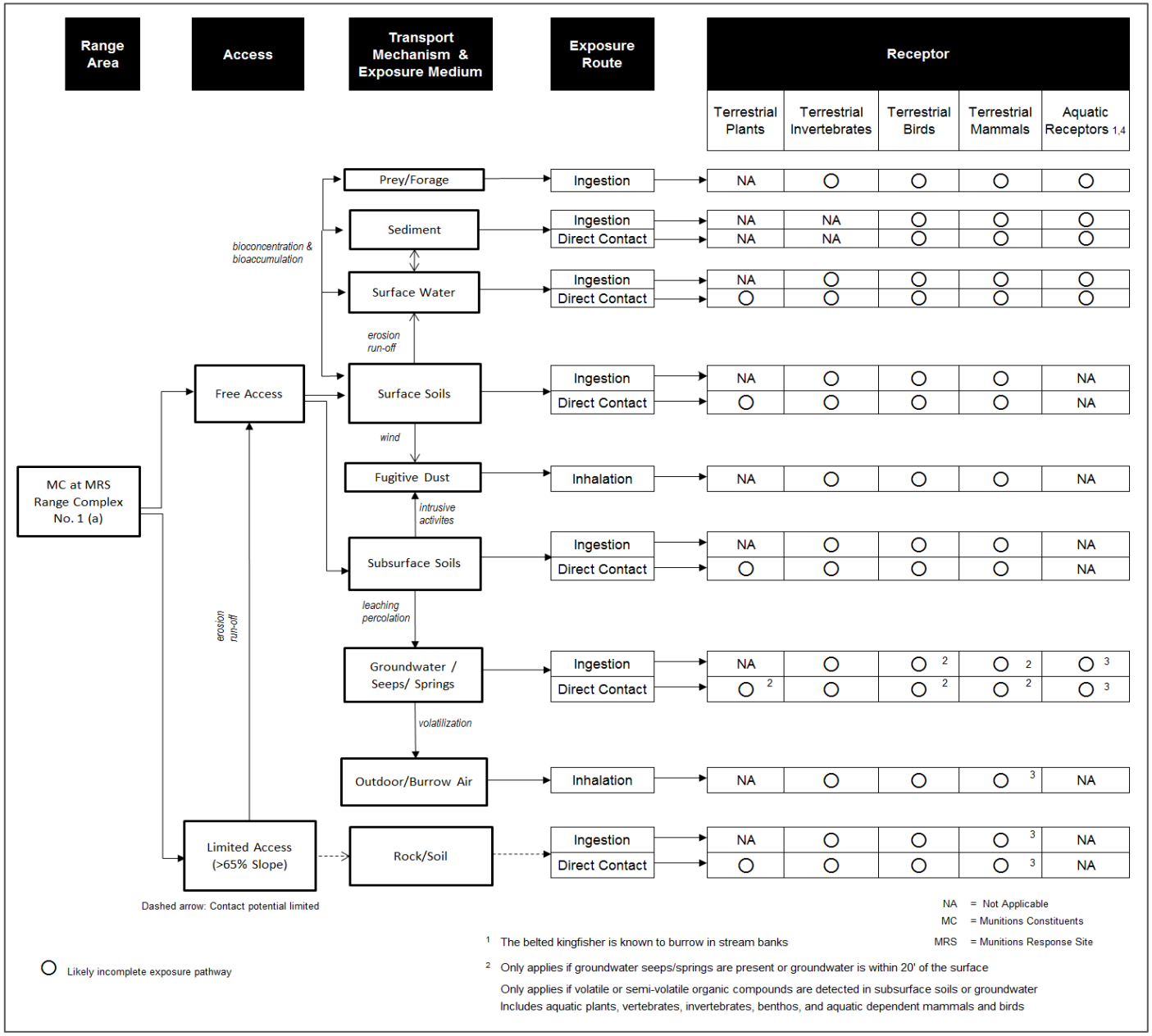
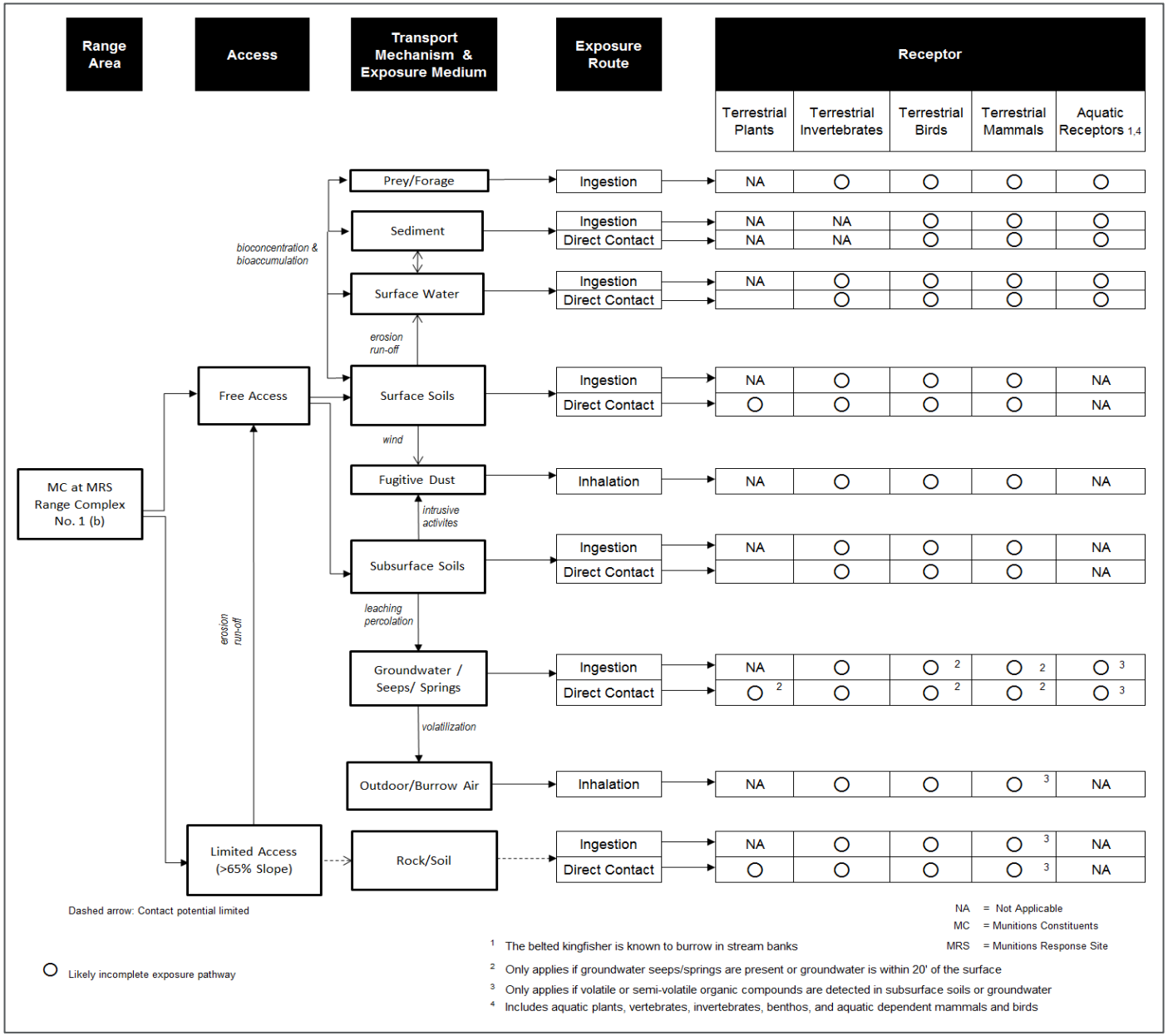


Figure 5-25 Updated Conceptual Site Model for MC Exposure to Ecological Receptors at the Port Angeles MRS Range Complex No. 1 (b)



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6.0 Contaminant Fate and Transport for MEC and MC

The MEC items discovered during the RI did not represent potential sources of MC. However, only 10% of each grid was investigated during the RI; therefore, there is still potential for MEC and MC at Range Complex No. 1.

6.1 Munitions and Explosives of Concern

There is the potential for human and ecological receptors to access MEC at the MRSs in surface and subsurface soil. Five MEC items were found during the RI field activities; consequently, all soil exposure pathways for access and exposure to MEC in these MRSs are complete for all receptors. Based on the recovery of semi-buried MEC items (i.e., the M63 37mm HE projectiles at grids K-03 and M-11), surface soil exposure pathways to MEC remain complete. All recovered MEC items were located in shallow surface soil (0-6 inches bgs). MD were present in many areas which suggests that other MEC may be present but not visible. No CWM or evidence of CWM was observed within the MRSs.

In general, the potential for transport of MEC from one location to another is based on the amount of precipitation, stabilization in soil, the steepness of the slope, and weight of the item. In areas that have steep, open slopes, MEC could be transported via frost heave and erosion or possibly by mudslides depending on the slope and cover. There are surface water features in the Range Complex No. 1 MRS; therefore, MEC transport from initial source locations to surface water or sediment and other areas within this MRS is possible although unlikely. Over time, soils, rocks, and organic debris tend to accumulate around stationary items thereby inhibiting movement. Due to the lack of ROE, Range Complex No. 1 (b) was not investigated during the RI.

6.2 Munitions Constituents

MEC can potentially represent a source of MC, specifically explosive residues in the form of nitroaromatics and nitramines. Migration of explosive residues can occur primarily from precipitation and fugitive dust. It is more likely that snowmelt and rainfall rather than fugitive dust would mobilize explosive residues from their initial source location. Windblown dust represents a potential migration pathway but a minor one relative to transport by moisture. MC can be found in subsurface soils upon initial deposition. However, many energetics are more likely to bind to humic materials where present, thereby limiting further leaching.

Based on the number of current and previous field investigations, particularly the SI (Shaw, 2009) and the 2013 RI field investigation, the potential for human and ecological exposure to MC is likely very low. There is some degree of uncertainty associated with other MEC items (source of MC) which remain buried (if any). However, all information to date suggests that the soil exposure pathway for human receptors for MC is potentially complete at the Range Complex No. 1 MRS and likely incomplete for Range Complex No. 1 (a) and Range Complex No. 1 (b).

There was no evidence of leaking MC associated with the MEC items recovered from MRS Range Complex No. 1. Consequently, contamination of soil and other environmental media is unlikely and no soil samples were collected for chemical analysis. For MRS Range Complex No. 1, some

exposure pathways are potentially complete though likely insignificant simply because MEC was found and other MEC could possibly be present. Based on the absence of MEC at the other two MRSs, all MC exposure pathways are likely incomplete.

MC released from MEC could be transported by surface water runoff to other areas down gradient from the source. MC could migrate to groundwater only in areas where depth to groundwater is shallow or where a hydrogeological connection exists between groundwater and surface water. However, because seeps and springs were not observed within the Range Complex No. 1 MRS migration of MC to groundwater and surface water is likely negligible. Exposure to MEC and/or MC via frost heave and erosion is possible especially in steep ravines.

Heavy rainfall and snowmelt could mobilize MC residues from their initial source location. Windblown fugitive dust represents a potential migration pathway. MC can also be found in subsurface soils upon initial deposition or through vertical and horizontal migration.

MC can also migrate through uptake via the food chain. Mobile receptors can carry contaminants from source locations to other areas based on their home ranges and foraging areas.

There is the potential for human and ecological receptors including wildlife, and other biota to access MC in surface and subsurface soil in the Range Complex No. 1 MRS where MEC and MD was recovered. MC in surface soil results in potential for uptake by vegetation; thus, the food chain pathway is considered potentially complete though likely insignificant for human receptors, wildlife and other biota. Potentially complete food chain exposures are present for terrestrial and aquatic-dependent animals; the food chain pathway is complete though likely insignificant for terrestrial soil invertebrates.

7.0 Baseline Risk Assessment for MC and Hazard Assessment for MEC

Baseline human health and ecological risk assessments for this RI were limited since environmental soil sampling was not conducted during the RI. Only the SI data were available for consideration (Shaw, 2009); however these data were previously screened for human health and environmental concern and were less than screening levels and not addressed further in this RI.

There were limited MEC items found and no evidence of MC release. A MEC HA, however, has been included in **Section 7.3**.

7.1 Baseline Human Health Risk Assessment

A comprehensive, detailed quantitative baseline HHRA was not conducted for the PACR MRSs due to the absence of environmental sampling data from the RI.

7.1.1 Data Evaluation and Usability

During the RI, a limited amount of in-situ XRF data was collected for lead analysis. These data were only used qualitatively by the field investigation. The XRF would have been utilized to guide the locations of samples for laboratory analysis if they would have been required. The XRF analysis results were not considered definitive data and are no longer considered in the baseline HHRA.

7.1.2 Human Health Screening Levels for Contaminants of Potential Concern

Not applicable. Screening for contaminants of potential concern was not conducted.

7.1.3 Screening for Contaminants of Potential Concern

Screening for contaminants of potential concern was not conducted.

7.1.4 Uncertainty Analysis

An uncertainty analysis was not conducted.

7.1.5 Exposure Assessment

An exposure assessment was not conducted.

7.1.6 Toxicity Assessment

A toxicity assessment was not conducted.

7.1.7 Risk Characterization and Uncertainty Analysis

A risk characterization and uncertainty analysis was not conducted.

7.2 Baseline Ecological Risk Assessment

A BERA was not conducted for the Range Complex No. 1 MRS due to the absence of RI environmental sampling data.

7.2.1 Screening for Contaminants of Potential Ecological Concern

Not applicable. Screening for contaminants of potential concern was not conducted.

7.2.2 COPEC Screening Values

Screening for contaminants of potential concern was not conducted.

7.2.3 COPEC Screening Results

Screening for contaminants of potential concern was not conducted.

7.3 MEC Hazard Assessment

The MEC HA presented in this section follows the *Munitions and Explosives of Concern Hazard Assessment Methodology* (USEPA, 2008), which provides an assessment of the acute explosive hazards associated with remaining MEC at an MRS by analyzing site-specific conditions and human issues that affect the likelihood that a MEC accident will occur. The MEC HA method focuses on hazards to human receptors and does not directly address environmental or ecological concerns that might be associated with MEC. The process uses input data based on historical documentation, field observations, and the results of previous studies and removal actions. The MEC HA interim guidance was developed by the Technical Working Group for Hazard Assessment, which included representatives from the DoD, the U.S. Department of the Interior, the USEPA, and various states and tribes. The DoD has encouraged use of this method on a trial basis (DoD, 2009).

The MEC HA supports hazard communication among stakeholders by organizing site information in a consistent manner for the hazard management decision-making process. However, the MEC HA does not provide a quantitative assessment of MEC hazards and is not used to determine whether further action is necessary at a site. The MEC HA itself was performed using the *Excel®-based automated MEC HA workbook V. 1.02*.

The MEC HA method reflects the basic difference between assessing acute hazards from exposure to MEC and assessing chronic environmental risks from exposure to potential contaminants, such as MC. An explosive hazard can result in immediate injury or death; therefore, risks from explosive hazards are evaluated as either being present or not present. If the potential for an encounter with MEC exists, then the potential that the encounter may result in injury or death also exists. Conversely, if the potential presence of MEC at an MRS can be ruled out because of field investigations, then no explosive hazards are present, and a MEC HA is not necessary. However, it is very unlikely that explosive hazards at the PACR can be confirmed as nonexistent, so the MEC HA should reflect the level of uncertainty remaining.

The MEC HA is designed primarily for use at two points in the CERCLA process. The first point is at the end of an RI to assess baseline explosive hazards and provide information about the relative hazard reductions associated with remedial response alternatives that might be evaluated in the FS. The second point is at the end of a removal action to assess baseline explosive hazards and relative hazard reductions associated with removal. For the three recommended MRSs shown in **Figure 8-1** and described in **Section 8.5.1**, the MEC HA was performed to assess the baseline explosives hazard based on the RI results and hazards remaining after implementing possible remedial response alternatives. These baseline evaluations provide input for the evaluation and implementation of effective management response alternatives in the FS.

The MEC HA baseline evaluation (row "a" in **Table 7-5**) is equivalent to the NA alternative discussed in the FS (**Section 10.2.1**). The complete MEC HA tables and figures for each MRS are provided in **Appendix L**.

7.3.1 Overview of MEC Hazard Assessment Input Factors

The MEC HA is structured around three components of potential explosive hazard incidents:

- Severity, which is the potential consequences of the effect on a human receptor should a MEC item detonate.
- Accessibility, which is the likelihood that a human receptor will be able to come in contact with a MEC item.
- Sensitivity, which is the likelihood that a human receptor will be able to interact with a MEC item such that it will detonate.

Each of these components is assessed in the MEC HA by input factors. Each input factor has two or more categories, each associated with a numeric score that reflects the relative contributions of the different input factors. The sum of the input factor scores falls within one of four defined ranges, called Hazard Levels. Each of the four Hazard Levels reflects attributes that describe groups of MRSs and site conditions ranging from the highest to lowest hazards. The MEC HA scores should not be interpreted as quantitative measures of explosive hazard.

To complete the baseline MEC HA for each assessment area, the input factors are reviewed and suitable categories (baseline, surface MEC cleanup, or subsurface MEC cleanup) are selected based on historical documentation and field observations.

The input factors for the MEC HA method are described below (USEPA, 2008c):

Energetic Material Type: This factor describes the general type of energetic material associated with the munition(s) known or suspected to be present within the MRS or assessment area. The six possible categories for this factor, ranging from the most to least potentially hazardous, are:

- Low explosive fillers in fragmenting rounds
- White phosphorus
- Pyrotechnics
- Propellants
- Spotting charges
- Incendiaries

The category selected for each MRS or assessment area is based on the energetic material with the greatest potential explosive hazard known or suspected to be present.

Location of Additional Human Receptors: Human receptors other than the individual who causes a detonation may be exposed to overpressure and/or fragmentation hazards from the detonation of MEC. This factor describes whether or not there are additional human receptors located within the MRS/assessment area or within the explosive safety quantity-distance (ESQD) ARC surrounding the MRS/assessment area. The two possible categories for this factor are "inside the MRS or inside the ESQD arc surrounding the MRS" and "outside the ESQD arc".

Site Accessibility: The site accessibility factor describes how easily human receptors can gain access to the MRS or assessment area and takes into account the various barriers to entry that

might be present. The four possible categories of site accessibility range from “full accessibility” (i.e., a site with no barriers to entry) to “very limited accessibility” (i.e., a site with guarded chain link fences or terrain that requires special skills and equipment to access). This factor differs from the Potential Contact Hours factor (see below) and does not include or account for LUCs that might restrict site access. The effects of LUCs are assessed in the FS alternatives assessment.

Potential Contact Hours: This factor accounts for the amount of time receptors spend within the MRS or assessment area during which they might come into contact with MEC and intentionally or unintentionally cause a detonation. Both the number of receptors and the amount of time each receptor spends in the MRS/assessment area are used to calculate the total “receptor-hours/year”. This total is calculated for all activities that might result in potential MEC interaction and there are four possible categories:

- Many hours, ≥ 1,000,000 receptor-hours/year.
- Some hours, 100,000 to 999,999 hours/year.
- Few hours, 10,000 to 99,999 hours/year.
- Very few hours, < 10,000 receptor-hours/year.

Amount of MEC: This input factor describes the relative quantity of MEC anticipated to remain within the MRS or assessment area as a result of past munitions-related activities. For example, a greater quantity of MEC would be expected to be present in a former target area than at a former firing point. The nine possible categories for this factor, from the largest to the least anticipated amount of MEC, include “target area”, “Open Burn/Open Detonation (OB/OD) area,” “function test range”, “burial pit”, “maneuver areas”, “firing point,” safety buffer areas, “storage”, and “explosives-related industrial facility.”

Minimum MEC Depth Relative to the Maximum Receptor Intrusive Depth: This factor indicates whether the MEC in the MRS or assessment area are located at depths that might be reached by the anticipated human receptor activities. For the baseline MEC HA, the four possible categories concern whether or not MEC are located at the surface and in the subsurface within the MRS or assessment area, or whether MEC are present in the subsurface only, and whether or not the receptor intrusive depth overlaps with this MEC location.

Migration Potential: The migration potential factor addresses the likelihood that MEC in the MRS or assessment area might migrate by natural processes (e.g., erosion or frost heave) thereby increasing the chance of subsequent exposure to potential human receptors. The two possible categories for this factor are “possible” and “unlikely”.

MEC Classification: This factor accounts for how easily a human receptor might cause a detonation of the MEC and relates directly to the MEC sensitivity. The six possible categories for this factor, ranging from the highest to lowest sensitivity (and explosive hazard) are:

- Sensitive UXO
- Other UXO
- Fuzed sensitive DMM
- Fuzed DMM
- Unfuzed DMM
- Bulk explosives

The selection of category for each MRS or assessment area is made using the MEC with the highest potential sensitivity known or suspected to be present and, where uncertainty exists; conservative assumptions are made and documented. For example, UXO is always assumed to be present within a known target area, whether or not the investigation uncovers UXO at the site.

MEC Size: This factor indicates how easy it is for a typical human receptor to move the MEC item(s) present within the MRS or assessment area. For example, an individual is considerably more likely to pick up or accidentally kick a hand grenade than a 200-lb bomb. The basic assumption used in this category is that MEC weighing 90-lbs or more is unlikely to be moved without the use of special equipment. Based on this assumption, the two possible categories for this factor are “small” (i.e., items weighing less than 90-lbs.) and “large” (items weighing 90-lbs or more). The selection of category for each MRS or assessment area is based on the MEC known or suspected to be present with the highest potential to be moved (i.e., the smallest item).

Each category for each of the MEC HA input factors has an assigned score that relates to the relative contributions of the different input factors to the overall MEC hazard. These scores were developed by the Technical Working Group for HA. These factors and their associated scores for the baseline condition are provided in (**Table 7-1**) while the detailed technical basis for the scores assigned is provided in the MEC HA interim guidance document (USEPA, 2008c). Scores for the categories are in multiples of five, with a total maximum possible score for all factors of 1,000 and a minimum possible score of 125. As previously noted, these MEC HA scores are *qualitative references only* and should not be interpreted as quantitative measures of explosive hazard. A summary of the maximum possible scores and their related weights with regard to the overall MEC HA score are shown in **Table 7-2**.

Table 7-1 Summary of MEC HA Input Factors and Associated Baseline Scores

Input Factor	Input Factor Category	Score after Subsurface Cleanup
Energetic Material Type	HE and low explosive fillers in fragmenting rounds	100
	White Phosphorus	70
	Pyrotechnic	60
	Propellant	50
	Spotting Charge	40
	Incendiary	30
Location of Additional Human Receptors	Inside the MRS or inside the ESQD arc surrounding the MRS	30
	Outside the ESQD arc	0
Site Accessibility	Full accessibility	80
	Moderate accessibility	55
	Limited accessibility	15
	Very limited accessibility	5
Potential Contact Hours	Many hours	30
	Some hours	20
	Few hours	10
	Very few hours	5
Amount of MEC	Target Area	30
	OB/OD area	30
	Function test range	25
	Burial Pit	10
	Maneuver Areas	5
	Firing Points	5
	Safety Buffer Areas	5
	Storage	5
	Explosive-related industrial facility	5
Minimum MEC Depth vs. Maximum Intrusive Depth	**Baseline Condition**: MEC located on surface and in subsurface; **After Cleanup**: intrusive depth overlaps with minimum MEC depth	95
	Baseline Condition: MEC located on surface and in subsurface; **After Cleanup**: intrusive depth *does not* overlap with minimum MEC depth	25
	Baseline Condition: MEC located only in subsurface; **Baseline Condition or After Cleanup**: intrusive depth overlaps with minimum MEC depth	95
	Baseline Condition: MEC located only in subsurface; **Baseline Condition or After Cleanup**: intrusive depth *does not* overlap with minimum MEC depth	25
Migration Potential	Possible	10
	Unlikely	10
MEC Classification	Sensitive UXO	
	UXO	
	Fuzed sensitive DMM	
	Fuzed DMM	
	Unfuzed DMM	
	Bulk explosives	
MEC Size	Small	40
	Large	0

Notes:
DMM – Discarded Military Munitions
ESQD – Explosive Safety Quantity-Distance
MEC – Munitions and Explosives of Concern
OB/OD – Open Burn/Open Detonation
UXO – Unexploded Ordnance

Table 7-2 Summary of MEC HA Maximum Scores and Weights

Explosive Hazard Component	Input Factor	Maximum Scores	Weights
Severity	Energetic Material Type	100	10%
	Location of Additional Human Receptors	30	3%
	Component Total	**130**	**13%**
Accessibility	Site Accessibility	80	8%
	Total Contact Hours	120	12%
	Amount of MEC	180	18%
	Minimum MEC Depth vs. Maximum Intrusive Depth	240	24%
	Migration Potential	30	3%
	Component Total	650	65%
Sensitivity	MEC Classification	180	18%
	MEC Size	40	4%
	Component Total	220	22%
	Maximum Total Score	**1,000**	**100%**

Notes:
MEC – Munitions and Explosives of Concern

7.3.2 MEC Hazard Assessment Input Data Summary

This MEC HA was conducted to evaluate the hazards at the three assessment areas (corresponding to the recommended MRSs) within the PACR (**Figure 7-1**). The delineation of the resulting MRSs was based on the types and quantities of MEC and MD found, and site conditions that suggest there were similar uses for the areas. These assessment areas follow the recommended MRSs described in **Section 8.5.1** as follows:

1. **MRS Range Complex No. 1** – This area represents the 105.7 acres where the five MEC items and 147 MD items were found. This MRS encompasses an area historically associated with a target range. There is one residence in this MRS. This MRS is recommended for further evaluation in the MEC-HA.
2. **MRS Range Complex No. 1 (a)** – This area of 1,286.5 acres represents a large portion (49%) of the original main range complex. No MEC or MD were found in this MRS. This MRS encompasses an area historically associated with a target range but includes buffer range as well. Based on the RI results this MRS is no longer believed associated with a target range. There are four residences in this MRS. This MRS is not considered for further evaluation in the MEC HA.
3. **MRS Range Complex No. 1 (b)** – This large area of 1,238.5 acres represents the buffer and impact/buffer zones within ONP where no ROE was obtained. Consequently, this MRS was not investigated during the RI. There are no humans residing within the ONP portion of the MRS. This MRS is not considered for further evaluation in the MEC HA.

The qualitative evaluation of explosive hazards was conducted by reviewing the input factors and developing specific inputs for each assessment area based on the RI findings, historical land use information, and available information about recreational and other users. The MEC HA evaluated the explosive hazards associated with the baseline, or current conditions, and hazards remaining

after implementing possible remedial action alternatives to support evaluation of alternatives in the FS.

The baseline and post-remedial action conditions assume no change in access or use patterns. The area will continue to be used primarily for commercial forest management, watershed management, and limited recreation (typically hunting). Most of the PACR is privately owned and limited portions are used for recreation. There are currently no known plans to change access or limit land use for private property owners at the Range Complex No. 1 MRS where the MEC items were recovered.

The following paragraphs describe the input factors for each assessment area. The assessment areas used for the MEC HA are the recommended MRSs as shown in **Figure 8-1** which shows the locations of each MRS

7.3.2.1 ENERGETIC MATERIAL TYPE

The MEC items known or suspected to be present at each assessment area are based on the MEC and MD found within each area during the RI and previous clearance activities. MEC items found during the RI were destroyed following proper disposal practices; however, the MEC/MD found within each area are assumed to represent the types of munitions that may still be present, and were used to assess the hazards currently present and following implementation of the remedial action alternatives.

During the development of the RI Work Plan (HDR, 2013), the ESP included two possible MEC items, neither of which were actually recovered during the fieldwork. One of these items, an 81mm M45 mortar, was used to represent the most hazardous and sensitive item potentially present in the PACR per MEC HA guidance (USEPA, 2008). This selection was based on the horizontal fragmentation distance (HFD) of 242 feet for this item. The 75mm MK 1 projectile was also included in the MEC HA as potentially present at the PACR.

7.3.2.2 LOCATION OF ADDITIONAL HUMAN RECEPTORS

Additional human receptors potentially exposed to munitions present within each assessment area were evaluated based on the MEC and MD items found in each area. Net Explosive Weights, EQSD arcs (also referred to as HFDs), and total weights for all munitions are shown in **Table 7-3**.

Table 7-3 Net Explosive Weights, Hazardous Fragment Distances, and Total Weights for Munitions Found During the Port Angeles Combat Range Munitions Response Site Remedial Investigation

Munition	Nomenclature	Net Explosive Weight (lbs)	Explosive Type	Hazardous Fragmentation Distance (ft.)	Total Munition Weight, (lb.)
Mortar, 81mm	M45	4.48	TNT	242	8.40
Projectile, 75mm	MK1	1.64	TNT	239	11.20
Mortar, 81mm	M57	0.04	Tetryl and White Phosphorus	34	2.94
Mortar, 81mm	M43	1.23	TNT	209	5.45
Projectile, 37mm	M63	0.09	TNT	118	1.01

Notes:
mm – millimeter
TNT - Trinitrotoluene

Source: Department of Defense Explosives Safety Board (DDESB), April 2013.

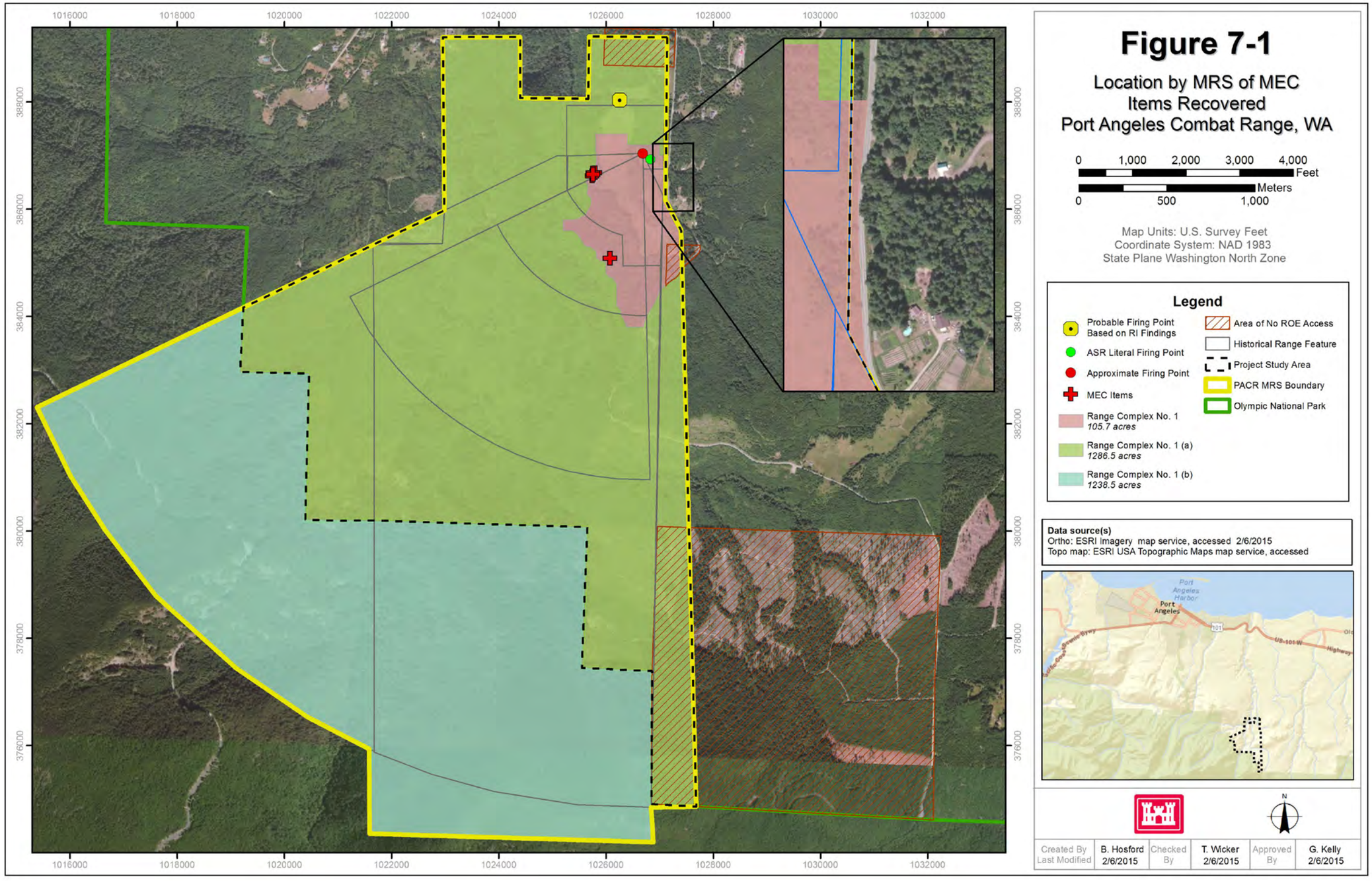

Figure 7-1

Location by MRS of MEC Items Recovered Port Angeles Combat Range, WA

0 1,000 2,000 3,000 4,000 Feet

0 500 1,000 Meters

Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- Probable Firing Point Based on RI Findings
- ASR Literal Firing Point
- Approximate Firing Point
- MEC Items
- Range Complex No. 1 *105.7 acres*
- Range Complex No. 1 (a) *1286.5 acres*
- Range Complex No. 1 (b) *1238.5 acres*
- Area of No ROE Access
- Historical Range Feature
- Project Study Area
- PACR MRS Boundary
- Olympic National Park

Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed

N

Created By Last Modified	B. Hosford 2/6/2015	Checked By	T. Wicker 2/6/2015	Approved By	G. Kelly 2/6/2015

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7.3.2.3 RANGE COMPLEX NO. 1 MRS

The portion of the MRS impacted by MEC (4% of the site) will retain the Range Complex No. 1 designation. The MRS includes areas that were confirmed to be impact (target) areas based on the distribution of MEC/MD.

All five of the MEC items (i.e., M63 37mm HE projectiles) were found in this MRS. The most conservative HFD of 242 feet for an M45 81mm mortar was assumed to represent the EQSD arc for the Range Complex No. 1 MRS.

MD recovered as identifiable include:

- Thirteen M51 37mm AP projectiles
- One M48 75mm projectile, point detonating fuze (expended)
- One M44 81mm practice mortar
- Three M43A1 81mm HE mortar pieces
- Three M57 81mm WP mortar bodies
- Four 81mm mortar tail fin pieces
- One 81mm motor tail fin
- One 75mm practice projectile and one half of a 75mm projectile (empty)

The western boundary of the MRS is defined by the top of a steep unsurveyable ridgeline. The MRS boundary for this area was extended beyond the project boundary in the northeast (grids S-02 through S-06) so that future investigation, if any, occurs up to the existing Deer Park Road (to the east). This expansion increased the total project acreage to 2630.7 acres.

This Range Complex No. 1 MRS is 105.7 acres of which 3.4 acres were documented as unsurveyable due to dense vegetation and steep slopes. This unsurveyable acreage is unlikely to be included in any remedial action. An additional 3.9 acres of this MRS were not surveyed because the USACE did not receive an ROE for parcel 47501 (**Figure 2-3**).

7.3.2.4 SITE ACCESSIBILITY

Existing and dilapidated fences and signs may warn visitors of the historical use of munitions. Access to all three of the MRSs in general is limited primarily by steep terrain and dense vegetation. In particular, MRS site accessibility was categorized as moderate for MRS Range Complex No. 1 based on the limited number of roads, access points, and private property.

7.3.2.5 POTENTIAL CONTACT HOURS

Potential contact hours were estimated for the assessment areas based on limited information therefore, the estimates are uncertain. The area is sparsely populated. In addition, recreational use is primarily for hunting. There are many other locations within the ONP for recreational use; therefore, contact hours with potential MEC would likely be low in all cases. Information gathered during the RI fieldwork was limited to occasional observations and some conversations with local residents. Other information regarding use of the area came from the SI (Shaw, 2009) and the ASR (USACE, 1996).

Estimation of contact hours was obtained by assessing the general land use and the presence of residents on or near each MRS.

MRS Range Complex No. 1 – due to the small size of this area in relation to the range complex as a whole, and the presence of only one residence located at the southern end of the MRS, recreational use was assumed very limited. Vegetable gardening likely occurs only at the primary residence; no gardens were observed by the field teams but they may be present. Target shooting and hunting might occur, but due to the small size of the MRS and proximity to Deer Park Road, such activities are likely minimal (**Appendix L**).

Although limited, contact hours were estimated for recreational users during the height of the summer season, typically June through August (six hours/day, one weekend/month [two days], for three months/year). Hunters and trespassers could hike into the heavily forested areas off established roads and trails. Hunting may or may not be allowed on the City of Port Angeles land; however, the field teams noted the presence of field dressed and processed (i.e. gutted and meat harvested) deer carcasses from hunting activities during the fall hunting season. No hikers or campers were observed during the RI fieldwork. Specific documentation regarding the number of hunters that may use the area is unavailable due to the private land use. Contact hours were estimated assuming that hunters would be likely to spend up to six hours per day during the fall deer hunting season (assuming every weekend [two days] for a total of four months/year). All activities were assumed to occur in daylight only. The field team observed vehicles parked by the roadside and surmised that the hunters were driving in from nearby Port Angeles. Limited fishing and gardening were also assumed to occur since there are streams and a residence in the MRS (for details, refer to **Appendix L**).

Contact hours for the commercial forest management worker were estimated using an 8-hour workday for 30 days per year (**Appendix L**). Typical work activities might include tree clearance, road maintenance, and land clearing. Workers could perform intrusive activities for various maintenance and construction projects, and a maximum intrusive depth of five feet bgs was estimated to account for these types of activities.

7.3.2.6 AMOUNT OF MEC

The Range Complex No. 1 MRS was used for WWII combat training, and there was documentation of specific uses or locations of exercises. Based on descriptions of the training in the ASR (USACE, 1996)and the SI report (Shaw, 2009), firing points and targets were selected for individual exercises and records of the specific exercise locations were not kept. The sparse distribution of MEC/MD found throughout most of the area during the extensive AVS performed in 2013, with higher concentrations found within the Range Complex No. 1 MRS is consistent with this type of use as a target area.

7.3.2.7 MINIMUM MEC DEPTH RELATIVE TO THE MAXIMUM RECEPTOR INTRUSIVE DEPTH

All five MEC items were recovered from the surface soil interval (0.5-foot bgs). Leaf litter and some soil obscured visibility. Minimal effort was needed to recover each item.

The maximum intrusive depth assumed for site users was 0.5-foot bgs for recreational users and up to 5 feet bgs for forest and construction workers. Based on this information, the minimum MEC depth relative to the maximum receptor intrusive depth overlaps. This applies to both the current and future scenarios in all assessment areas.

7.3.2.8 MIGRATION POTENTIAL

Migration of surface or subsurface items is possible due to erosion, frost heave, or mudslide considering the elevation and some steep slopes present in the assessment areas. Frost heave could possibly expose buried MEC. This factor applies to all assessment areas for both current conditions and all post-remedial action scenarios.

7.3.2.9 MEC CLASSIFICATION

As noted in the energetic materials description, MEC items known or suspected to be present in Range Complex No.1 included 37mm artillery, 75mm artillery, 60mm mortars, and 81mm mortars.

7.3.2.10 MEC SIZE

The largest MEC and MD items suspected in the Range Complex No. 1 MRS, included 75mm artillery and 81mm mortars. None of these weighs more than 15 lbs (**Table 7-3**); thus, these MEC were classified as small items (less than 90 lbs).

7.3.3 Overview of MEC Hazard Assessment Output Factors

Once the categories and scores for all input factors are defined for each MRS or assessment area at the site, the related scores for each category are totaled to calculate an overall MEC HA score for each MRS/assessment area. The total maximum possible MEC HA score for an MRS/assessment area ranges from 125 - 1,000. The MEC HA method identifies the associated hazard levels for these scores, which can range from one to four. A Hazard Level of one indicates the highest potential explosive hazard conditions and a hazard level of four indicates low potential explosive hazard conditions. The basis for these hazard levels is detailed in the MEC HA interim guidance document (USEPA, 2008c). As previously noted, the total MEC HA scores and associated hazard levels are qualitative references only and should not be interpreted as quantitative measures of explosive hazard, or as the sole basis for determining whether or not further action is necessary at a site. A summary of the hazard levels and their related MEC HA scores are presented in **Table 7-4**.

Table 7-4 Hazard Level Scoring Ranks

Hazard Level	Maximum MEC HA Score	Minimum MEC HA Score	Associated Relative Explosive Hazard
1	1,000	840	Highest potential explosive hazard conditions
2	835	725	High potential explosive hazard conditions
3	720	530	Moderate potential explosive hazard conditions
4	525	125	Low potential explosive hazard conditions

7.3.4 MEC Hazard Assessment Outputs and Scorings

Hazard level determinations and scoring based on MEC HA remedial alternatives are presented for the one MRS in **Table 7-5** and **Table 7-6**. Scoring Summary “b”, Summary Scoring for Future Use, is not applicable, and is therefore not shown in the tables below.

Table 7-5 Port Angeles Range Complex No. 1 MRS MEC HA Hazard Level Determination

Alternative Description	Hazard Level Category	Score
Port Angeles Combat Range Complex No. 1 MRS		
a. Current Use Activities	2	780
b. Response Alternative 1: Institutional Controls	2	780
c. Response Alternative 2: Surface Removal	3	565
d. Response Alternative 3: Subsurface Removal	3	545
e. Response Alternative 4: Tree	3	545

Table 7-6 Range Complex No. 1 MRS: Alternatives 1, 2, 3, and 4, MEC HA Scores

Scoring Summary			
Port Angeles Combat Range - Range Complex No. 1 MRS			
Site ID:	**Port Angeles Combat Range FUDS Property No. F10WA00330**	**a. *Scoring Summary for Current Use Activities***	
Date:	**2/6/2015**	**Response Action Cleanup:**	**No Response Action**
Input Factor		**Input Factor Category**	**Score**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	15
V. Amount of MEC		Target Area	180
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	**780**
		Hazard Level Category	**2**

Site ID:	**Port Angeles Combat Range FUDS Property No. F10WA00330**	***b. Scoring Summary for Response Alternative 1: Institutional Controls***	
Date:	**2/6/2015**	**Response Action Cleanup:**	**No MEC cleanup**
Input Factor		**Input Factor Category**	**Score**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	15
V. Amount of MEC		Target Area	180
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	**780**
		Hazard Level Category	**2**

Table 7-6 Range Complex No. 1 MRS: Alternatives 1, 2, 3, and 4, MEC HA Scores (Continued)

Site ID:	**Port Angeles Combat Range FUDS Property No. F10WA00330**	***c. Scoring Summary for Response Alternative 2: Surface Removal***	
Date:	**2/6/2015**	**Response Action Cleanup:**	**cleanup of MECs located on the surface only**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	10
V. Amount of MEC		Target Area	120
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	N/A
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	**565**
		Hazard Level Category	**3**

Site ID:	**Port Angeles Combat Range FUDS Property No. F10WA00330**	**d. Scoring Summary for Response Alternative 3: Subsurface Removal**	
Date:	**2/6/2015**	**Response Action Cleanup:**	**cleanup of MECs located both on the surface and subsurface**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	5
V. Amount of MEC		Target Area	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	95
VII. Migration Potential		Possible	10
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	**545**
		Hazard Level Category	**3**

Table 7-6 Range Complex No. 1 MRS: Alternatives 1, 2, 3, and 4, MEC HA Scores (Continued)

Site ID:	**Port Angeles Combat Range FUDS Property No. F10WA00330**	**e. Scoring Summary for Response Alternative 4: Tree Survey and Removal**	
Date:	**2/6/2015**	**Response Action Cleanup:**	**cleanup of MECs located both on the surface and subsurface**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	5
V. Amount of MEC		Target Area	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	95
VII. Migration Potential		Possible	10
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	**545**
		Hazard Level Category	**3**

7.4 Munitions Response Site Prioritization Protocol Update

This section discusses the updated Munitions Response Site Prioritization Protocol (MRSPP) for the PACR and the associated MRSs as a result of this RI.

The DoD proposed the MRSPP (32 Code of Federal Regulations [CFR] Part 179) (DoD, 2009) to assign a relative risk priority to each defense site in the MMRP Inventory for response activities. These response activities are based on the overall conditions at each MRS and consider various factors related to explosive safety and environmental hazards (68 FR 50900) (DoD, 2003). The application of the MRSPP applies to all locations:

- That are or were owned, leased to, or otherwise possessed or used by the DoD.
- Those that are known to or are suspected of containing MEC or MC.
- That are included in the MMRP Inventory.

In assigning a relative priority for response activities, the DoD generally considers MRSs posing the greatest hazard as being the highest priority. The MRSPP priority will be one factor in determining the sequence in which munitions response actions are funded.

The Range Complex No. 1 parent parcel MRS (i.e. the 2.629.8 acre MRS from the SI) was initially scored based on the worst-case of the components of the MRA at the conclusion of the SI. The Range Complex No. 1 parent parcel MRS scored a priority rating of 3 at the conclusion of the SI (Shaw, 2009) based on the Explosive Hazard Evaluation (EHE) and the Human Health Evaluation (HHE). No Chemical Warfare Materiel was identified. Human Health Hazards were identified (Shaw, 2009).

The RI informally splits the Range Complex No. 1 parent parcel MRS (i.e. the 2.629.8 acre MRS from the SI) into three separate MRSs. The three MRSs are shown in **Figure 8-1**.

The Range Complex No. 1 parent parcel MRS (i.e. the 2.629.8 acre MRS from the SI) is recommended to be expanded by 0.9 acres, to a total of 2,630.7 acres, and to be split into three MRSs as follows:

- **Range Complex No. 1** - This MRS includes the areas where DGM and subsurface investigations were performed. There is evidence of sub-surface MEC and MD that pose unacceptable human health risks. The original project MRS boundary is recommended to be expanded by 0.9 acres to the east to align the MRS boundary with Deer Park Road. This MRS has been assigned a score of **Priority 3,** based upon the EHE.
- **Range Complex No.1 (a)** – This MRS includes the remaining acreage of the investigation area included as part of this RI (i.e. the areas that were investigated but did not contain any evidence of MEC). There was no evidence of military activity, MD, MEC or MC contamination. It is unlikely that MEC or MD are present within this MRS based upon the firing point and range analysis discussed in **Section 5.2.1.4.3**. This MRS has been assigned an alternative rating of **No Known or Suspected Hazard**.
- **Range Complex No. 1 (b)** – This MRS includes all acreage that falls within the ONP. The MRS was not investigated because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist. It is unlikely that MEC or MD are present within this MRS based upon the firing point and range analysis discussed in **Section 5.2.1.4.3**. This MRS has been assigned an alternative rating of **No Known or Suspected Hazard**.

Based on the results of the RI, the MRSPP has been updated to include scoring for the recommended MRSs (refer to **Section 8.5.1**). The MRSPP worksheets are provided in **Appendix M**.

7.4.1 Explosive Hazard Evaluation Module

The EHE module assesses the presence of known or suspected explosive hazards. The EHE module is composed of three factors, each of which has two to four data elements that are intended to assess the specific conditions at an MRS. Based on site-specific information, each data element is assigned a numeric score. The sum of these values is the EHE module score that is used to determine the corresponding EHE module rating. These factors are as follows:

- **Explosive Hazard**: which has the data elements Munitions Type and Source of Hazard
- **Accessibility**: which has the data elements Location of Munitions, Ease of Access, and Status of Property
- **Receptors**: which has the data elements Population Density, Population Near Hazard, Types of Activities/Structures, and Ecological and/or Cultural Resources

The EHE module worksheet tables are presented in **Appendix M** and summarized in **Table 7-7**, below.

Table 7-7 Summary of EHE Data Element Score

Factors	Range Complex No. 1	Range Complex No. 1 (a)	Range Complex No. 1 (b)
Explosive Hazard Factor	35	-	-
Accessibility Factor	33	-	-
Receptor Factor	16	-	-
EHE Combination Level	84	-	-
TOTAL EHE MODULE RATING	**B**	**NH**	**NH**

Notes:
EHE = Explosive Hazard Evaluation NH = No known or Suspected Explosive Hazard - = No data available
B = a score of 82-91 on a scale of 0-100 where 100 indicates the highest explosive hazard

7.4.2 Chemical Warfare Materiel Hazard Evaluation Module

The Chemical Warfare Materiel Hazard Evaluation (CHE) module provides an evaluation of the chemical hazards associated with the physiological effects of CWM. The CHE module is used only when CWM in the form of MEC or MC are known or suspected of being present at an MRA or MRS. Like the EHE module, the CHE module has three factors, each of which has two to four data elements that are intended to assess the conditions at an MRA or MRS. These factors are as follows:

- **CWM Hazard Factor**: has the data elements CWM Configuration and Sources of CWM and constitutes 40 percent of the CHE score.
- **Accessibility Factor**: focuses on the potential for receptors to encounter CWM known or suspected to be present at an MRA or MRS. This factor consists of three data elements, Location of CWM, Ease of Access, and Status of Property and constitutes 40 percent of the CHE score.
- **Receptor Factor**: focuses on the human and ecological populations that may be impacted by the presence of CWM. It has the data elements Population Density, Population near Hazard, Types of Activities/Structures, and Ecological and/or Cultural Resources.

Similar to the EHE module, each data element is assigned a numeric value, and the sum of these values is the CHE module score used to determine the corresponding CHE module rating. If CWM is not known or suspected, the CHE module rating is “No Known or Suspected CWM Hazard”.

The worksheet tables are presented in **Appendix M** and summarized in **Table 7-8**. There was no evidence of CWM at any of the MRSs.

Table 7-8 Summary of the CHE Data Element Score

Factors	Range Complex No. 1	Range Complex No. 1 (a)	Range Complex No. 1 (b)
CWM Hazard Factor	0	0	0
Accessibility Factor	0	0	0
Receptor Factor	0	0	0
CHE COMBINATION LEVEL	0	0	0
TOTAL CHE MODULE RATING	**NH**	**NH**	**NH**

Notes:
CWM = Chemical Warfare Materiel CHE = Chemical Warfare Materiel Hazard Evaluation
- = no data available NH= No Known or Suspected CWM Hazard

7.4.3 Health Hazard Evaluation Module

The HHE module provides a consistent DoD-wide approach for evaluating the relative risk to human health and the environment posed by contaminants (i.e., MC) present at an MRS. The module has three factors that are as follows:

- **Contamination Hazard Factor (CHF)**: evaluates potential risk posed by contaminants and contributes a level of High (H), Medium (M), or Low (L) based on Significant, Moderate, or Minimal contaminants present, respectively.
- **Migration Pathway Factor (MPF)**: assesses the potential for MC or incidental contaminants to migrate from an MRA or MRS and contributes a level of H, M, or L based on Evident, Potential, or Confined pathways, respectively.
- **Receptor Factor (RF)**: evaluates the presence of receptors that may be exposed and contributes a level of H, M, or L based on Identified, Potential, or Limited receptors, respectively.

The HHE builds on the DoD Relative Risk Site Evaluation (RRSE) framework that is used in the Installation Restoration Program (IRP). The CHF, RF, and MPF are based on a quantitative evaluation of MC and/or CERCLA hazardous substances, and a qualitative evaluation of pathways and human and ecological receptors in surface soil, groundwater, surface water, and sediment. The HHE does not address subsurface soil. In addition, the HHE does not consider air as a pathway because the risk through this medium from DoD MMRP sites with soil contamination is generally minimal.

The H, M, and L levels for the CHF, RF, and MPF are combined in a matrix to obtain composite three-letter combination levels that integrate considerations of all three factors. The three-letter combination levels are organized by frequency, and the combination of frequencies results in the HHE module rating.

The worksheet tables are presented in **Appendix M** and summarized in **Table 7-9**.

Table 7-9 Summary of the HHE Surface Soil Data Element Score

Factors	Range Complex No. 1	Range Complex No. 1 (a)	Range Complex No. 1 (b)
Contaminant Hazard Factor	-	-	-
Migration Pathway Factor	-	-	-
Receptor Factor	-	-	-
HHE Combination Level	-	-	-
TOTAL HHE MODULE RATING	**Evaluation Pending**	**NH**	**NH**

Notes:
HHE = Human Health Evaluation *- = no data available* *NH = No Known or Suspected MC Hazard*
.

7.4.4 Munitions Response Site Prioritization Protocol Score

In accordance with the DoD MRSPP Primer (DoD, 2007), each MRA and MRS is assigned an MRSPP Priority ranging from one to eight (**Table 7-10**). Priority 1 indicates the highest potential hazard and Priority 8 indicates the lowest potential hazard. Only a site with a chemical warfare hazard can receive an MRS Priority of one. The MRSPP Priority is determined by selecting the highest rating from among the EHE, CHE, and HHE modules. For example, if the EHE rating is two, the CHE rating is five, and the HHE rating is four, the MRSPP Priority assigned would be two. The

MRSPP Priority will be used to determine the future funding sequence of MRSs for further munitions response actions.

Table 7-10 Priority Ratings for the Port Angeles Combat Range Munitions Response Sites

Factors	Range Complex No. 1	Range Complex No. 1 (a)	Range Complex No. 1 (b)
EHE Module Rating	B	NH	NH
CHE Module Rating	NH	NH	NH
HHE Module Rating	Evaluation Pending	NH	NH
Priority	**3**	**NH**	**NH**

Notes:
CHE = Chemical Warfare Materiel Hazard Evaluation
EHE = Explosive Hazard Evaluation
HHE = Human Health Evaluation
NH = No Known or Suspected Hazard

8.0 Summary of Results

This summary describes the PACR RI and provides a review of the nature and extent of contamination delineated during the RI, a review of contaminant fate and transport, and a review of the risk assessment and qualitative MEC HA performed. It also presents conclusions derived from the results of the PACR RI.

The RI field activities at the PACR were conducted from mid-October to mid-December 2013. Field activities included AVS, in-situ XRF screening for MC (lead) in soil, geophysical surveys, and subsurface investigations. The results of the investigation are summarized in the following discussion. MEC and MD were identified during the RI. The high density of coverage during the AVS and geophysical surveys, and results of subsurface investigations have met the objectives of the RI to characterize the nature and extent of areas impacted by munitions related activities. The results provide sufficient information to make recommendations for further action, including recommending a large portion of the MRS for NDAI.

8.1 Nature and Extent of Contamination

The nature and extent of areas impacted by munitions related activities was defined based on the results of AVS, geophysical surveys, and subsurface investigations using mag and dig technology. Assisted visual surveys were performed during the RI. During the AVS, field teams surveyed virtually all of the accessible acreage in the MRS, walking a total of 112.1 miles of transects. The AVS team conducted real-time intrusive investigations on subsurface anomalies in areas where the use of DGM was not practical. DGM was not practical in areas with limited access, heavy vegetation, and steep topography. As shown in **Figure 5-1** through **Figure 5-3**, the surveys provided a high density of coverage in all accessible areas of the PACR. Due to cliffs or steep slopes, the presence of extensive areas of streams and/or dense vegetation, 567.8 acres of the PACR were unsurveyable and inaccessible. The USACE did not receive ROE for three parcels that overlapped the eastern PACR project boundary; consequently 105.9 acres were not surveyed. During the AVS, no features related to military activity were observed. Non-military site features encountered during the AVS included logging industry debris and civilian trash such as metal debris, metal cables, barbed wire, and old automobile wheel hubs.

During the subsequent subsurface investigations, 147 MD features were recorded in the Range Complex No. 1 MRS. Identifiable MD included; 13 M51 37mm AP projectiles, one M48 75mm projectile point detonating fuze (expended), one M44 81mm practice mortar, three M43A1 81mm HE mortar pieces, three M57 81mm WP mortar bodies, four 81mm mortar tail fin pieces, one 81mm motor tail fin, one 75mm practice projectile, and one half of a 75mm projectile (empty).

Twenty-five small arms debris features (20 unfired .50 caliber projectiles and five links) were recorded in the Range Complex No. 1 MRS. Due to the presence of the .50 caliber links and the lack of rifling striations it is believed the small arms were likely unfired and deposited in the area, as there are no indications of a separate small arms impact area.

Five MEC items were found during the RI field investigation within the Range Complex. No. 1 MRS. Four M63 37mm projectiles were discovered in grid K-03. In addition, eight pieces of HE frag, and

two .50 caliber projectiles were found within grid K-03. One M63 37mm projectile was found within grid M-11.

No environmental sampling for MC analysis was performed during the RI because the conditions that would have warranted the collection of samples for laboratory analysis as described in **Section 4.2.1** were not observed during the field investigation. Environmental sampling for MC analysis was performed during the SI. There were no COPCs/COPECs associated with the HHRA and ecological screening of the soil, sediment, surface water, and groundwater data.

In-situ XRF screening for lead in soil was conducted during the RI in two locations where natural features (e.g., natural berm feature) were found, and in one location where small arms debris was found. Sixty-eight in-situ XRF screening locations were sampled in two natural features. Forty-five in-situ XRF screening locations were also sampled where small arms debris was found. A total of 113 in-situ XRF screening samples were collected from the three locations. All in-situ XRF screening sample results for lead were below the conservative screening level of 125 mg/kg (**Appendix J**). Thus, no soil samples were collected for laboratory analysis.

No MEC, MD, or small arms debris were found in areas of standing or flowing water. Therefore, no surface water or sediment samples were collected during the RI. No MEC, MD or small arms debris were found in saturated areas. Therefore, no groundwater sampling was conducted during the RI.

The nature and extent of the Port Angeles Combat Range is defined by the Range Complex No. 1 MRS boundary.

There was no evidence of MEC, MD, or MC contamination within Range Complex No. 1 (a). It is unlikely that MEC or MD are present within this MRS based upon the firing point and range analysis discussed in **Section 5.2.1.4.3**.

Range Complex No. 1 (b) is comprised of property within the ONP that was not investigated because a programmatic agreement to conduct investigations and remedial actions between the NPS and the DoD does not exist. It is unlikely that MEC or MD are present within this MRS based upon the firing point and range analysis discussed in **Section 5.2.1.4.3**.

8.2 Fate and Transport

There is the potential for human receptors to access MEC at the Range Complex No. 1 MRS in surface and subsurface soil. Five MEC items were found during the RI field activities; consequently, the surface soil exposure pathways for access and exposure to MEC are complete for all human receptors. Based on the recovery of the obscured MEC items in surface soil (i.e., the M63 37mm HE projectiles), subsurface soil exposure pathways to MEC are potentially complete. MD are present in many areas which suggests that other MEC may be present but not visible.

In general, the potential for transport of MEC from one location to another is based on the amount of precipitation, stabilization in soil, the steepness of the slope, and weight of the item. In areas that have steep, open slopes, MEC could be transported via frost heave and erosion or possibly by mudslides depending on the slope and cover. There are surface water features in the Range Complex No. 1 MRS; therefore, MEC transport from initial source locations to surface water or sediment and other areas within this MRS is possible although unlikely. Over time, soils, rocks, and

organic debris tend to accumulate around stationary items thereby inhibiting movement. Due to the lack of ROE, Range Complex No. 1 (b) was not investigated during the RI.

The MEC items discovered during the RI did not represent potential sources of MC. However, only 10% of each grid was investigated during the RI; therefore, there is still potential for MEC and MC at Range Complex No. 1.

MEC can potentially represent a source of MC, specifically explosive residues in the form of nitroaromatics and nitramines. Migration of explosive residues can occur primarily from precipitation and fugitive dust. It is more likely that snowmelt and rainfall rather than fugitive dust would mobilize explosive residues from their initial source location. Windblown dust represents a potential migration pathway but a minor one relative to transport by moisture. MC can be found in subsurface soils upon initial deposition. However, many energetics are more likely to bind to humic materials where present, thereby limiting further leaching.

MC released from MEC could be transported by surface water runoff to other areas down gradient from the source. MC could migrate to groundwater only in areas where depth to groundwater is shallow or where a hydrogeological connection exists between groundwater and surface water. However, because seeps and springs were not observed within the Range Complex No. 1 MRS migration of MC to groundwater and surface water is likely negligible. Exposure to MEC and/or MC via frost heave and erosion is possible especially in steep ravines.

Heavy rainfall and snowmelt could mobilize MC residues from their initial source location. Windblown fugitive dust represents a potential migration pathway. MC can also be found in subsurface soils upon initial deposition or through vertical and horizontal migration.

MC can also migrate through uptake via the food chain. Mobile receptors can carry contaminants from source locations to other areas based on their home ranges and foraging areas.

There is the potential for human and ecological receptors including wildlife, and other biota to access MC in surface and subsurface soil in the Range Complex No. 1 MRS where MEC and MD was recovered. MC in surface soil results in potential for uptake by vegetation; thus, the food chain pathway is considered potentially complete though likely insignificant for human receptors, wildlife and other biota. Potentially complete food chain exposures are present for terrestrial and aquatic-dependent animals; the food chain pathway is complete though likely insignificant for terrestrial soil invertebrates.

8.3 Human Health and Ecological Risk Assessment

8.3.1 Baseline Human Health Risk Assessment

A baseline HHRA was not conducted for the MRSs due to the absence of environmental sampling data from the RI.

8.3.2 Baseline Ecological Risk Assessment

A BERA were conducted for the MRSs due to the absence of environmental sampling data.

8.4 MEC Hazard Assessment

The MEC HA was performed for three areas, consistent with the recommended MRS. The qualitative MEC HA analysis was performed for the current, or baseline conditions, as well as for several response alternative scenarios. The baseline and response alternative hazard level categories are summarized in **Table 8-1**.

Table 8-1 MEC HA Summary

Alternative Description	Hazard Level Category	Score
Port Angeles Range Complex No. 1 MRS		
a. Current Use Activities	2	780
b. Response Alternative 1: Institutional Controls	2	780
c. Response Alternative 2: Surface Removal	3	565
d. Response Alternative 3: Subsurface Removal	3	545
e. Response Alternative 4: Tree Survey and Removal	3	545

8.5 Conclusions

The PACR RI results are sufficient to achieve the RI objective to fully characterize the nature and extent of areas impacted by munitions within each MRS and provide information sufficient to evaluate remedial action alternatives and allow stakeholders to make an informed decision about the need for further action under the MMRP and CERCLA. The PACR parent MRS was informally separated into three MRSs based on the different levels of risk as determined by the types and distribution of MEC/MD. The RI results will be used to perform a FS to develop site-specific RAOs and remedial action alternatives appropriate to each MRS.

8.5.1 MRS Recommendations

It is recommended that the Range Complex No. 1 MRS be split into three MRSs as shown in **Figure 8-1**. These three MRSs reflect the information from historical records, AVS, geophysical surveys, the subsurface investigation, and in-situ XRF screening for lead in soil performed during the RI. These MRSs were developed based on the types and distribution of MEC/MD within each MRS and their recommended remedial action alternatives. These are also the same MRSs evaluated in the MEC HA. These areas are:

Range Complex No. 1 - The portion of the MRS impacted by MEC is recommended to be carried forward and retain the Range Complex No. 1 designation. The MRS includes the Direct Impact Fire Area (sub-range SR-02) and the adjacent Buffer Zones (sub-ranges SR-05, SR-04, and SR-07) (**Figure 8-1**) that were confirmed to be impact areas based on the results of the subsurface investigation and the distribution of MEC/MD. Five MEC items (M63 37mm HE projectiles) were recovered. Recovered identifiable MD included thirteen M51 37mm AP projectiles, one M48 75mm projectile point detonating fuze (expended), one M44 81mm practice mortar, three A1 81mm HE mortar pieces, three M57 81mm WP mortar bodies, four 81mm mortar tail fin pieces, one 81mm mortar tail fin, one 75mm practice projectile, and one half of a 75mm projectile (empty).

The top of a steep unsurveyable ridgeline defines the western boundary of the MRS. The MRS boundary for this area was extended beyond the project boundary in the northeast (grids S-02

through S-06) so that the MRS eastern boundary is located at the western edge of the existing Deer Park Road. This expansion added 0.9 acres to Range Complex No. 1 and increased the total project acreage from 2629.8 acres to 2630.7 acres.

This MRS contains MD and likely additional MEC and is 105.7 acres. 3.4 acres of this MRS were documented as unsurveyable due to dense vegetation, and steep slopes. 3.9 acres of this MRS were not investigated because the USACE did not receive a ROE for parcel 47501 (**Figure 2-3**).

Range Complex No. 1 (a) – The second MRS is designated Range Complex No. 1 (a). As described in **Section 5.1.1.3**, there was no evidence of military activity, MD, MEC or MC contamination.

This MRS is 1,286.5 acres and likely does not contain any MEC or MD based on the lack of evidence observed during the RI. Range Complex No. 1 (a) includes most of the area of Technical Approach Area 1 (Combat Training Area – sub-range R01-SR-06) in the northern portion of the MRS and Technical Approach Area 3 (Indirect Fire Impact Area – R-01-SR03 and adjacent Buffer Zones R01-SR-04, and R01-SR-07) in the southern portion of the MRS. The AVS that were conducted throughout the MRS indicate that it is unlikely that any impact areas or other significant features were missed. The areas that were able to be surveyed are within the direction of fire from the firing points to the targets further supporting the absence of munitions related items.

There were 564.4 acres of this MRS documented as unsurveyable due to dense vegetation, and steep slopes. In addition, 102.0 acres of this MRS were not surveyed because the USACE did not receive an ROE for Parcels 47404, 47501, and 47730 and (**Figure 2-3**).

Range Complex No. 1 (b) - The third MRS is designated Range Complex No. 1 (b). This 1,238.5 acre MRS is comprised of property within the ONP that was not investigated because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist. It is unlikely that MEC or MD are present within this MRS based upon the firing point and range analysis discussed in **Section 5.2.1.4**.

Summary statistics for acreage, unsurveyable areas, and percentage of the original Range Complex. No.1 MRS for each of the recommended MRSs are presented in **Table 8-2**.

Table 8-2 Summary Statistics for Port Angeles Combat Range MRSs

Munitions Response Site	Area (Acres)	% Total Area	Unsurveyable Area (acres) No ROE	Unsurveyable Area (acres) Vegetation and Steep Terrain	Unsurveyable Area - Total (Acres)
Range Complex No. 1 MRS	105.7	4%	3.9	3.4	7.3
Range Complex No. 1 (a) MRS	1286.5	49%	102.0	564.4	666.4
Range Complex No. 1 (b) MRS	1238.5	47%	1238.5	0.0	1238.5
Total	**2630.7[1]**	**100%**	**1344.4**	**567.8**	**1912.2**

***Notes**:*
[1]Total original MRS project acreage increased from 2629.8 acres to 2630.7 acres due to expansion of project boundary in Range Complex No. 1. The Range Complex No. 1 MRS project boundary was extended in the northeast (grids S-02 through S-06) so that future investigation occurs up to the west edge of the existing Deer Park Road.
MRS = Munitions Response Site
ROE – Right of Entry

8.5.2 Data Limitations, Baseline Risk Assessment Analysis of Uncertainty, and Recommendations for Future Work

8.5.2.1 DATA LIMITATIONS

There are no significant data limitations after completion of the PACR RI field effort. The AVS, DGM and subsurface investigation were conducted in all accessible areas, and the inaccessible areas are likely inaccessible to any other site visitors or workers.

There is some uncertainty associated with the screening of the SI environmental media with the more current HHRA screening levels; however, these values are necessarily conservative. As such, they would tend to overestimate rather than underestimate potential risks.

8.5.2.2 REMEDIAL INVESTIGATION UNCERTAINTY EVALUATION

The AVS, geophysical surveys, subsurface investigations, evaluation of the MC, and the MEC and MD observed provided sufficient information to identify the impact area within the Range Complex No. 1 MRS. The VSP spatial evaluation of the potential for remaining target or impact areas that were not identified suggests there is a very low probability that there are unidentified target or impact areas within the MRS. This analysis was conducted only as a spatial analysis and was not intended to confirm detection of surface or subsurface munitions. The density of AVS and DGM coverage across all acreage except for unsurveyable areas also indicates that there is low potential for additional target areas outside of the Range Complex No. 1 MRS because there were no additional clusters of MEC or MD that would suggest a target area. The western boundary of the Range Complex No. 1 MRS was defined by the top of a steep unsurveyable ridgeline. Subsurface investigation grids were established and investigated directly adjacent to the top of the steep slope. Additional step out grids were not established due to the unsurveyable conditions. It is possible MEC may migrate down the slope, but human access to any potential MEC is likely insignificant due to the difficult inaccessible terrain. During the RI an attempt was made to survey the toe of the slope; however, it was also inaccessible.

Despite the density of coverage and a much more comprehensive understanding of how the area was used, there is still a potential for isolated MEC or MD to be present within the MRSs. Only a 100% surface and subsurface clearance could provide absolute assurance that there are no remaining hazards. There is potential for remaining subsurface MEC in the impact areas.

MC concentrations were below agreed upon screening values at the conclusion of the SI or were associated with naturally occurring soil concentrations. At that time, the stakeholders agreed that MC sampling would not be required for subsequent investigations (Shaw, 2009). No environmental sampling for MC analysis was performed during the RI because the conditions that would have warranted the collection of samples for laboratory analysis as described in **Section 4.2.1** were not observed during the field investigation. However, there is still a potential for MC release into the environment from damaged or leaking munitions. However, based on the SI analytical laboratory results and the amount and types of MD observed during the RI, it is unlikely that MC is a concern. The SI recommendation not to consider MC sampling during the RI, was valid. If damaged or leaking munitions items are found during future remedial actions, MC sampling may need to be evaluated.

There is uncertainty associated with the unknown site conditions within each MRS where no ROE was obtained. The uncertainty associated with each MRS is described below.

Range Complex No. 1

Due to no ROE, there is uncertainty associated with the unknown site conditions for 3.9 acres of parcel 47501 (**Figure 2-3**). MEC may be present within parcel 47501 given that MD (3 pieces of HE frag equaling less than 1 pound) was discovered in adjacent subsurface investigation grids (S-11 and S-12).

In addition, there is uncertainty associated with unknown site conditions in parcels 47420 and 47384, to the west of grid S-05. Based on the anomaly density analysis 119 grids were selected for subsurface investigation. An additional five grids were investigated as step out grids. Step out grids were established until the extent of munitions debris was determined. Complete delineation utilizing this methodology was achieved with the exception of grid S-05. Three small pieces of HE frag, weighing less than 0.25 lbs, were recovered in grid S-05 on the west side of Deer Park Road. No step out investigations were conducted to the east of Deer Park Road, as an ROE was not obtained for parcels 47420 and 47384. Numerous interviews in the ASR indicated that firing had taken place on the west side of the road (USACE, 1996). Based on the findings of the RI firing point and range analysis the direction of fire was determined to have been to the south (**Section 5.2.1.4.3**). Based on typical and historical range usage it is unlikely that munitions were fired towards the old school house or across the only access road to the MRS. Because of the range configuration and the limited amounts of MD the extent of potential MEC and MD is presumed to be to the west edge of Deer Park Road.

Range Complex No. 1 (a)

Due to no ROE, there is uncertainty associated with the site conditions for 102.0 acres within parcels 47404 and 47730 (**Figure 2-3**). It is unlikely that MEC or MD are present within this MRS based upon the firing point and range analysis discussed in **Section 5.2.1.4.3**. If a remedial action is selected during the subsequent PP/DD, the USACE will notify land owners and attempt to request a ROE.

Range Complex No. 1 (b)

Due to no ROE, there is uncertainty associated with the site conditions present at Range Complex No. 1 (b). This 1238.5-acre MRS is comprised of property within the ONP that was not investigated because a programmatic agreement to conduct investigations and remedial actions between the NPS and the DoD does not exist. It is unlikely that MEC or MD are present within this MRS based upon the firing point and range analysis discussed in **Section 5.2.1.4.3**.

8.5.3 Munitions Response Site Prioritization Protocol Update

The MRSPP was updated to reflect the RI results for the three recommended MRSs. The priority ratings are summarized in **Table 8-3**.

Table 8-3 MRSPP Summary

	Range Complex No. 1	Range Complex No. 1 (a)	Range Complex No. 1 (b) (Olympic National Park)
Priority	3	NH	NH

Notes:
NH = No Known or Suspected Hazard

8.5.4 FUDS Management Information System

The FUDS Management Information System (FUDSMIS) is used to track and report FUDS property, project, and phase data. It also supports planning, programming, and budgeting for FUDS sites. Upon final approval of the MRS designations based on the results of the PACR RI, changes to the MRS designations in the FUDSMIS will be updated by the USACE and used to support scheduling/estimating of future projects, studies, and any cleanup actions determined necessary.

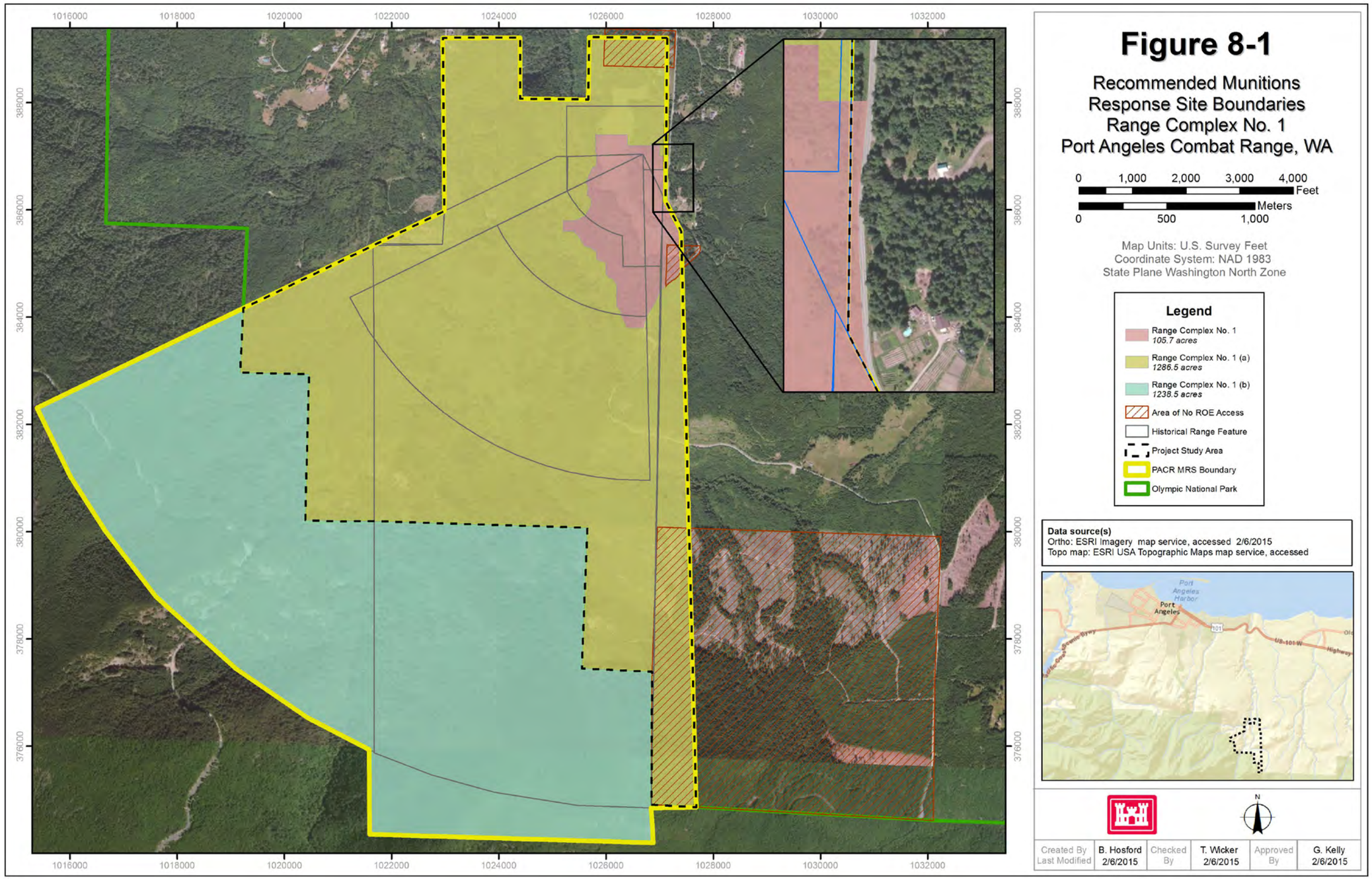
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Figure 8-1
Recommended Munitions
Response Site Boundaries
Range Complex No. 1
Port Angeles Combat Range, WA
0 1,000 2,000 3,000 4,000 Feet
0 500 1,000 Meters
Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone
Legend
Range Complex No. 1
105.7 acres
Range Complex No. 1 (a)
1286.5 acres
Range Complex No. 1 (b)
1238.5 acres
Area of No ROE Access
Historical Range Feature
Project Study Area
PACR MRS Boundary
Olympic National Park
Data source(s)
Ortho: ESRI Imagery map service, accessed 2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed
Port Angeles Harbor
Port Angeles
101
US-101-W
Highway
N
Created By B. Hosford
Last Modified 2/6/2015
Checked By T. Wicker 2/6/2015
Approved By G. Kelly 2/6/2015

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9.0 Identification and Screening Technologies for MEC and MC

The remaining sections of this report present the FS conducted for the MRS. As presented in the NCP (40CFR 300.430[e]) (USEPA, 2011), the purpose of the FS is to ensure that remedial alternatives are developed that provide decision-makers with an appropriate range of options and sufficient information to compare alternatives. The following sections describe the alternatives and technologies that may be implemented at the MRS to eliminate or minimize MEC hazard. In this section, RAOs and the process for developing the appropriate alternatives and initial screening are described. The alternatives that may be applicable for the MRS were developed and screened for effectiveness, cost, and implementability as described in **Section 10.0**. Those alternatives determined to be feasible based on these factors were further evaluated and compared in the detailed analysis of alternatives presented in **Section 11.0**. Because there is no evidence of MEC present within the Range Complex 1 (a) and Range Complex 1 (b) these MRSs are not being considered for the establishment of RAOs and the FS.

9.1 Remedial Action Objective

The RAO for the MRS is identified and provides a basis for developing the remedial action alternatives that may be selected to address any possible remaining explosive hazards. Separate alternatives addressing MC were not evaluated because none of the recovered MEC were compromised to the extent that MC was likely released to the environment. It was agreed upon during the SI that MC sampling would not be required. During the SI the stakeholders agreed that if the environmental samples did not exceed regulatory human health screening values additional MC sampling would not be required. The SI did not collect subsurface samples; therefore, the RI still considered the potential for MC to be present in the subsurface. The type and density of MD observed did not indicate that additional MC analysis was required. Therefore, the agreement reached at the end of the SI is still valid. Thus, the RAO focuses on MEC receptors and exposure pathways and drives the development of the munitions response alternatives.

The overall RAO for all of the MRS is to manage the risk of MEC exposure through a combination of removal/remedial actions, administrative controls, and/or public education, thus making the areas as safe as reasonably possible. The RAOs define the measure for success of the adopted remedial action.

The site-specific RAO consider the location, size, and terrain within each area, and specific documentation about the general locations of training exercises, firing points, and other details that might provide information to focus remedial actions. The types of MEC/MD and other evidence of military activity observed were also considered in developing the RAO. The site-specific RAO is:

- For the Range Complex Area No. 1 MRS there is greater potential for MEC to be present within or near the identified impact areas. The RAO for this MRS is to reduce the probability of human interaction with intact MEC on the ground surface, in the subsurface (to a depth of 18 inches bgs based on RI findings), and potentially present in tree trunks. Selection of the PP will be based on the most feasible method that meets the RAO. .

9.2 General Response Actions

General response actions (GRAs) for MEC sites include a NA alternative as required per the NCP to provide a baseline for comparison, LUCs, and applicable clearance alternatives. GRA combinations, such as clearance and LUCs, may be applicable.

Clearance responses may include a combination of surface, subsurface, and timber removal alternatives as appropriate to the site. MEC clearance alternatives may include well-established and innovative detection technologies, as well as recovery and disposal of any MEC items found. Evaluation of innovative technologies is encouraged as described in the CERCLA guidance (USEPA, 1988).

9.3 Identification and Screening of Remedial Technologies

In this step, the potentially applicable technology types and process options are identified and reduced by evaluating the options with respect to technical implementability. The technologies are representative of what is available at the time this FS was prepared. New technologies may become available and will be addressed during the Remedial Design phase. Each GRA and the applicable technologies are identified. Descriptions of the advantages and limitations of each GRA, and a determination about whether they were retained for further evaluation are presented.

9.3.1 Land Use Controls

The LUCs are physical, legal, or administrative mechanisms designed to mitigate risks associated with potential MEC exposure. The selected LUCs must be compatible with current and future land use and must be clearly defined, established in coordination with the landowner or manager, be agreeable to all stakeholders, and they must be enforceable. LUCs are often used in combination with other alternatives to mitigate any hazard remaining following a response action.

The LUC GRA utilizes ICs, and any applicable engineering controls (ECs) implemented at a site to reduce explosive hazards by limiting access and exposure to MEC. ICs are legal controls intended to minimize the potential for human exposure to hazards by limiting land use (e.g. deed restrictions). ECs are physical controls put into place to prevent human and ecological exposure to MEC hazards (e.g. fence). LUCs do not address contamination directly, but rather increase awareness and educate site visitors and workers about the potential hazards, and restrict access to and development of the affected area. In the case of the MRSs, the ICs would include an education component to provide materials and information to site visitors and workers about the possibility of encountering MEC, what to do if a possible MEC item is discovered, and how to report any discoveries.

The LUCs would also include restrictive covenants and deed restrictions in the event the property is transferred from City of Port Angeles control. It should be noted that there is currently a “surface use only” indemnification clause within the property owned by the City of Port Angeles. However, there are also privately (residential and commercial) owned parcels with the MRSs. LUCs might also include use of ECs such as signs and fences to prevent or restrict access.

The advantages of this alternative are:

- Direct exposure through inadvertent site access is reduced.
- The costs are generally lower than other response actions.
- Time to implement the action (i.e., response time) is short.

The limitations of this alternative are:

- There is no MEC removal except in the event of any incidental discoveries or MEC identified during specific projects supported by UXO technicians.
- The City of Port Angeles would be required to ensure that the selected LUCs would be included as deed restrictions if the property is to ever transfer to a new site owner (only applicable to property owned by the City of Port Angeles).
- Deed restrictions on privately owned parcels would be difficult or impossible to implement and enforce.
- Stakeholders must coordinate implementing the selected LUCs for the anticipated life cycle of the site.
- The USACE, as the agency responsible for the FUDS MMRP, must identify mechanisms for funding implementation of all aspects of the LUCs.

Any ICs or ECs selected would need to be implemented and monitored according to an Institutional Control Implementation and Assurance Plan (ICIAP) as described in the IC guidance provided in EPA-540-R-09-002 (USEPA, 2012), and ongoing evaluation of their effectiveness may be addressed through five-year reviews. On-going costs would be incurred for all LUCs until it is determined that no hazard remains. The MRSs are located within municipal and private lands. The City of Port Angeles maintains property within the Range Complex No. 1 MRS as a protected watershed. However, there is no other evidence that the City actively manages the property such as maintenance of fence lines, mowing, etc. The WDNR owns a small portion of land within the MRS that has not been impacted by munitions. Privately owned commercial properties include timber growth and harvesting operations. Privately owned residential properties are generally on the periphery of the PACR MRSs to the north and east.

The LUC GRA was retained for further evaluation as it may be appropriate to meet RAOs for the Range Complex No. 1 MRS or may be incorporated as a component of other alternatives. The LUCs described above are intended to provide a representative technical approach. Specific LUCs will be developed during the Remedial Design phase and within the ICIAP.

9.3.2 Surface Clearance

The surface clearance GRA can range from a simple visual site walkover to a highly controlled series of 100% survey lane inspections depending on the objectives of the surface clearance project. In general, a surface clearance/surface removal is performed to detect, identify, and remove a majority of the MEC and MD on the surface. It is required to be conducted prior to the completion of DGM is support of subsurface MEC detection and removal. Surface clearance is performed by qualified UXO technicians and typically includes use of analog or other geophysical sensors to aid in detecting MEC or MD that may be present.

The advantages of this response action are:

- MEC items found during the clearance activities are removed, thus the MEC hazard is reduced.
- It is relatively low-tech and can be implemented using existing technologies and experience.
- Time to implement is short.

Limitations are:

- Costs, primarily labor costs, associated with 100% or very high coverage rates over a large area may be high, so implementing this alternative can become prohibitively costly.
- Site accessibility due to vegetation and steep terrain may limit the ability to implement full coverage surface clearance.
- Depending on the vegetation cover and procedures for implementing the surface clearance, some vegetation removal could be required.
- Alternative positioning systems or procedures may be required in forested areas where GPS coverage is denied.
- Only MEC at the surface is removed, so subsurface MEC would remain and could be exposed if there is a potential for frost heave, erosion, or mudslides to expose buried MEC.

The surface clearance GRA is technically feasible to be implemented for the Range Complex No. 1 MRS. Therefore, this response action was retained for further evaluation for this MRS. The methodology described above is intended to provide a representative technical approach. Specific procedures will be developed during the Remedial Design phase.

9.3.3 Subsurface Clearance

The subsurface clearance GRA may be achieved through use of one or a combination of geophysical technologies including analog (e.g., Schonstedt magnetometers), DGM (e.g. Geonics EM61 sensor) and advanced classification (e.g., Metal Mapper) techniques. These technologies vary in level of sophistication, cost, ease of use, and availability. Each technology is effective and capable of achieving the RAO as summarized below.

Analog geophysical techniques using sensors such as Schonstedt magnetometers can be used to perform a mag and dig subsurface clearance. These techniques are well known and have historically been used to detect ferrous metal on the surface or in the shallow (< 24 inches) subsurface. This is the type of subsurface investigation that was performed during the RI. The use of analog sensors is the simplest of the geophysical techniques that may be used to locate subsurface anomalies. For this type of subsurface clearance operation, the analog sensors are used to perform a controlled sweep of the area to be cleared, and the locations of any items that register on the sensor are flagged so that a dig team can follow and perform manual excavations to identify and remove MEC or MD items present. Subsurface clearance is performed concurrent with surface clearance activities. A portion of the area that has been cleared, typically 10%, is checked independently by a UXOQCS. A USACE OESS will provide QA. Analog geophysical techniques are completed by UXO qualified personnel as defined by USACE Technical Paper (TP) 18 (DDESB, 2004).

DGM technologies, including industry standard Geonics EM61 sensors, can also be used to perform a subsurface survey to detect subsurface anomalies potentially representing the type of MEC that may be present. These electromagnetic sensors may be deployed on a variety of platforms

depending on the site accessibility and terrain, and include towed array, litter, or man-portable platforms. The sensors detect shallow ferrous and non-ferrous metallic objects with high spatial resolution and accuracy and can be conducted to achieve up to 100% coverage of selected areas. These systems are positioned using RTK GPS or equivalent technology to guarantee accurate positioning. Following data processing, analysis, and QC, a dig list is developed to identify anomalies to be reacquired and excavated. The dig locations are marked and manually excavated by a dig team. Subsurface clearance is performed after completion of surface clearance activities. The DGM surveys, anomaly reacquisition, and excavation are performed by qualified geophysicists and UXO Technicians per USACE TP 18. Post-removal verification (PRV) is conducted whereby a percentage, usually 10%, of the area or transects cleared is re-surveyed after the subsurface clearance has been completed to confirm that no subsurface anomalies remain in the cleared areas. The analog geophysical surveys, anomaly reacquisition, excavation, and PRV are performed by qualified UXO and field technicians.

Advanced classification technologies are becoming available that are capable of discriminating anomalies likely to represent MEC, thus providing an ability to significantly reduce the number of anomalies that must be excavated. In large-scale field tests, these technologies have been successfully demonstrated to reduce the number of digs required by up to 90% depending on the munitions types, density, and site conditions. Development and demonstration of advanced EMI sensors deployed on a variety of platforms, along with advanced data processing techniques for discriminating MEC from non-MEC, has resulted in multiple maturing technologies that may be successfully deployed for subsurface clearance activities. These technologies collect a more complex dataset (relative to standard DGM sensors) that can then be processed and analyzed using advanced classification and discrimination algorithms to produce a prioritized dig list that identifies anomalies most likely to represent MEC. These technologies are usually deployed in a cued-interrogation mode (i.e., data are collected while the sensor is stationary) over anomalies previously identified in a standard DGM survey. These technologies have been developed using vehicular and man-portable platforms, so the most appropriate technology can be selected based on site accessibility and terrain. As for DGM, the advanced EMI technologies would be deployed after completion of surface clearance activities. The data collection and processing are performed by qualified geophysicists. UXO technicians perform the excavation of the selected anomalies. PRV is performed following anomaly excavation. As presented in the CERCLA RI/FS guidance (USEPA, 1988), innovative technologies judged to be technically implementable should be retained for further evaluation.

Any areas disturbed by the excavations associated with a subsurface removal would be rehabilitated and re-seeded utilizing native seed mixtures.

The advantages of this GRA are:

- MEC items found during the clearance activities are removed, eliminating or minimizing the potential for exposure and the explosive hazard.
- The technologies can detect MEC items suspected to be present to depths where it is likely to be encountered within the impact and target areas.
- The technologies and data processing and analysis tools are available and generally accepted by stakeholders (additional activities may be required to confirm the performance of the advanced classification technologies).

- These technologies are man-portable, making it feasible to implement this GRA at sites with steep terrain or where access is limited.

Disadvantages are:

- Costs, primarily labor costs, associated with 100% clearance operations over large areas or areas with high anomaly densities are high, so implementing this GRA at sites with these conditions can become very costly.
- Vegetation removal may be required and can be extensive if there are many excavations required.
- Alternative positioning systems or procedures may be required in forested areas where GPS coverage is denied.
- Site accessibility/steep terrain may limit the ability to implement full coverage subsurface clearance.

The subsurface clearance GRA is technically feasible because MEC are likely present in the subsurface, and geophysical techniques are available and effective in performing a subsurface clearance. The subsurface clearance GRA was retained for further evaluation for the Range Complex No.1 MRS. Analog geophysical methods (i.e., use of Schonstedt metal detectors) were selected as a representative subsurface clearance technology for purposes of identification and screening of alternatives and developing the associated costs and level of complexity. The methodologies described above are intended to provide a representative technical approach. Specific procedures will be developed during the Remedial Design phase.

9.3.4 Tree Survey and Clearance

The tree survey and clearance GRA may be achieved through use of one or a combination of GIS technologies, tree stand classification surveys, historical aerial photograph analysis and tree survey and clearance. These techniques vary in level of sophistication, cost, ease of use, and availability. Each technology is effective and capable of achieving the RAOs as summarized below.

A GIS line of sight and slope analysis was conducted during the RI, utilizing publicly available Light Detection and Ranging (LiDAR) data. LiDAR data provides a terrain model that supports highly detailed terrain modeling and represents what terrain that would be visible during munitions training activities from the firing point. The areas identified during the line of sight and slope analysis indicated terrain that may be impacted by artillery, either as a target area or as an area containing munitions that missed the intended target.

Based on the findings of the RI field investigation the Range Complex No. 1 MRS has been delineated as an impact and target area containing MD and likely MEC. In addition to the MD and MEC located on the surface and subsurface, MEC are potentially present in the trunks of the trees that were present at the time the range was operational. It is important to note that the 1948 accident that killed two youths occurred during timber harvesting operations.

A historical aerial photograph analysis was performed to determine what trees were present at the time the range was utilized and subsequently how many acres may contain trees imbedded with MEC. The locations of wooded areas potentially impacted by MEC observed during the RI are generally the same locations when the range was operational; approximately 75 acres have the potential to be impacted by MEC.

In order to address potential MEC hazards in trees the following general process would be required:

- The age of individual trees will be determined.
- Metallic anomalies in the trees would be identified by UXO Technicians.
- Metallic anomalies would be investigated and removed by UXO Technicians.
- Any MEC recovered from the trees would be destroyed.
- Removal and destruction of any trees that could not be certified by UXO Technicians as free of potential MEC hazards would be performed. This includes destruction of MEC that can not be safely removed from the tree trunks.

A professional forester may be employed to assess which trees would have been present within Range Complex No. 1 in the 1940s when the PACR was operational. The forester would estimate the age of the tree by both measuring trunk diameters and utilizing typical growth rates or would collect a boring from the tree and count the number of growth rings. A UXO Technician will be present to identify and avoid interaction with any MEC while the forester conducts the tree surveys.

Once the trees that were present when the PACR was operational are identified, UXO Technicians would utilize metal detectors to locate any metallic anomalies in the tree trunks. This may entail the use of a lift boom to allow the UXO Technicians to look for features that may be indicative of a munitions impact (e.g. tree scarring) and to sweep the tree trunk with a metal detector for anomalies.

If UXO are identified in a tree it is unlikely that the item would be safe to remove due to the sensitive nature of fuzes present within the anticipated munitions and the methods required to remove a UXO item from a tree (e.g. chainsaw). The UXO Technicians would likely utilize shape charges wrapped around the tree trunk to perform a BIP.

The advantages of this GRA are:

- MEC items found during the tree survey and clearance activities are removed, eliminating or minimizing the potential for exposure and the explosive hazard.
- The technologies can detect metallic anomalies present in trees.
- The technologies required to locate metallic anomalies are readily available and inexpensive.

Disadvantages are:

- Costs, primarily labor costs, associated with 100% clearance operations over large areas are high, so implementing this GRA at sites with these conditions can become very costly.
- Vegetation removal may be required and can be extensive.
- Steep terrain and vegetation may limit the ability of the required equipment (e.g. lift boom) to access the site. It is unlikely that all of the trees potentially impacted by MEC could be addressed.
- The use of shape charges on standing timber is extremely hazardous and may present an unacceptable safety risk including the potential to ignite a forest fire.

The tree survey and clearance GRA is technically feasible because MEC may be present in timber, and analog hand held survey techniques are available and effective in assessing the presence of metallic anomalies in timber. The tree survey and clearance GRA was retained for further evaluation for the Range Complex No.1 MRS. The methodology described above is intended to provide a

representative technical approach. Specific procedures will be developed during the Remedial Design phase.

9.3.5 Summary of Technology Screening and Evaluation

Table 9-1, on the next page, contains a summary of the screening and evaluation of the representative technologies available at the time that this FS has been prepared.

Table 9-1 Technology Screening and Evaluation

General Response Action	Primary Remedial Technology	Process Options	Screening	Evaluation			
			Technically Implementable?	Effective?	Administratively and Institutionally Implementable?	Cost Prohibitive?	Retained for Consideration*?
No Action	None	None	Yes	N/A	N/A	No cost	Yes
Risk and Hazard Management	Land Use Controls	Access Restrictions (fencing, signage)	Yes	Yes Potentially effective in meeting RAOs	Yes Readily implementable	No Negligible Cost	Yes
		Activity Restrictions (e.g., no intrusive activities allowed)	Yes	Yes. Potentially effective in meeting RAOs	No No oversight enforcement mechanism	No Negligible Cost	No
		Public Education	Yes	Yes Potentially effective in meeting RAOs	Yes Readily implementable	No Negligible Cost	Yes
		Deed Notice	Yes	Yes. Potentially effective in meeting RAOs	No Property is primarily owned by the City of Port Angeles or private owners	No Negligible Cost	No
	MEC Detection	Airborne Geophysical Survey	Yes	No The site vegetation and height of trees would not permit the detection of the smallest munition of concern.	Yes Readily implementable	No High Cost	No
		Geophysical Surveys (digital or analog)	Yes	Yes Potentially effective in meeting RAOs	No Not recommended for high density areas (could be used in outlying areas)	No Moderate Cost	Yes
		Advance Anomaly Classification (e.g., MetalMapper)	Yes	Yes Potentially effective in meeting RAOs	Yes Readily implementable	No High Cost	No
Remedial Action	MEC Recovery	Hand Excavation	Yes	Yes Potentially effective in meeting RAOs	Yes Readily implementable	No Moderate Cost	Yes
		Mechanical Excavation	Yes	Yes Potentially effective in meeting RAOs	Yes Readily implementable	No Moderate Cost	Yes
		Mechanical Excavation and Sifting	Yes	Yes Potentially effective in meeting RAOs	Yes Readily implementable	Yes High Cost	No
	MEC Disposal	MEC Disposal (conducted by qualified UXO personnel)	Yes	Yes Potentially effective in meeting RAOs	Yes Readily implementable	No Moderate Cost	Yes

Notes:
** The technology being retained for consideration is intended to be a representative technology. The alternatives presented in the FS focus on the outcome of the alternative instead of the methodology of a remedial action.*
MEC – Munitions and Explosives of Concern
RAO – Remedial Action Objective
UXO – Unexploded Ordnance

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10.0 Development and Screening of Alternatives

After identifying the GRAs that are technically feasible for the sites considered for remediation, they were evaluated to develop site-specific alternatives and initially screened for effectiveness, cost, and implementability based on the following criteria:

- Effectiveness is evaluated based on the demonstrated ability of the technology to achieve design or remedial action goals and comply with ARARs. Possible adverse effects are also considered.
- Implementability includes factors such as safety, technical feasibility, regulatory and public support, compatibility with current and planned land uses, availability of the technology, site accessibility, and any other issues associated with successful implementation of the alternative. Implementability encompasses both the technical and administrative feasibility of implementing a technology process.
- Costs are evaluated on a relative order-of-magnitude basis and fall within the recommended accuracy range of +50% to -30%, and include costs for implementing the remedial action as well as any post-removal monitoring costs, as appropriate. It is important to include the long-term and life cycle costs so that decision makers are informed about the total costs for each alternative. Cost plays a limited role in the screening of process options. Relative capital, and Operation and Maintenance (O&M) costs are used rather than detailed estimates. At this stage in the process, the cost analysis is made on the basis of engineering judgment, and each alternative is evaluated as to whether costs are high, low, or medium relative to other alternatives in the same technology type.

In this section, alternatives developed from the GRAs identified in **Section 9.0** are described and screened against the effectiveness, cost, and implementability criteria.

10.1 Development of Alternatives

As described in the CERCLA guidance (USEPA, 1988), the GRAs should be evaluated and combined into site-specific alternatives. The alternatives applicable to the MRSs were developed based on the following general criteria:

- The alternative is protective of human health and environment by eliminating, reducing, or otherwise controlling risks or hazards posed by the site.
- There are a reasonable number and type of alternatives based on the characteristics and complexity of the sites, including current site conditions and physical constraints.
- At least one permanent cleanup action alternative must be identified to serve as a baseline against which other alternatives shall be evaluated for the purpose of determining whether the cleanup action selected is permanent to the maximum extent practicable.
- Alternatives may consist of one or more components, including, but not limited to: components that remove MEC from the site; provide for on-site or off-site demolition and disposal of MEC; and, on-site isolation of MEC with ECs and/or ICs.
- The alternative meets the RAOs established for one or more of the MRSs.

The GRAs described in **Section 9.0** were selected individually or in combination to develop remedial action alternatives that apply to the MRSs as follows:

- Alternative 1 – NA
- Alternative 2 – LUCs for Site Visitors and Workers
- Alternative 3 – Surface Clearance and LUCs
- Alternative 4 – Surface Clearance, Subsurface Clearance, and LUCs
- Alternative 5 – Surface Clearance, Subsurface Clearance, Tree Survey and Clearance, and LUCs

The costs developed for the alternatives were based on 2014 rates, and estimated rates for stakeholder costs for the LUC alternatives. Costs applicable for one or more of the alternatives include estimates for:

- Planning documents and meetings.
- Materials (e.g., sign fabrication).
- Equipment rental.
- Mobilization and demobilization of field teams and equipment.
- Labor costs for the remedial action team (e.g. GIS analysts, UXO Technicians, Foresters, etc.).
- Travel (assume field teams would be stationed near Port Angeles for the duration of each field effort).
- Explosives for MEC demolition.
- For the clearance alternatives, multi-year efforts and associated cost escalation were assumed.
- Status reporting.
- GIS hosting.
- Project management and cost controls.

10.2 Screening of Individual Alternatives

A detailed description and the screening analysis for each alternative are presented in the following subsections.

10.2.1 Alternative 1 – No Action

The NA alternative involves taking no current or future action at any of the MRSs.

- Effectiveness: The NA alternative does not reduce or prevent exposure to MEC, and does not provide short or long-term reduction in explosive hazard. Exposure pathways would remain for current and future receptors. This alternative would not address the RAOs.
- Implementability: This alternative is technically and administratively feasible and no services or materials are needed for implementation.
- Cost: The total estimated cost for this alternative is $0. There are no capital or post-remediation costs, contingencies, or professional or technical services associated with this alternative.

This alternative is included in accordance with the NCP and is used to provide a baseline for alternative comparison. As required, it will be retained for detailed analysis for all MRSs.

10.2.2 Alternative 2 – Land Use Controls for Site Visitors and Workers

The LUC alternative for site visitors and workers includes ICs such as preparation and distribution of informational materials for site visitors and workers. Distribution of these materials would be coordinated through the USACE and would include information or notification to local communities and other interested persons. The materials would describe the munitions that may be encountered, what to do, and how and where to report any findings. Development and access to the educational materials would be coordinated through and funded by USACE. The alternative could include ECs such as warning and restricted access signs and fencing to further restrict access. The fencing LUC is limited to the Range Complex 1 MRS due to the presence of MEC and MD identified during the RI. Installation of signs or fences would be performed by the USACE.

The LUC alternative also addresses mitigation of hazards to site workers performing forest and watershed management activities. ICs would include administrative controls prohibiting intrusive activities and timber harvesting without proper notifications and procedures. If the property is transferred at some time in the future, the LUCs would need to be included as restrictive covenants and deed restrictions in the property transfer documents. The components of LUC development and implementation for the MRSs would include:

- Maintaining a dedicated former PACR webpage on the City of Port Angeles website (or other location) with educational material, including photos of munitions that may be encountered and instructions for what to do upon discovery of a munitions item and how to report findings.
- Providing informational materials and the website link at City of Port Angeles offices, and as part of any special use permits, agreements or leases issued by the City of Port Angeles.
- Providing materials to agencies issuing hunting and fishing licenses to distribute to hunters and anglers.
- Providing materials to local libraries and other appropriate public venues.
- Posting signs at strategic access points. Conducting monitoring to ensure signs have not been damaged or removed, and provide resources to replace or install new signs.
- Planning activities to identify the type of use restrictions (such as prohibiting intrusive activities and timber harvesting), responsible parties for conducting long-term IC activities and maintenance of ECs, estimated costs, and funding mechanisms.
- Implementation and monitoring activities for documenting and putting the selected LUCs in place and ensuring their continued effectiveness, including preparation of an ICIAP and updates following five-year reviews.
- Establishing a process to modify or transfer the LUCs in the event the property is transferred from City of Port Angeles or other property owner's control.
- Installation of approximately 10,500 linear feet of a 6-foot tall chain link fence (limited to the 105.7 acres of the Range Complex No. 1 MRS).

Preparation of the ICIAP would be required upon completion of the PP/DD for the MRSs. The objectives of this document would be to systematically establish and document the activities associated with implementing and ensuring the long-term stewardship of the LUCs, and specify the persons and/or organizations responsible for conducting these activities (USEPA, 2012).

- **Effectiveness**: This alternative provides limited short and long-term reduction of explosive hazard by promoting awareness and providing information to site visitors and workers about potential hazards and how to avoid them. This alternative does not remove or limit exposure pathways. In general, exposure pathways for most of the MRS acreage would remain unchanged for current and future receptors.
- **Implementability**: This alternative is technically feasible, administratively feasible, and services and materials necessary to implement the LUCs are readily available. This alternative is technically feasible because the action is achievable using readily available services and equipment for website development; coordination with local agencies, venues, and vendors to distribute informational material; and sign fabrication and installation.

  An ICIAP would be required upon completion of the PP/DD. Constraints to implementing the LUCs include identifying and establishing long-term funding mechanisms for LUC implementation. The technical and administrative requirements identified to implement this alternative would be included in the ICIAP.

  Constraints to implementing the LUCs include developing a mechanism to ensure long-term funding for developing and maintaining the website, preparing and printing informational materials, monitoring and replacing warning and informational signs and updates to the ICIAP. As the agency responsible for environmental cleanup on former military land under the FUDS program, the USACE would be responsible to fund activities required as part of the LUCs. This alternative is administratively feasible because the technologies and capabilities needed to implement LUCs are available. There are no known permits, waivers, easements, or right-of-way agreements necessary to install signs as the property impacted by munitions is primarily under management of the City of Port Angeles.

  Access to reach some areas where the installation of a fence would be required may be challenging due to the steep terrain and heavy vegetation. However, it is not anticipated that these factors will prevent the installation of the fence restricting access to the areas potentially containing MEC (Range Complex No.1 MRS).
- **Cost**: Costs are shown in Section 11.3.5 (**Table 11-1**) below for implementing the LUCs that would be likely to apply under this alternative. Costs include website development and maintenance, preparing general informational materials (e.g., pamphlets), fabrication of road signs, installation of a fence around the Range Complex No. 1 MRS and the associated project management, planning documents and reports. Costs are based on 2014 rates for these activities and include costs for planning documents, reporting, and administrative costs. Costs for initial preparation and subsequent updates to the ICIAP were estimated assuming costs for several technical planning meetings among stakeholders as well as a document preparation and review cycle. Updated ICIAP updates were assumed to be required following Five-Year reviews. The selection of the alternative during the PP and DD may exclude certain aspects of the LUCs such as the installation of a fence line.

  This alternative is effective in meeting the RAOs technically and administratively, feasible, effective, and implementable, and was retained for detailed analysis for all three MRSs.

10.2.3 Alternative 3 – Surface Clearance and LUCs

A surface clearance would be performed by conducting a 100% coverage non-intrusive visual survey of a designated area. Munitions related items identified during the visual survey including MEC would be removed and disposed of. The presence of any small arms and evidence of military activity would also be documented, but the primary focus would be the MEC and MD removal. Non-munitions related metallic material would be removed if the area is to be cleared for DGM surveys. Any MEC found would be either detonated in place or transported to a designated location for consolidated disposal following established procedures. Surface clearance would be conducted by teams according to the requirements of USACE TP-18 (DDESB, 2004). The UXO technicians would use a magnetometer (e.g., Schonstedt) or other approved geophysical sensor to aid in detecting metal on the ground surface.

Prior to beginning fieldwork, a work plan would be developed and approved as required by stakeholders. An ESS would be developed and approved as required by the USACE. All field activities would be coordinated with the municipal and private landowners to ensure all required permits or licenses would be obtained. Work planning and implementation would be conducted in compliance with Occupational Safety and Health Administration (OSHA) regulations to ensure worker health and safety, ARARs or TBC, regulations for handling and transportation of explosive materials, and destruction of MEC.

The area to be surveyed would first be defined and the boundaries marked using a professional land survey or other pre-approved survey method. Depending on the survey area, some vegetation clearance may be conducted with a small piece of power equipment; such as a walk behind brush hog, if it is determined that the ground surface is completely obscured and cannot otherwise be surveyed. Multiple grids would be developed based on the size and extent of the area to be surveyed, topography, and other factors to ensure that the required coverage would be completed as efficiently as possible. The grids would be divided into search lanes using ropes, pin flags, or other suitable markers. Lane sizing to meet the required coverage would be determined based on the site conditions (for example, flat open areas may allow for wider sweep lanes while dense vegetation or heavily contaminated areas may call for narrower sweep lanes). The teams would then survey each grid lane and mark or flag any items found for further inspection.

If an item is discovered the MPPEH inspection process will be completed in accordance with DODI 4140.62, EM1110-1-4009 and EM385-1-97. If identified as a fuzed MEC item or an item that is unsafe to move, the item would be carefully marked, photographed and its location recorded using a GPS. Then the item would be properly disposed using BIP procedures. Following the BIP, remaining MD would be removed for disposal following established procedures. If the item was determined safe to move, it would be transported to a central location for consolidated disposal with other items. All non-MEC metallic items found would be removed from the surface and consolidated for proper disposal if subsequent DGM activities are planned.

Quality control procedures would include:

- Establishing an exclusion zone for field operations.
- Ensuring that all personnel have required certifications and training.
- Ensuring that all equipment is operating properly.
- Ensuring that all required notifications and permits are in place.

- Ensuring that all activities are properly and fully documented

To ensure instrument functionality (e.g., GA-52Cx Schonstedt, Vallon VMH3, Minelab Explorer), each instrument operator will be required to sweep the analog test strip using the sweep techniques and instrument settings proposed for the project and detect 100% of the items at least once a day. The analog test strip would be established in a designated area and be used to confirm that the instruments are operating as specified and will accurately detect anticipated MEC items under site conditions. Following clearance of each grid, a final QC inspection of a portion of the grid (typically 10%) would be performed by a designated QC specialist to ensure that the clearance was completed.

Following completion of the surface clearance activities, an after action report would be prepared to document all activities as well as MEC recovered and destroyed. Disposal of MD would be completed following required procedures for handling and demilitarization.

Even though the surface clearance would be anticipated to locate and remove any remaining MEC on the ground surface, there is the potential for subsurface items to remain and be exposed due to erosion, frost heave, or mudslides. Therefore, in addition to conducting surface clearance activities, LUCs would be selected and implemented as described for Alternative 2.

- **Effectiveness:** This alternative would identify and remove all surface MEC within the clearance areas, eliminating short-term, and most long-term explosive hazards. It would also remove surface exposure pathways. They would achieve RAOs and comply with applicable regulations as specified in the final ARARs. Surface clearance is a proven method for surface MEC removal and is accepted by stakeholders as an effective remedy. Surface clearance would not remove subsurface MEC, therefore it is possible that subsurface MEC, if present, could be exposed by natural processes (e.g. erosion or frost heave), therefore the long-term explosive hazard would be reduced but not eliminated. Due to the possibility of exposure of subsurface MEC, the areas may be subject to future monitoring or clearance activities based on recommendations from a five-year review or other process. Subsurface MEC may occur at any location, but is considered more likely to occur within the identified impact and target areas.
- **Implementability:** This alternative is considered technically and administratively feasible, and services to perform the clearance activities are readily available. Coordination with the municipal and private land owners would be required to schedule clearance activities, and contractors performing the work would be required to prepare the planning documents, and comply with all licensing and documentation requirements for handling and transporting explosives as required for MEC destruction. Facilities are available to perform the required demilitarization and recycling of MD recovered from the sites. Selected LUCs would be implemented as described in Alternative 2.
- **Cost:** Costs are shown in **Section 11.3.5** (**Table 11-2**) for implementing surface clearance in the Range Complex No. 1 MRS. These costs were developed utilizing an estimated acreage per day for each alternative. Cost estimates include all of the cost elements listed in **Section 11.1**.The materials and MD disposal costs were based on the amount of material observed during the RI. LUCs would be implemented as described in Alternative 2.

Because this alternative would be effective and is technically feasible, it was retained for detailed analysis for the Range Complex No. 1 MRS.

10.2.4 Alternative 4 – Surface Clearance, Subsurface Clearance, and LUCs

This alternative is presented using analog geophysics technologies (i.e., mag and dig) as a representative technology for subsurface detection and clearance. Due to the dense tree canopy at the PACR, GPS positioning accuracy is not adequate to conduct a DGM investigation. Target DGM utilizing reacquisition is not feasible for the MRSs. Analog geophysics was selected as the most effective subsurface clearance remedy for the PACR; however, the selected technologies, associated procedures, and actual costs would be developed as part of the remedial design.

Because the surface and subsurface technologies and procedures are essentially the same, the two clearances would happen concurrently. For Alternative 4, the subsurface clearance would be performed across the Range Complex No. 1 MRS. Although the subsurface clearance would be anticipated to locate all MEC for removal within the clearance areas, it is possible to miss items due to difficulty in accessing an area, site conditions, or other reasons (e.g., unsurveyable areas). Therefore, LUCs would be implemented to ensure that any future site users or visitors are aware of the potential for MEC to be present.

Vegetation removal would be required and implemented as described above in **Section 10.2.3**. Prior to beginning fieldwork, an Explosives Safety Submission (ESS) would be developed and approved as required by the USACE. All field activities would be coordinated with the municipal and private landowners to ensure all required permits or licenses would be obtained. Work planning and implementation would be conducted in compliance with OSHA worker health and safety requirements, and ARARs and TBCs for transportation of explosive materials and destruction of MEC.

The field procedures would be similar to those described above in **Section 10.2.3** except the subsurface MEC and MD would be removed. Based on the RI, the vertical extent of subsurface munitions is expected to be approximately 18 inches bgs.

Following completion of the subsurface clearance activities, a final report would be prepared to document all activities as well as MEC recovered and destroyed. Disposal of MD would be completed following required procedures for handling, demilitarization, and recycling.

- **Effectiveness:** This alternative would identify and remove all surface and subsurface MEC within the clearance areas, eliminating surface and subsurface pathways and short-term and long-term explosive hazards. This alternative would achieve the RAOs and comply with applicable regulations as specified in the final ARARs. Subsurface clearance is a proven method for MEC remediation and is accepted by stakeholders as an effective remedy.
- **Implementability:** This alternative is considered technically and administratively feasible, and services to perform the clearance activities are readily available. Coordination with municipal and private landowners would be required to schedule field activities, and contractors performing the work would be required to prepare the planning documents, and comply with all licensing and documentation requirements for handling and transporting explosives as required for MEC destruction. Facilities are available to perform the required demilitarization of MD recovered from the sites and the disposition of soil impacted by energetic MC.

- **Cost:** Costs shown in **Section 11.3.5** (**Table 11-3**) were developed utilizing an estimated acreage per day for each alternative. Cost estimates include all of the cost elements listed in **Section 11.1**. LUCs would be implemented as described in Alternative 2.

10.2.5 Alternative 5 – Surface Clearance, Subsurface Clearance, Tree Survey and Clearance, and LUCs

For Alternative 5, in order to address MEC hazards in trees, a tree survey and removal would be performed after completion of the clearances described in Alternative 4.

A GIS line of sight and slope analysis was conducted during the RI, utilizing publicly available LiDAR data. LiDAR data provides a terrain model that supports highly detailed terrain modeling and represents what terrain would be visible during munitions training activities from the firing point. The areas identified during the line of sight and slope analysis indicated terrain that may be impacted by artillery, either as a target area or as an area containing munitions that missed the intended target.

Based on the findings of the RI field investigation the Range Complex No. 1 MRS has been delineated as an impact and target area containing MD and likely MEC. In addition to the MD and MEC located on the surface and subsurface, MEC are potentially present in the trunks of the trees that were present at the time the range was operational. It is important to note that the 1948 accident that killed two youths occurred during timber harvesting operations.

A historical aerial photograph analysis was performed to determine what trees were present at the time the range was utilized and subsequently how many acres may contain trees imbedded with MEC. The locations of wooded areas potentially impacted by MEC observed during the RI are generally the same locations when the range was operational; approximately 75 acres have the potential to be impacted by MEC.

In order to address potential MEC hazards in trees the following general process would be required:

- The age of individual trees would be determined.
- Metallic anomalies in the trees would be identified by UXO Technicians.
- Metallic anomalies would be investigated and removed by UXO Technicians.
- Any MEC recovered from the trees would be destroyed.
- Removal and destruction of any trees that could not be certified by UXO Technicians as free of potential MEC hazards would be performed. This includes destruction of MEC that can not be safely removed from the tree trunks.

A professional forester may be employed to assess which trees would have been present within Range Complex No. 1 in the 1940s when the PACR was operational. The forester would estimate the age of the tree by both measuring trunk diameters and utilizing typical growth rates or collecting a boring from the tree and count the number of growth rings. A UXO Technician will be present to identify and avoid interaction with any MEC while the forester conducts the tree surveys.

Once the trees that were present when the PACR was operational are identified, UXO Technicians would utilize metal detectors to locate any metallic anomalies in the tree trunks. This may entail the use of a lift boom to allow the UXO Technicians to look for features that may be indicative of a munitions impact (e.g. tree scarring) and sweep the tree trunk with a metal detector for anomalies.

If UXO are identified in a tree it is unlikely that the item would be safe to remove due to the sensitive nature of fuzes present within the anticipated munitions and the methods required to remove a UXO item from a tree (e.g. chainsaw). The UXO Technicians would likely utilize shape charges wrapped around the tree trunk to perform a BIP.

Following completion of the tree survey and removal activities, a final report would be prepared to document all activities as well as MEC recovered and destroyed. Disposal of MD would be completed following required procedures for handling, demilitarization, and recycling.

- **Effectiveness:** This alternative would identify and remove all surface and subsurface MEC as well as MEC remaining within trees present when the range was operational, eliminating all exposure pathways and the short-term and long-term explosive hazards. This alternative would achieve the RAOs and comply with applicable regulations as specified in the final ARARs. Subsurface clearance is a proven method for MEC remediation and is accepted by stakeholders as an effective remedy.
- **Implementability:** This alternative is considered technically and administratively feasible, and services to perform the clearance activities are readily available. Coordination with municipal and private landowners would be required to schedule field activities, and contractors performing the work would be required to prepare the planning documents, and comply with all licensing and documentation requirements for handling and transporting explosives as required for MEC destruction. Facilities are available to perform the required demilitarization of MD recovered from the sites and the disposition of soil impacted by energetic MC. The tree survey and clearance is considered less feasible compared to the other alternatives presented within this FS because of access limitations due to the thick vegetation and steep terrain. The removal of MEC within trees may also pose a greater risk than any MEC remaining in-situ.
- **Cost:** Costs shown in **Section 11.3.5** (**Table 11-4**) were developed utilizing an estimated acreage per day for each alternative. Cost estimates include all of the cost elements listed in **Section 11.2.4**. Surface and subsurface clearance costs also would be incurred and are shown separately. LUCs would be implemented as described in Alternative 2.

10.2.6 Range of Appropriate Alternatives

Alternative 1, the no action alternative is applicable to all MRSs. The other alternatives are applicable to the areas where there is a remaining hazard associated with munitions, specifically the Range Complex No. 1 MRS. Since the Range Complex No. 1 MRS is the only area identified to contain a hazard associated with munitions it is the only MRS retained for evaluation. Due to the lack of evidence of MEC in the Range Complex No. 1 (a) MRS and the Range Complex No. 1 (b) MRS these MRSs are no longer being retained for the detailed analysis of alternatives. **Table 10-1** presents a summary of the screening and range of appropriate alternatives for the Range Complex No. 1 MRS.

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Table 10-1 Screening Individual Remedial Alternatives, Range Complex No. 1 MRS

No.	Alternative	Major Components	Screening Criteria			Retained?
			Effective?	***Implementable?***	***Cost Prohibitive?***	
1	No Action Alternative	• Required by NCP for comparison purposes only • No MEC clearance would be conducted • No LUCs would be implemented	No Does not provide any protection from the MEC hazards associated with the MRS.	Yes	No No Cost	Yes
2	Land Use Controls	• Maintaining a dedicated former PACR webpage on the City of Port Angeles website (or other location) • Providing informational materials and website link at City of Port Angeles offices • Providing materials to agencies issuing hunting and fishing licenses to distribute to hunters and anglers • Providing materials to local libraries and other appropriate public venues • Posting signs at strategic access points • Establishing a process to modify or transfer the LUCs in the event the property is transferred from City of Port Angeles or other property owners control • Installation of approximately 10,500 linear feet of a six-foot tall chain link fence (limited to the 105.7 acres of the Range Complex No. 1 MRS) • Five-year reviews would be conducted	Yes Fencing reduces receptor exposure to MEC hazards. Reduces risk by providing information to land owners and public. Fact sheets and website will provide hazard recognition to reduce chance of exposure.	Yes Methods for this alternative are all proven, well-established, and administratively feasible.	No Low Cost	Yes
3	Surface Clearance and LUCs	• LUCs as described above in item 2 • 100% coverage non-intrusive removal action of MEC located on the ground surface • Five-year reviews would be conducted	Yes Somewhat effective in meeting RAOs since MEC on the surface would be removed.	Yes Methods for this alternative are all proven, well-established, and administratively feasible.	No Moderate Cost	Yes
4	Surface Clearance, Subsurface Clearance, and LUCs	• LUCs as described above in item 2 • 100% coverage non-intrusive removal action of MEC located on the ground surface • MEC clearance to a fixed depth of 18 inches bgs • Five-year reviews would be conducted	Yes Effective in meeting RAOs; however, the potential for MEC within tree trunks would still exist.	Yes Remedial action methods for this alternative are all proven, well-established, and administratively feasible; skilled labor readily available from MEC clearance.	Yes Moderate to High Cost	Yes
5	Surface Clearance, Subsurface Clearance, Tree Survey and Clearance, and LUCs	• LUCs as described above in item 2 • 100% coverage non-intrusive removal action of MEC located on the ground surface • MEC clearance to a fixed depth of 18 inches bgs • A tree survey would be conducted to identify what trees would have been present during the period when the range was operational • MEC would be removed from the trees • Five-year reviews would be conducted	Yes Fully effective in meeting RAOs and is the UU/UE alternative.	Yes Remedial action methods for this alternative are all proven, well-established, and administratively feasible; skilled labor readily available from MEC clearance.	Yes High Cost	Yes

Notes:
bgs – below ground surface
LUC – Land Use Control
MEC – Munitions and Explosives of Concern
MRS – Munitions Response Site
NCP – National Oil and Hazardous Substances Pollution Contingency Plan
PACR – Port Angeles Combat Range
RAO – Remedial Action Objective
UU/UE - Unrestricted Use/Unrestricted Exposure

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11.0 Detailed Analysis of Alternatives

11.1 Introduction

The detailed analysis of alternatives relative to the CERCLA criteria is presented in this section. Comparative analysis of the alternatives and a table summarizing the results and scoring for each alternative is also presented.

The purpose of the detailed analysis of alternatives is to evaluate and compare the alternatives remaining after the initial screening. Section 300.430(e) (9) (iii) of the NCP describes the nine criteria for evaluating and comparing alternatives. During the detailed analysis, the alternatives are individually evaluated and then compared to one another with regard to their relative performance against each of the criteria. The nine criteria are described below.

The first two criteria are **Threshold Criteria**, or requirements each alternative must meet or have specifically waived to be eligible for selection.

1. Criterion for Protectiveness of Human Health and the Environment – The overall protectiveness of an alternative is a combination of the magnitude of the residual risk/hazard following the action and the short-and long-term effectiveness of the alternative. The MEC HA results are used qualitatively to evaluate the relative protection associated with the alternatives.
2. Compliance with ARARs and TBCs – Evaluation of this criterion is based on the statutory laws and regulations and any other identified state or federal guidance or policies as applicable to the site and alternatives. The alternatives are evaluated with regard to their ability to comply with ARARs and TBCs.

The next five criteria are **Balancing Criteria**, and form the basis for performance comparison among alternatives that meet the Threshold Criteria.

3. Permanence and long-term effectiveness – this criterion evaluates the degree to which the alternative permanently reduces or eliminates the explosive hazard for MEC, the magnitude of residual risk/hazard with the alternative in place, and the effectiveness of controls to manage the residual risk/hazard. Non-clearance alternatives (NA and LUCs) have negligible impact in reducing MEC sources and explosive exposure hazards since no MEC will be removed as a direct consequence of implementing these alternatives.
4. Reduction of toxicity, mobility, or volume through treatment – This is a balancing criterion that assesses the degree to which the alternatives employ recycling or treatment reducing toxicity, mobility, or volume. For MEC, the toxicity and volume are not directly relevant. Therefore, the volume reduction or removal of MEC is the primary factor used to evaluate a MEC alternative. As previously noted, there were no unacceptable risks to human health or the environment for MC, therefore the alternatives evaluation is focused to the reduction of the hazards associated with MEC.
5. Short-term effectiveness – this criterion addresses the potential consequences and effects of an alternative during the implementation phase. Short-term risks address adverse impacts to the workers, community, and the environment during the implementation phase of the action.
6. Implementability – This criterion can include technology and administrative requirements. Technical requirements may include access due to terrain, vegetation, soils, water, or hazards; availability of technology and equipment; ability to determine effectiveness; and the ability to

integrate munitions responses with other environmental actions. Administrative requirements may include the ability to implement and enforce deed restrictions, covenants, etc.

7. Cost – Cost is a balancing criterion used to evaluate the capital cost, annual Operations and Maintenance (O&M) cost, and net present value cost associated with each alternative. Cost estimates developed at this stage should have a desired accuracy of -30% to +50%.

The last two criteria are **Modifying Criteria** considered in remedy selection, and are typically not formally evaluated at the FS stage. Therefore, they are not addressed in the comparative assessments of alternatives in the following sections of this FS.

8. Regulatory Acceptance – this criterion cannot be fully evaluated at this stage and will be evaluated following comment on the RI report, FS and the proposed plan regarding the regulators' preferences or concerns about the alternatives, and prior to remedy selection.
9. Community Acceptance – this criterion cannot be fully evaluated at this stage and is generally the last stage of the process prior to remedy selection, and is evaluated when the PP has been issued and the public meeting and comment period has been conducted so that community members' preferences or concerns have been provided. Community acceptance can be estimated based on community outreach efforts.

For the alternatives analysis, the Threshold and Balancing criteria were analyzed and a relative score from zero to 10 was assigned for each alternative and criterion. A value of zero represents the poorest performance while a value of 10 represents the best performance. The results are compiled in tables following the comparative analysis discussion for all of the alternatives. Due to the lack of evidence of MEC in the Range Complex No. 1 (a) MRS and the Range Complex No. 1 (b) MRS these MRSs were not retained for the detailed analysis of alternatives.

11.2 Individual Analysis of Alternatives

11.2.1 Alternative 1 – No Action

The NA alternative is included as a baseline for comparison against all other alternatives. For this alternative, no action would be taken at any of the MRSs.

11.2.1.1 ALTERNATIVE – NA DESCRIPTION

The NA alternative does not reduce MEC hazard and therefore does not meet the threshold criterion for protectiveness or the balancing criteria for long-term effectiveness or reduction of volume of MEC as no MEC would be removed and all exposure pathways would remain intact. This alternative represents the MEC HA baseline condition. The MEC HA baseline hazard levels is 2 for the Range Complex No. 1 MRS. As no direct action would be taken, there is no short-term effect upon workers or site visitors. No costs or implementation limitations are associated with this alternative. It is carried through the FS as specified in the NCP. The NA alternative scores were assigned as follows:

1. Protectiveness – 0
2. ARARs compliance – Not Applicable (N/A)
3. Permanence and long-term effectiveness – 0
4. Reduction in mobility, toxicity, or volume – 0
5. Short-term effectiveness – 10
6. Implementability – 10
7. Cost – 10

11.2.2 Alternative 2 – Land Use Controls for Site Visitors and Workers

11.2.2.1 ALTERNATIVE 2 – DESCRIPTION

Alternative 2, LUCs for Site Visitors and Workers, includes ECs such as warning and restricted access informational signs and fencing to further restrict access. ICs include administrative controls prohibiting intrusive activities and timber harvesting without proper notifications and procedures. If the property is transferred at some time in the future, the LUCs would need to be included as restrictive covenants and deed restrictions in the property transfer documents. In addition, ICs include development and maintenance of a website to provide information, and coordination with local agencies, public venues, and vendors to distribute site visitor information. This might include agencies issuing hunting and fishing permits and local libraries. The LUCs that apply specifically to site workers would include developing and distributing training and educational materials and programs for workers performing road maintenance or construction or forest and watershed management projects that could result in more extensive intrusive activities. Preparation of an ICIAP will be required, along with provision for preparing periodic updates, possibly following five-year reviews.

This alternative is also included as components of the surface, subsurface and tree survey and clearance alternatives and is retained for the Range Complex No. 1 MRS.

11.2.2.2 ALTERNATIVE 2 – ASSESSMENT

The LUC alternative does not meet the Threshold Criterion for hazard reduction, and has permanence or long-term effectiveness in that it provides for increasing receptor awareness but it would not reduce the volume of MEC as no MEC would be removed and all exposure pathways would remain intact. The MEC HA hazard levels are not reduced and are the same as for the baseline condition because no MEC would be removed under this alternative. The MEC HA baseline hazard level is 2 for the Range Complex No. 1 MRS. However, implementing the LUCs promotes increased awareness and provides at least a low level of protectiveness.

As no direct action would be taken, there is no short-term effect upon workers, site visitors, or the environment. This alternative can be quickly implemented. Costs are low relative to the clearance alternatives.

Based on the screening evaluation, this alternative was retained for the Range Complex No. 1 MRS and LUCs were combined with other response actions for Alternatives 3-5. Scoring for LUCs was assigned as follows:

1. Protectiveness – 3
2. ARARs compliance – N/A
3. Permanence and long-term effectiveness – 4
4. Reduction in mobility, toxicity, or volume – 0
5. Short-term effectiveness – 10
6. Implementability – 7
7. Cost – 9

11.2.3 Alternative 3 – Surface Clearance and LUCs

11.2.3.1 ALTERNATIVE 3 – DESCRIPTION

This alternative includes a surface clearance and LUCs. Surface clearance consists of up to 100% visual survey coverage to locate, identify, and remove any MEC found on the surface. Any MEC found would be disposed using BIP procedures if it was unsafe to move, or moved to a central location for consolidated disposal. All field activities would be coordinated with the WDOE to ensure compliance with ARARs related to wildlife protection and management, and all required permits or licenses would be obtained. The surface clearance would be performed by qualified individuals and all MEC identification and disposal activities would be performed by UXO technicians. Prior to and following the surface clearance, LUCs would be implemented, including installing warning signs, developing and distributing educational materials and installation of a fence to restrict access to areas containing MEC and MD. Alternative 3 was retained for the Range Complex No. 1 MRS.

11.2.3.2 ALTERNATIVE 3 – ASSESSMENT

This alternative meets the Threshold Criteria for protectiveness and compliance with ARARs. The MEC HA score for this alternative shows reduced hazard relative to the baseline condition and LUCs alone. For the surface clearance alternative, the MEC HA hazard level is 2 for the Range Complex No.1 MRS.

Surface clearance provides long-term effectiveness and reduction in volume of MEC in that surface MEC would be removed, but the potential for future exposure of buried MEC would remain. There is some risk to site workers performing surface clearance activities both due to possible challenging site conditions related to working in varied and steep terrain, and potential for exposure to MEC. There are extensive areas with thick vegetation and downed trees where the ground surface is obscured. Vegetation clearance may be conducted with a small piece of power equipment; such as a walk behind brush hog. For MEC disposal activities, notifications and exclusion zones would be established as specified in the ESS developed for the site, but these exclusions would be limited to the short timeframe required to set up and complete the disposal activities. If MEC is consolidated to a central location prior to disposal, appropriate exclusion, and limits to access would be employed to ensure protection of all site workers and visitors, but would be limited in extent and duration. Based on these considerations, short-term effectiveness is moderate.

Alternative 3 can be implemented in the Range Complex No. 1 MRS, with the exception of the unsurveyable terrain. However, there may be some limitations to performing 100% surface clearance due to terrain and access limitations, therefore implementability is scored as moderate. Costs are considered moderate relative to LUCs and subsurface clearance. LUC costs for this alternative are assumed to be equivalent to Alternative 2.

Based on this assessment, scoring was assigned as follows for Alternative 3:

1. Protectiveness – 6
2. ARARs compliance – 10
3. Permanence and long-term effectiveness – 6
4. Reduction in mobility, toxicity, or volume – 8
5. Short-term effectiveness – 7
6. Implementability – 7
7. Cost – 7

11.2.4 Alternative 4 – Surface Clearance, Subsurface Clearance, and LUCs

11.2.4.1 ALTERNATIVE 4 – DESCRIPTION

This alternative includes a surface and subsurface clearance using analog geophysics (i.e., mag and dig with Schonstedt magnetometers). Analog geophysics was selected as a representative subsurface technology. For this alternative the surface clearance and subsurface clearance would happen concurrently. All surface and subsurface MD and MEC found within the clearance areas will be removed. If there is vegetation that prevents the deployment of the analog sensors, some vegetation removal may be required. The subsurface investigation performed during the RI indicated that the extent of MD within the impact areas is shallow and nearly all items were found within 18 inches of the surface. The analog geophysical sensors are capable of detecting the suspected MEC items to these depths so clearance to detected depth is readily achievable. Any MEC found during surface and subsurface clearance activities would be disposed of using Blow-in-Place (BIP) procedures if it was unsafe to move, or moved to a central location for consolidated disposal. All field activities would be coordinated with the WDOE to ensure compliance with ARARs related to wildlife protection and management, and all required permits or licenses would be obtained. The surface and subsurface clearance activities would be performed by qualified individuals and all MEC identification and disposal activities would be performed by UXO technicians. Because there would be limited potential for MEC to remain, LUCs would be implemented following the clearance activities.

This alternative was retained for the Range Complex No. 1 because this MRS has the potential for subsurface MEC.

11.2.4.2 ALTERNATIVE 4 – ASSESSMENT

This alternative meets the Threshold Criteria for protectiveness and compliance with ARARs. The MEC HA score for this alternative shows reduced hazard relative to the baseline condition, LUCs, and the surface clearance and LUCs described in Alternatives 1, 2 and 3. For the subsurface clearance alternative, the MEC HA hazard level is 2 for the Range Complex No. 1 MRS. Subsurface clearance provides long-term effectiveness and reduction in volume of MEC in that all surface and subsurface MEC would be removed within the clearance areas. Based on the RI, the vertical extent of subsurface munitions is expected to be approximately 18 inches bgs. There is some risk to site workers performing surface and subsurface clearance activities due to both possible challenging site conditions and terrain, and potential for exposure to MEC. There could be environmental impacts due to the disturbance caused by the surface clearance and excavations. Complete vegetation removal would not be anticipated for the clearance activities. For MEC disposal activities, notifications and exclusion zones would be established as specified in the ESS developed for the site, but these exclusions would be limited to the short timeframe required to set up and complete the disposal activities. If MEC will be consolidated to a central location prior to disposal, appropriate exclusion, and limits to access would be employed to ensure protection of all site workers and visitors, but would be limited in extent and duration. Based on these considerations, short-term effectiveness is scored as moderate.

Alternative 4 would be performed within the one MRS (Range Complex No. 1) that contains impact and target areas. This area should be mostly accessible for deploying analog geophysical sensors (e.g. Schonstedt magnetometers); therefore, implementability is scored as moderate. The unsurveyable areas would not be included in any clearance activities. Costs are considered high

relative to the LUC and surface clearance alternatives because all identified MEC/MD in the surface and subsurface would be located and removed. Costs for this alternative are higher with respect to alternatives 1 through 3 because of the higher cost to excavate the subsurface anomalies.

Based on this assessment, scoring was assigned as follows:

1. Protectiveness – 9
2. ARARs compliance – 10
3. Permanence and long-term effectiveness – 9
4. Reduction in mobility, toxicity, or volume – 9
5. Short-term effectiveness – 6
6. Implementability – 6
7. Cost – 5

11.2.5 Alternative 5 – Surface Clearance, Subsurface Clearance, Tree Survey and Clearance, and LUCs

11.2.5.1 ALTERNATIVE 5 – DESCRIPTION

This alternative includes surface and subsurface clearance using analog geophysics and then removal of any trees that were believed to be present in the late 1940s when the Range Complex No. 1 MRS was operational. The surface and subsurface clearance would be performed as described above in Alternative 4. For this alternative, a professional consulting forester would be employed to assist in determining the age of the trees. Trees that are considered to be of the optimum age would be evaluated by UXO Technicians. Any metallic anomalies identified by the UXO technicians would be addressed by either inspection or disposal to certify the tree as free from explosive hazards.

This alternative was retained for the Range Complex No. 1 because this MRS has the potential for the presence of MEC.

11.2.5.2 ALTERNATIVE 5 – ASSESSMENT

This alternative meets the Threshold Criteria for protectiveness and compliance with ARARs. The MEC HA score for this alternative shows reduced hazard relative to the baseline condition, LUCs, surface clearance, and subsurface clearance described in Alternatives 1 through 4. For this alternative, the MEC HA hazard levels is 3 for the Range Complex No. 1 MRS. Surface and subsurface clearances and tree survey clearances provide long-term effectiveness and a reduction in volume of MEC because all detected MEC present within the Range Complex No. 1 MRS would be removed. There is some risk to site workers performing clearance activities due to both possible challenging site conditions and terrain, and potential for exposure to MEC. There could be environmental impacts due to the disturbance caused by the subsurface clearances and tree survey and clearance. Complete vegetation removal would not be anticipated for the clearance activities. For MEC disposal activities, notifications and exclusion zones would be established as specified in the ESS developed for the site, but these exclusions would be limited to the short timeframe required to set up and complete the disposal activities. If MEC will be consolidated to a central location prior to disposal, appropriate exclusion, and limits to access would be employed to ensure protection of all site workers and visitors, but would be limited in extent and duration. Based on these considerations, short-term effectiveness is scored as moderate. This alternative would be performed within identified impact areas.

Alternative 5 would be performed within the one MRS (Range Complex No. 1) that contains impact areas. This area should be mostly accessible for deploying teams to perform the surface and subsurface clearances and the tree surveys and removal. It is anticipated that there will be some trees that won't be accessible by the required equipment to evaluate metallic anomalies in trees; therefore, implementability is scored as moderate. The unsurveyable areas would not be included in any clearance activities. Costs are considered high relative to the four other alternatives because all identified MEC/MD would be located and removed. Costs for this alternative is the highest among all of the alternatives evaluated because of the higher cost to deploy the foresters, timber harvesters, UXO technicians, wildlife biologists, and community fire safety professionals, and removal of all anomalies that have signals would be required.

Based on this assessment, scoring was assigned as follows:

1. Protectiveness – 10
2. ARARs compliance – 10
3. Permanence and long-term effectiveness – 9
4. Reduction in mobility, toxicity, or volume – 10
5. Short-term effectiveness – 5
6. Implementability – 3
7. Cost – 2

11.3 Comparative Analysis of Alternatives

For the comparative analysis, the ranks for each alternative were compiled and summed to support evaluation of the performance and effectiveness of the applicable alternatives for the Range Complex No. 1 MRS. The following comparative analysis presents a narrative discussion describing the strengths and weaknesses of the alternatives relative to one another with respect to each criterion, and how reasonable variations of key uncertainties could change the expectations of their relative performance.

11.3.1 Protectiveness and ARARs Compliance

The protectiveness criterion evaluation provides a check to assess whether each alternative provides adequate protection of human health and the environment. The overall assessment incorporates the assessments for long-term effectiveness and permanence, and short-term effectiveness. Compliance with ARARs and TBCs is a requirement for any alternative to be considered feasible, with the exception of the baseline NA alternative.

The protectiveness criterion evaluation provides a check to assess whether each alternative provides adequate protection of human health and the environment. The overall assessment incorporates the assessments for long-term effectiveness and permanence, and short-term effectiveness. Compliance with ARARs and TBCs is a requirement for any alternative to be considered feasible, with the exception of the baseline NA alternative.

Alternative 1, NA is included per the NCP to provide a baseline against which all other alternatives can be compared. It does not meet the protectiveness criterion as no reduction in MEC hazard would be achieved and it therefore has no long-term effectiveness with regard to removing MEC or exposure pathways. As no action would be taken, ARARs compliance and short-term effectiveness criteria do not apply.

Alternative 2, LUCs for Site Visitors and Site Workers, provides a moderate level of protectiveness by restricting access and preventing intrusive activities. Fencing may be installed to further restrict access if trespassing is a concern. The LUCs would be transferred to new landowners if property within the MRS impacted by munitions is ever transferred. Alternative 2 also provides limited protectiveness and possible reduction in exposure to MEC hazards through education and training.

Alternative 3, Surface Clearance and LUCs, provides a moderate level of protectiveness within the clearance areas. For Alternative 3, the Range Complex No. 1 MRS would be cleared and would achieve a moderate level of protectiveness, especially if 100% coverage is achieved. Completion of a surface clearance should remove all MEC located on the ground surface and remove surface exposure pathways. Long-term effectiveness of this alternative is considered to be moderate for impact areas in that subsurface MEC would remain and could be exposed through frost heave or erosion, or it could be transported and exposed by mudslides. There is a much lower probability for subsurface MEC outside the impact areas so the long-term effectiveness for this alternative is considered high in the clearance areas. Because of the potential for subsurface MEC, it is possible that additional monitoring or removal activities may be recommended in a Five-Year Review after implementation of a surface clearance remedy. LUCs also would be implemented to mitigate any remaining hazard by promoting awareness of the potential hazard to all site users and providing training for any site workers (e.g. wildlife biologists or utility workers). Short-term effectiveness is moderate since there would be some MEC exposure hazard associated with clearance activities. However, the requirement to have the clearance activities led by qualified UXO technicians and to have appropriate ESS and health and safety plans in place mitigate the hazard and safety risks as much as possible.

All activities associated with this alternative would comply with ARARs. In particular, coordinating field activities regarding wildlife or habitat disturbance with the WDOE would be conducted, and requirements for compliance with OSHA standards, explosives transport and handling, and MEC disposal procedures would be met.

Alternative 4, Surface Clearance, Subsurface Clearance, and LUCs, provides a high level of protectiveness by removing both surface and subsurface MEC. Subsurface clearance alternatives are considered feasible only for the Range Complex No. 1 MRS because of the likelihood of the presence of subsurface MEC.

With this alternative, it is possible that some MEC would be missed and exposure pathways and MEC hazard cannot be assumed to be completely eliminated; therefore, LUCs would be implemented. All activities for these alternatives would comply with ARARs. In particular, coordinating field activities regarding wildlife or habitat disturbance with the WDOE would be conducted, and requirements for compliance with OSHA standards, explosives transport and handling, and MEC disposal procedures would be met.

Alternative 5, Surface Clearance, Subsurface Clearance, Tree Survey and Clearance, and LUCs, provides the highest level of protectiveness by removing both surface and subsurface MEC, as well as MEC imbedded in trees. This alternative is considered feasible only for the Range Complex No. 1 MRS because of the likelihood of the presence of subsurface MEC and MEC in trees.

With this alternative, it is possible that some MEC would be missed and exposure pathways and MEC hazards cannot be assumed to be completely eliminated; therefore, LUCs would be implemented. All activities for this alternative would comply with ARARs. In particular, coordinating field activities regarding wildlife or habitat disturbance with the WDOE would be conducted, and requirements for compliance with OSHA standards, explosives transport and handling, and MEC disposal procedures would be met.

11.3.2 Long-Term Effectiveness and Permanence

This criterion addresses the results of a remedial action in terms of the risk remaining at the site after response objectives have been met. For the three MRSs, rather than evaluating the remaining risk, the remaining explosive hazard posed by MEC is addressed since MC was not reported at levels that could pose a risk to human or ecological receptors. This criterion is evaluated in terms of the magnitude of residual hazard, adequacy of the response action in limiting the hazard, and the required LUCs and any long-term monitoring that may be required.

Alternative 1, NA, represents the baseline conditions for comparison with the other alternatives. The NA alternative provides no hazard reduction and does not reduce or eliminate any exposure pathways.

Alternative 2, LUCs for Site Visitors and Site Workers, provides hazard reduction in that access to the MRSs would be restricted and administrative controls prohibiting intrusive activities would be documented. Exposure pathways would be not be eliminated but would be reduced through limiting access. Development of supplemental informational and educational materials alone would not provide direct hazard reduction.

The MEC HA results indicate no reduction in the hazard level for any of the MRSs for this alternative. However, this alternative is still considered feasible and as a component of Alternatives 3, 4, 5. This alternative is considered applicable for all three MRSs either alone or as a component of the clearance alternatives.

Alternative 3, Surface Clearance and LUCs provide the next greatest reduction in explosive hazard since MEC present on the surface would be found and removed within the clearance areas, thus removing the surface exposure pathway for at least the short term. Surface clearance may not offer a long-term or permanent solution in areas where there is moderate or high probability of subsurface MEC because the subsurface MEC could be exposed through frost heave, erosion, or mudslides. For this reason, the MEC HA Hazard Level Category is reduced by one level for the MRSs where surface clearance is considered implementable. LUCs would be required following implementation of surface clearance to promote and maintain user awareness and provide training for site workers.

Alternative 4, Surface Clearance, Subsurface Clearance, and LUCs, provides the next greatest reduction in explosive hazard. Alternative 4 was retained only for the Range Complex No. 1 MRS because of the potential for subsurface MEC to be present. Subsurface clearance was not retained for the Range Complex No. 1 (a) MRS or the Range Complex No. 1 (b) MRS because of the lack of evidence of a target or impact area. Based on the MEC HA results, subsurface clearance reduces the hazard ranking from the high potential hazard conditions (Hazard Level 2) to moderate potential hazard conditions (Hazard Level 3) for the Range Complex No. 1 MRS. The subsurface exposure

pathway would be minimized or possibly eliminated altogether in the areas that undergo subsurface clearance.

Under this alternative, all anomalies with signals that exceed a specified threshold are excavated and result in a low but non-zero probability for MEC to remain following implementation, so LUCs are included as part of the alternative to promote and maintain user awareness. This alternative is proposed only for consideration for the Range Complex No. 1 MRS since it includes areas with the greatest probability for exposure and for subsurface MEC to be present.

Alternative 5, **Surface Clearance, Subsurface Clearance, Tree Survey and Clearance, and LUCs**, provides the greatest reduction in explosive hazard and the most permanent and effective solutions for the long term in the clearance areas. Alternative 5 was retained only for the Range Complex No. 1 MRS because of the potential for subsurface MEC to be present. Based on the MEC HA results, subsurface clearance reduces the hazard ranking from the high potential hazard conditions (Hazard Level 2) to moderate potential hazard conditions (Hazard Level 3) for the Range Complex No. 1 MRS. This is the greatest hazard reduction indicated among all of the alternatives. Alternative 5 was not retained for the Range Complex No. 1 (a) MRS or the Range Complex No. 1 (b) MRS because of the lack of evidence of an impact or target area.

Under this alternative, all anomalies with signals that exceed a specified threshold are excavated and result in a low but non-zero probability for MEC to remain following implementation, so LUCs are included as part of the alternative to promote and maintain user awareness. This alternative is proposed only for consideration for the Range Complex No. 1 MRS since it includes areas with the greatest probability for exposure and for subsurface MEC and MEC imbedded in trees to be present.

11.3.3 Short-Term Effectiveness

Short-term effectiveness considers worker and community safety, as well as ecological and cultural impacts associated with implementing each alternative for the MRSs. Worker and community safety is addressed through LUCs such as exclusion zones or other access limitations. Ecological impacts could be related to disturbance during clearance activities.

Alternative 1, NA has no short-term impacts to site workers, visitors, or the environment so short-term effectiveness is high. There would be no limitations to access, or safety risks for site workers, and there would be no ecological disturbance associated with this alternative.

Alternative 2, LUCs for Site Visitors and Site Workers has negligible short-term impacts to visitors or the environment related to installation of ECs such as signs or fencing. There would be minimal impacts on ecological receptors as well.

Alternative 3, Surface Clearance and LUCs, would pose some risk to site workers due to the physical challenges of working in varied terrain, and the potential for exposure to MEC hazards. There is some potential for environmental impacts if any vegetation must be removed as part of the action. The Range Complex No. 1 MRS is the only area considered for surface clearance. For MEC disposal activities, some site access limitations would be temporarily imposed to ensure both worker safety and to keep site visitors well outside the area. These exclusions would be limited to the short timeframe required to set up and complete the disposal activities. If MEC will be consolidated to a central location prior to disposal, appropriate exclusion and limits to access would be employed to

ensure protection of all site workers and visitors, but these limitations also would be limited in extent and duration.

Alternative 4, Surface Clearance, Subsurface Clearance, and LUCs, would pose the next greatest risk to site workers due to the subsurface excavation activities required in addition to surface clearance hazards and terrain challenges. There would be short-term environmental effects because of the excavations performed and possible requirements for vegetation removal. Based on the subsurface investigation performed during the RI, the excavations would not be expected to be much deeper than 18 inches, and would be manually performed. Only small mechanized equipment (e.g., walk behind brush hog) would be used for vegetation removal. No mechanized equipment that could cause more short-term environmental impacts would be used. Following the removal of the MEC or MD associated with the anomalies, the holes would be backfilled. Additionally, the excavation procedures could specify that the native vegetation be preserved and replaced upon backfilling to minimize the impacts or to be re-seeded with native grasses.

The short-term risks related to MEC disposal and handling would be the same as for surface clearance with the possible difference in the number of disposal operations required because greater numbers of MEC items could be found. For MEC disposal activities, some site access limitations would be temporarily imposed to ensure both worker safety and to keep site visitors well outside the area. These exclusions would be limited to the short timeframe required to set up and complete the disposal activities. If MEC can be consolidated to a central location prior to disposal, appropriate exclusion and limits to access would be employed to ensure protection of all site workers and visitors, but these limitations also would be limited in extent and duration.

Alternative 5, **Surface Clearance, Subsurface Clearance, Tree Survey and Clearance, and LUCs**, would pose the greatest risk to site workers due to the timber harvesting activities required in addition to surface and subsurface clearance hazards and terrain challenges.

The short-term risks related to MEC disposal and handling would be the same as for surface and subsurface clearances with the possible difference in the number of disposal operations required because greater numbers of MEC items could be found. For MEC disposal activities, some site access limitations would be temporarily imposed to ensure both worker safety and to keep site visitors well outside the area. These exclusions would be limited to the short timeframe required to set up and complete the disposal activities. If MEC can be consolidated to a central location prior to disposal, appropriate exclusion and limits to access would be employed to ensure protection of all site workers and visitors, but these limitations also would be limited in extent and duration. The removal of MEC hazards from trees is extremely hazardous since MEC would likely require a BIP while the tree is still intact. This poses the risk of the tree falling while the MEC is destroyed or the possible ignition of a forest fire.

11.3.4 Implementability

Implementability considerations include both technology and administrative requirements associated with performing each alternative. Technical requirements are related to site access issues such as terrain, accessibility in terms of the distance from roads or trails that must be navigated to perform the field activities, available technologies, and availability of equipment and trained personnel. Administrative requirements include access due to ownership, coordination required to schedule and perform site activities, timeframe for implementation, any legal considerations, and funding

availability. The tree survey and clearance alternative addresses all media and receptors that could potentially contain MEC and MC and is considered the Unrestricted Use/Unrestricted Exposure (UU/UE) alternative.

Alternative 1, NA requires no technology or administrative coordination to implement, so it ranks highest in terms of ease of implementability.

Alternative 2, LUCs for Site Visitors and Site Workers could be quickly implemented over the majority of the MRSs. Stakeholders would need to coordinate to prepare the ICIAP, and the USACE would need to identify funding mechanisms. The expertise and professional services are readily available to develop the elements that would likely be included, such as training materials and informational signs, and UXO technicians. Coordination among stakeholders would be required to develop a final plan. Primary considerations for implementing these alternatives are the need to determine funding sources and stakeholder responsibilities for:

- Preparing and distributing materials, maintaining a website
- Monitoring and replacing signs as needed
- Installation of fencing

Implementing and enforcing deed restrictions on privately owned land will be difficult and likely impossible. The majority of the MRS impacted by munitions is owned by the City of Port Angeles and would likely not have any issues implanting such restrictions.

Alternative 3, Surface Clearance and LUCs is possible for the Range Complex No. 1 MRS. Surface clearance could be implemented at this location with the exception of any areas too steep or heavily vegetated for access. This alternative was not retained for the remaining MRSs because they are not likely impacted by munitions. These observations were based on extensive visual survey coverage, so the potential for MEC/MD remaining within these MRSs is considered to be low.

The Range Complex No. 1 MRS is mostly accessible from existing roads and trails. This MRS is located within property owned and managed by the City of Port Angeles; therefore, access coordination would only need to be addressed with the City of Port Angeles. Field teams performing surface clearance would need to include certified UXO technicians. Field equipment includes analog geophysical sensors (e.g., Schonstedt magnetometers) and a GPS unit to record recovered features. The field season is generally unlimited; however, the time of year with more sunlight would be preferable (April until September). Field efforts also would require coordination with the WDOE to ensure compliance with ARARs related to wildlife protection to ensure there would be no disturbance of wildlife as required during nesting and breeding seasons. There are no significant implementability issues associated with this alternative.

Alternative 4, Surface Clearance, Subsurface Clearance, and LUCs, is applicable for the Range Complex No. 1 MRS. This alternative is implementable and would consider the same factors as described above for Alternative 3.

Alternative 5, Surface Clearance, Subsurface Clearance, Tree Survey and Clearance, and LUCs, is applicable for the Range Complex No. 1 MRS. This is the location where there is greater potential for exposure to MEC imbedded in trees. This alternative is considered implementable; however, it is anticipated that some of the trees that contain the potential to contain MEC may not be accessible. Other factors that would need to be addressed compared to Alternatives 3 and 4 include

the greater potential for forest fires and overhead hazards due to falling trees, and the evaluation/removal of MEC imbedded in trees. Alternative 5 is considered the least implementable compared to the other Alternatives.

11.3.5 Cost

Comparison of costs should be based on the relative order-of-magnitude among the identified alternatives for each MRS. Estimates should represent net present value costs for all components of the alternative, including initial capital costs and any post-removal monitoring costs as appropriate. As recommended in the CERCLA guidance (USEPA, 1988), the desired level of accuracy for this stage of the process is -30% to +50%.

Alternative 1, NA requires no action and therefore has no implementation costs.

Alternative 2, LUCs for Site Visitors and Site Workers costs are the lowest among the alternatives that would require any effort to implement. There are no field deployment costs associated with the primary activities of preparing and updating the ICIAP, maintaining the website, and developing and distributing training and informational materials. Some minimal level of field activity would be required for installing or replacing road and trail signs, and if determined necessary, fencing. This alternative would require long-term implementation to monitor and replace or install signage and fencing, maintain and update the website, distribute informational material, and review and update the ICIAP. If the property were to be transferred from within the MRS impacted by munitions (Range Complex No. 1), the LUCs would need to be incorporated into the property transfer documents.

Table 11-1 Cost Breakdown: LUCs for Site Visitors and Workers

Materials	Field Work	Planning Documents	Project Management	Reporting	Fence Installation	10% Contingency	Total Estimate
$14.6K	$28.8K	$49.5K	$5.0K	$35.3K	$322.3K	$45.6K	**$501.1K**

Alternative 3, Surface Clearance and LUCs costs assume 100% clearance for the Range Complex No. 1 MRS. Cost components included preparation of planning documents and the field effort required to perform the clearance activities. Estimates included the labor, equipment, and costs associated with MEC destruction and MD demilitarization and recycling. LUC costs were also incorporated as developed for Alternative 2. Relative costs for this alternative is lower than for subsurface clearance.

Table 11-2 Range Complex No. 1 Surface Clearance and LUCs

LUCs	Surface Clearance Cost	Planning Docs	Project Management	Land Survey	Reports	10% Contingency	Total Estimate	Cost per Acre
$501.1K	$288.6K	$80.2K	$41.3K	$38.0K	$81.6K	$103.1K	**$1,133.9K**	**$10.7K**

Alternative 4, Surface Clearance, Subsurface Clearance, and LUCs costs are the next highest relative costs among the alternatives due to the additional level of effort required to remove the subsurface MEC hazard.

Table 11-3 Range Complex No. 1 Surface Clearance, Subsurface Clearance, and LUCs

LUCs	Surface and Subsurface Clearance Cost	Planning Docs	Project Management	Land Survey	Reports	10% Contingency	Total Estimate	Cost per Acre
$501.1K	$1,493.2K	$80.2K	$94.5K	$38.0K	$81.6K	$228.9K	**$2,517.5K**	**$23.8K**

Alternative 5, Surface Clearance, Subsurface Clearance, Tree Survey and Clearance, and LUCs costs are the highest relative among the alternatives due to the significant level of effort required to remove the subsurface hazard and remove the MEC imbedded in trees.

Table 11-4 Range Complex No. 1 Surface Clearance, Subsurface Clearance, Tree Survey and Clearance, and LUCs

LUCs	Surface and Subsurface Clearance Cost	Planning Docs	Project Management	Land Survey	Tree Survey and Clearance	Reports	10% Contingency	Total Estimate	Cost per Acre
$501.1K	$1,493.2K	$80.2K	$94.5K	$38.0K	$616.6K	$81.6K	$290.5K	**$3,195.7K**	**$30.2K**

The scores, summed scores, and rankings for applicable alternatives for each MRS to provide a guide to identify the alternative that is the most practicable solution to reducing or eliminating the MEC exposure hazard is presented in **Table 11-5**.

11.4 Conclusions

The information presented within this RI/FS report is intended to assist stakeholders with selecting the most appropriate alternative and to proceed with the next steps of the CERCLA and MMRP process. Once the project team agrees upon a preferred alternative a PP will be prepared. The PP will be presented to the local community at a meeting for input. A formal public comment period will be held for a minimum of 30 days. At the completion of the PP public comment period, any comments received will be addressed by the USACE. A DD will document the selected alternative and the intent to scope further munitions response actions, if any.

Table 11-5 Detailed Analysis of Alternatives

		Threshold Factors			Balancing					
	Alternative	**Overall Protection of Human Health and the Environment**	**Compliance with ARARs and TBCs**	**Pass/ Fail**	**Long-Term Effectiveness and Permanence**	**MECH HA Hazard Level/Score**	**Reduction of Toxicity, Mobility, or Volume by Treatment**	**Short-Term Effectiveness**	**Implementability**	**Value**
1	No Action	Not protective of human health and the environment. No source reduction. No reduction of future hazards	Yes.	Fail	Would not provide any long-term effectiveness or permanence.	2/780	No reduction of source area toxicity, mobility, or volume.	No short-term risks due to no actions required.	Highly implementable due to no actions required.	$0
2	Land Use Controls	Fencing and signs reduce interaction with MEC, thus reducing risk. Source remains; however, and access, although prohibited, is possible.	Yes, should be able to implement LUCs since the majority of the MRS is owned by the City of Port Angeles.	Pass	Can be effective at reducing possible receptor interaction.	2/780	No reduction of source area toxicity, mobility, or volume.	Limited short-term impacts associated with fence/sign installation.	Readily implementable, though installation and maintenance could be challenging due to the location and possible future funding constraints.	$501.1 K
3	Surface Clearance and LUCs	Source area reduction achieved via surface clearance of MEC. Further mitigate residual MEC hazards by reducing potential for interaction via LUCs.	Yes, work plans will identify appropriate protection of any wetlands and sensitive species. Any IDW will be managed and disposed of. All personnel utilizing explosives will be licensed by the State of Washington to acquire, possess, handle and use explosives.	Pass	Provides short-term effectiveness due to MEC source removal from the surface and the implementation of LUCs; however, residual MEC will be present.	3/565	Provides source area reduction of toxicity, mobility, or volume in MEC contaminated areas.	Possible short-term impacts associated with MEC removal.	Readily implementable; clearance requires qualified UXO technicians and specific equipment.	$1,133.9 K
4	Surface Clearance, Subsurface Clearance, and LUCs	Source area reduction achieved via surface clearance of MEC. Further mitigate residual MEC hazards by reducing potential for interaction via LUCs.	Yes, work plans will identify appropriate protection of any wetlands and sensitive species. Any IDW will be managed and disposed of. All personnel utilizing explosives will be licensed by the State of Washington to acquire, possess, handle and use explosives.	Pass	Provides short-term effectiveness due to MEC source removal from the surface and the implementation of LUCs; however, residual MEC may be present embedded within tree trunks.	3/545	Provides source area reduction of toxicity, mobility, or volume in MEC contaminated areas.	Possible short-term impacts associated with MEC removal.	Readily implementable; clearance requires qualified UXO technicians and specific equipment.	$2,157.5 K
5	Surface Clearance, Subsurface Clearance, Tree Survey and Clearance, and LUCs	Source area removal achieved by complete removal of MEC. Further mitigate residual MEC hazards by reducing potential for interaction via LUCs.	Yes, work plans will identify appropriate protection of any wetlands and sensitive species. Any IDW will be managed and disposed of. All personnel utilizing explosives will be licensed by the State of Washington to acquire, possess, handle and use explosives.	Pass	Provides long-term effectiveness due to MEC source removal from surface, subsurface, and the implementation of LUCs.	3/545	Provides source area reduction of toxicity, mobility, or volume in MEC contaminated areas.	Possible short-term impacts associated with MEC removal.	Partially implementable; clearance requires qualified UXO technicians and specific equipment. Access to all of the trees that would have been present when the range was operations would be difficult and robust safety protocols would be required.	$3,195.7 K

Notes:
IDW – Investigation Derived Waste
LUC – Land Use Control
MEC – Munitions and Explosives of Concern
UXO – Unexploded Ordnance

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APPENDIX

Definitions

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Definitions

Anomaly – Any identified subsurface mass that may be geologic in origin, unexploded ordnance (UXO), or some other man-made material. Such identification is made through geophysical investigation and reflects the response of the sensor used to conduct the investigation. (Handbook on the Management of Munitions Response Actions, Interim Final, EPA, May 2005).

Anomaly Avoidance – Techniques employed on property known or suspected to contain unexploded ordnance, other munitions that may have experienced abnormal environments (e.g., discarded military munitions), munitions constituents in high enough concentrations to pose an explosive hazard, or chemical agents, regardless of configuration, to avoid contact with potential surface or subsurface explosive or CA hazards, to allow entry to the area for the performance of required operations. (AF Manual 91-201 and DOD 6055.09-M).

Applicable or Relevant and Appropriate Requirements – Applicable requirements are cleanup standards, standards of control, and other substantive environmental protection requirements promulgated under Federal or state environmental law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at a CERCLA site. Relevant and appropriate requirements are cleanup standards that, while not "applicable," address situations sufficiently similar to those encountered at a CERCLA site where their use is well suited to the particular site. (National Oil and Hazardous Substances Pollution Contingency Plan [NCP], 40 CFR Part 300, July 2005).

Chemical Warfare Materiel (CWM) – Items generally configured as a munition containing a chemical compound that is intended to kill, seriously injure, or incapacitate a person through its physiological effects. CWM includes V- and G-series nerve agents or H-series (mustard) and L-series (lewisite) blister agents in other-than-munition configurations; and certain industrial chemicals (e.g., hydrogen cyanide [AC], cyanogen chloride [CK], or carbonyl dichloride [called phosgene or CG]) configured as a military munition. CWM does not include riot control devices, chemical defoliants and herbicides, industrial chemicals (e.g., AC, CK, or CG) not configured as a munition, smoke and other obscuration producing items, flame and incendiary producing items, or soil, water, debris or other media contaminated with low concentrations of chemical agents where no CA hazards exist. (MRSPP, 32 CFR Part 179, October 2005).

CWM contains the following four subcategories:

1. CWM, explosively configured – All UXO or DMM that contain a CA fill and any explosive component. Examples are M55 rockets with CA, the M23 VX mine, and the M360 105-mm GB artillery cartridge.
2. CWM, non-explosively configured – All UXO or DMM that contain a CA fill but that do not contain any explosive components. Examples are any chemical munitions that do not contain explosive components and VX or mustard agent spray canisters.
3. CWM, bulk container – All discarded (e.g., buried) non-munitions-configured containers of CA (e.g., a ton container) and CAIS K941, toxic gas set M-1 and K942, toxic gas set M-2/E11.
4. Chemical Agent Identification Sets (CAIS) – Military training aids containing small quantities of various CA and other chemicals. All forms of CAIS are scored the same in this rule, except CAIS K941, toxic gas set M-1; and CAIS K942, toxic gas set M-2/E11, which are considered forms of CWM, bulk container, due to the relatively large quantities of agent contained in those types of sets.

Closed Range – A military range that has been taken out of service as a range and that either has been put to new uses that are incompatible with range activities or is not considered by the military to be a potential range area. A closed range is still under the control of a Component. (MGDERP, September 2001).

Conceptual Site Model (CSM) – The CSM is a description of a site and its environment that is based on existing knowledge. It describes sources of MEC or hazardous, toxic, and radioactive waste at a site; actual, potentially complete, or incomplete exposure pathways; current or reasonably anticipated future land use; and potential receptors. The source-receptor interaction is a descriptive output of a CSM. The CSM serves as a planning instrument, a modeling and data interpretation aid, and a communication device among the Project Team.

Defense Sites – Locations that are or were owned by, leased to, or otherwise possessed or used by the Department of Defense. 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 U.S.C. 2710(e) (1)).

Components – The Office of the Secretary of Defense (OSD), the Military Departments, the Defense Agencies, the Department Field Activities, and any other Department organizational entity or instrumentality established to perform a government function. (MRSPP, 32 CFR Part 179, October 2005).

Discarded Military Munitions (DMM) – Military munitions that have been abandoned without proper disposal, or removed from storage in a military magazine or other storage area, for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations. (10 U.S.C. 2710(e) (2)).

Explosive Ordnance Disposal (EOD) – The detection, identification, on-site evaluation, rendering safe, recovery, and final disposal of unexploded explosive ordnance. It may also include explosive ordnance that has become hazardous by damage or deterioration.

Explosive Ordnance Disposal (EOD) Personnel – Active duty military personnel of any military service branch that are trained in the detection, identification, field evaluation, safe rendering, recovery, and final disposal of explosive ordnance and of other munitions that have become an imposing danger, for example, by damage or deterioration. (Handbook on the Management of Munitions Response Actions, Interim Final, EPA, May 2005).

Facility – A building, structure, or other improvement to real property, in relation to work classification. (10 U.S.C. 2801)

Formerly Used Defense Sites (FUDS) – Facility or site (property) that was under the jurisdiction of the Secretary of Defense and owned by, leased to, or otherwise possessed by the United States at the time of actions leading to the contamination by hazardous substances. By the DoD Environmental Restoration Program (ERP) policy, the FUDS program is limited to those real properties that were transferred from DoD control prior to 17 October 1986. FUDS properties can be located within the 50 States, District of Columbia, Territories, Commonwealths, and possessions of the United States. (FUDS Program Policy, ER 200 3-1, May 2004).

Hazardous Substance – (A) Any substance designated pursuant to Section 1321(b)(2)(A) of title 33, (B) any element, compound, mixture, solution, or substance designated pursuant to Section 9602 of this title, (C) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act [42 U.S.C. 6921] (but not including any waste the regulation of which under the Solid Waste Disposal Act [42 U.S.C. 6901 et seq.] has been suspended by Act of Congress), (D) any toxic pollutant listed under section 1317(a) of title 33, (E) any hazardous air pollutant listed under Section 112 of the Clean Air Act [42 U.S.C. 7412], and (F) any imminently hazardous chemical substance or mixture with respect to which the Administrator has taken action pursuant to Section 2606 of Title 15. The term does not include petroleum, including crude oil or any fraction thereof, which is not otherwise specifically listed or designated as a hazardous substance under subparagraphs (A) through (F) of this paragraph, and the term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas). (CERCLA, 42 U.S.C. § 9601 et seq.).

Installation (as defined by the Restoration Management Information System [RMIS] Data Element Dictionary for a Federal Facility Identification [FFID]) – The FFID number is a unique identifier, assigned to an installation/property in RMIS. The 14-character aggregate string is used in RMIS as the key column for each data table and is used to track all associated records for each installation. An installation may have a single range or multiple ranges (and each range may have more than one site contained within its boundaries) and a single or multiple sites, not associated with a range. (Management Guidance for the Defense Environmental Restoration Program, September 2001).

Military Installation – A base, camp, post, station, yard, center, or other activity under the jurisdiction of the Secretary of a Military Department, or, in the case of an activity in a foreign country, under the operational control of the Secretary of a military department or the Secretary of Defense, without regard to the duration of operational control. (10 U.S.C. 2801).

Military Munitions – All ammunition products and components produced for or used by the Armed Forces for national defense and security, including ammunition products or components under the control of the Department of Defense, the Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants; explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives and chemical warfare agents; chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, and demolition charges; and devices and components of any item thereof. The term does not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, nuclear components, other than non-nuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) have been completed. (10 U.S.C. 101(e) (4)).

Military Range – Designated land and water areas set aside, managed, and used to research, develop, test, and evaluate military munitions, other ordnance, or weapon systems, or to train military personnel in their use and handling. Ranges include firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, and buffer zones with restricted access and exclusionary areas. (40 CFR 266.201).

Munitions and Explosives of Concern (MEC) – Military munitions that are 1) unexploded ordnance, as defined in 10 U.S.C. 101(e)(5); 2) abandoned or discarded, as defined in 10 U.S.C. 2710(e)(2); 3) MC (e.g., TNT, RDX) present in soil, facilities, equipment, or other materials in high enough concentrations so as to pose an explosive hazard. (MRSPP, 32 CFR Part 179, October 2005).

Munitions Constituent (MC) – Any material that originates from UXO, DMM, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions. (10 U.S.C. 2710(e) (4)).

Munitions Debris (MD) – Remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal. (DoD 6055.09-M).

Munitions Response – Response actions, including investigation, removal actions, and remedial actions, to address the explosives safety, human health, or environmental risks presented by UXO, DMM, or MC or to support a determination that no removal or remedial action is required. (MRSPP, 32 CFR Part 179, October 2005).

Munitions Response Area (MRA) – Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples include former ranges and munitions burial areas. A munitions response area is comprised of one or more munitions response sites. (MRSPP, 32 CFR Part 179, October 2005).

Munitions Response Site (MRS) – A discrete location within an MRA that is known to require a munitions response. (MRSPP, 32 CFR Part 179, October 2005).

Operational Range – A range that is under the jurisdiction, custody, or control of the Secretary of Defense and that is used for range activities, or although not currently being used for range activities, that is still considered by the Secretary to be a range and has not been put to a new use that is incompatible with range activities. (10 U.S.C. 101(e) (3)).

Ordnance and Explosives (OE) – Military munitions that have been abandoned, expelled from demolition pits or burning pads, lost, discarded, or buried. These include dud-fired UXO, soil presenting explosive hazards, and buildings with explosives residues that present explosion hazards. Note: The term OE has been replaced with the term Munitions and Explosives of Concern (MEC) in more recent publications.

Other than Operational Range – A closed, transferred, or transferring range.

Pollutant and Contaminant – These terms include, but are not be limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations, in such organisms or their offspring; except that the term pollutant or contaminant shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under subparagraphs (A) through (F) of paragraph (14) and shall not include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas). (CERCLA, 42 U.S.C. § 9601 et seq.).

Range Activities – Research, development, testing, and evaluation of military munitions, other ordnance, and weapons systems; and the training of members of the Armed Forces in the use and handling of military munitions, other ordnance, and weapons systems. (10 U.S.C. 101(3) (2)).

Range Related Debris – Debris, other than munitions debris, collected from operational ranges or from former ranges (e.g., target debris, military munitions packaging and crating material). (DoD 6055.09-M).

Relative Risk – The evaluation of individual sites to determine high, medium, or low relative risk to human health and the environment, based on contaminant hazards, migration pathways and receptors, in accordance with the DoD's Risk-Based Site Evaluation Primer. (MGDERP, September 2001).

Removal – The cleanup or removal of released hazardous substances from the environment. Such actions may be taken in the event of the threat of release of hazardous substances into the environment, such actions as may be necessary to monitor, assess, and evaluate the release or threat of release of hazardous substances, the disposal of removed material, or the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment, which may otherwise result from a release or threat of release. The term includes, in addition, without being limited to, security fencing or other measures to limit access, provision of alternative water supplies, temporary evacuation and housing of threatened individuals not otherwise provided for, action taken under Section 9604(b) of this title, and any emergency assistance which may be provided under the Disaster Relief and Emergency Assistance Act [42 U.S.C. 5121 et seq.] The requirements for removal actions are addressed in 40 CFR §§300.410 and 300.415. The three types of removals are emergency, time-critical, and non-time critical removals. (CERCLA, 42 U.S.C. § 9601 et seq.).

There are three types of removals:

1. Emergency – Emergency removal or response is performed when an immediate or imminent danger to public health or the environment is present and action is required within hours. Trained responders identify the explosive threat and make the decision as to whether the munitions and explosive of concern should be moved or blown in place and ensure the threat is removed safely and expeditiously.
2. Time-critical – A response to a release or threat of release that poses such a risk to public health (serious injury or death), or the environment, that cleanup or stabilization actions must be initiated within six months.
3. Non-time critical – An action initiated in response to a release or threat of a release that poses a risk to human health and welfare, or the environment. Initiation of removal cleanup actions may be delayed for six months or more.

Risk Reduction – The movement of any site from a higher to lower relative risk category as a result of natural attenuation, interim remedial, remedial, or removal actions taken. (DoD Instruction 4715.7, Environmental Restoration Program, April 1996).

Site (as defined in the Restoration Management Information System Data Element Dictionary for a SITE_ID) – A unique name given to a distinct area of an installation containing one or more releases or threatened releases of hazardous substances treated as a discreet entity or consolidated grouping for response purposes. Includes any building, structure, impoundment, landfill, storage container, or other site or area where a hazardous substance was or has come to be located, including formerly used sites eligible for building demolition/debris removal. Installations and ranges may have more than one site. (MGDERP, September 2001).

Stakeholder – Groups or individuals who were interested in, concerned about, affected by, who had a vested interest in, or would be involved in the munitions response at an MRA/MRS.

Transferred Range – A property formerly used as a military range that is no longer under military control and had been leased by the DoD, transferred, or returned from the DoD to another entity, including federal entities. This includes a military range that is no longer under military control but was used under the terms of a withdrawal, executive order, special-use permit or authorization, right-of-way, public land order, or other instrument issued by the federal land manager. (MGDERP, September 2001).

Transferring Range – A military range that is proposed to be transferred or returned from the DoD to another entity, including federal entities. This includes a military range that is used under the terms of a withdrawal, executive order, act of Congress, public land order, special-use permit or authorization, right-of-way, or other instrument issued by the federal land manager or property owner. An operational or closed range will not be considered a “transferring range” until the transfer is imminent. (MGDERP, September 2001).

Unexploded Ordnance (UXO) – Military munitions that have been primed, fuzed, armed, or otherwise prepared for action and have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material, and remain unexploded either by malfunction, design, or any other cause. (10 U.S.C. 101(e) (5)).

UXO Technicians – Personnel who are qualified for and filling Department of Labor, Service Contract Act, Directory of Occupations, contractor positions of UXO Technician I, UXO Technician II, and UXO Technician III. (Department of Defense Explosive Safety Board TP18, December 2004).

X-ray Fluorescence (XRF) - Analytical method that uses x-ray tubes to irradiate samples with x-rays. When an atom absorbs the source x-rays, the incident radiation dislodges electrons from the innermost shells of the atom, creating vacancies. The electron vacancies are filled by electrons cascading in from outer electron shells. Electrons in outer shells have higher energy states than inner shell electrons, and the outer shell electrons emit energy as they cascade down into the inner shell vacancies. This rearrangement of electrons results in emission of x-rays character.

APPENDIX

Abbreviations and Acronyms

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Abbreviations and Acronyms

2,4-DNT	2,4-dinitrotoluene
AOI	Areas of Interest
AP	Armor Piercing
ARAR	Applicable or Relevant and Appropriate Requirements
ARC	Annual Report to Congress
ASR	Archive Search Report
AVS	Assisted Visual Surveys
BERA	Baseline Ecological Risk Assessment
bgs	Below ground surface
BIP	Blow-in-Place
btoc	below top of casing
CAIS	Chemical Agent Identification Sets
CDC	Centers for Disease Control
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHE	Chemical Warfare Materiel Hazard Evaluation
CHF	Contamination Hazard Factor
cm	centimeters
COPC	Contaminants of Potential Concern
COPEC	Contaminants of Potential Ecological Concern
CSM	Conceptual Site Models
CWM	Chemical Warfare Materiel
DAS	Data Acquisition System
DD	Decision Document
demil	demilitarization
DERP	Defense Environmental Response Program
DGM	Digital Geophysical Mapping
DHS	Department of Homeland Security
DID	Data Item Description
DMM	Discarded Military Munitions
DoD	Department of Defense

DOE	Department of Energy
DPS	distinct population segment
DQCR	Daily Quality Control Report
DQO	Data Quality Objectives
DSR	Daily Site Report
EC	Engineering Controls
EHE	Explosive Hazard Evaluation
EM	Engineering Manual
EM61-MK2	Geonics EM61-MK2
EO	Executive Order
ERA	Ecological Risk Assessment
ESA	Endangered Species Act
ESQD	Explosive Safety Quantity-Distance
ESS	Explosives Safety Submission
ESTCP	Environmental Security Technology Certification Program
FCR	Field Change Request
FS	Feasibility Study
FTP	File Transfer Protocol
FUDS	Formerly Used Defense Sites
FUDSMIS	FUDS Management Information System
GIS	Geographic Information System
GLONASS	Russian Global Navigation Satellite System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GRA	General Response Action
GSV	Geophysical System Verification
H	High
HA	Hazard Assessment
HE	High Explosive
HEAT	High Explosive Anti Tank
HFD	horizontal fragmentation distance
HGL	Hydro Geologic, Inc.

HHE	Human Health Evaluation
HHRA	Human Health Risk Assessment
Hz	Hertz
Lbs	pounds
IC	Institutional Controls
ICIAP	Institutional Control Implementation and Assurance Plan
IDW	Investigation Derived Waste
INPR	Inventory Project Report
IRP	Installation Restoration Program
ISO	Industry Standard Object
ITRC	Interstate Technology and Regulatory Council
IVS	Instrument Verification Strip
KDE	Kernel Density Estimation
L	Low
lbs	Pounds
LiDAR	Light Detection and Ranging
LUCs	Land Use Controls
M	Medium
mag and dig	Magnetometer and Dig
MC	Munitions Constituents
MD	Munitions Debris
MDAS	Material Deemed As Safe
MEC	Munitions and Explosives of Concern
mg/kg	milligrams/kilogram
mm	millimeter
MMRP	Military Munitions Response Program
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MPF	Migration Pathway Factor
MPPEH	Material Potentially Presenting an Explosive Hazard
MRA	Munitions Response Area
MRS	Munitions Response Site

MRSPP	Munitions Response Site Prioritization Protocol
NA	No Action
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NC	Nitrocellulose
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDAI	No Department of Defense Action Indicated
NEODFC	Naval Explosives Ordnance Disposal Facility Center
NG	Nitroglycerin
NGS	National Geodetic Survey
NH	No known or Suspected Explosive Hazard
NMEA	National Marine Electronics Association
NPS	National Park Service
NQ	Nitroguanidine
NRL	Naval Research Laboratory
NWO	USACE Northwestern Division Omaha District
OB/OD	Open Burn/Open Detonation
OESS	Ordnance and Explosive Safety Specialist
O&M	Operations and Maintenance
ONP	Olympic National Park
OSHA	Occupational Safety and Health Administration
PACR	Port Angeles Combat Range
PDOP	Position Dilution of Precision
PETN	Pentaerythritol tetranitrate
PP	Proposed Plan
PPE	Personal Protective Equipment
PRG	Preliminary Remediation Goals
PRV	Post-Removal Verification
PUD	Public Utility District
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control

QSM	Quality Systems Manual
RAC	Risk Assessment Code
RAO	Remedial Action Objectives
RF	Receptor Factor
RI	Remedial Investigation
ROE	Right of Entry
RRSE	Relative Risk Site Evaluation
RSL	Risk Screening Levels
RTK	Real-Time Kinematic
SI	Site Inspection
SMC	Smallest Munition of Concern
SOP	Standard Operating Procedure
SR	Sub Range
SUXOS	Senior UXO Supervisor
T&E	Threatened and Endangered
TBC	To Be Considered
TNT	Trinitrotoluene
TP	Technical Paper
TPP	Technical Project Planning
UFP	Uniform Federal Policy
USACE	United States Army Corps of Engineers
USC	United States Code
USCB	United States Census Bureau
USEPA	United States Environmental Protection Agency
USFWS	United States Fish & Wildlife Service
UTM	Universal Transverse Mercator
UU/UE	Unrestricted Use/Unrestricted Exposure
UXO	Unexploded Ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer
VSP	Visual Sample Plan
WA	Washington

WDAHP	Washington Department of Archaeology and Historic Preservation
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WDOE	Washing Department of Ecology
WP	White Phosphorus
WWII	World War II
XRF	X-ray Fluorescence
ºF	degrees Fahrenheit

APPENDIX

Photo Documentation Log

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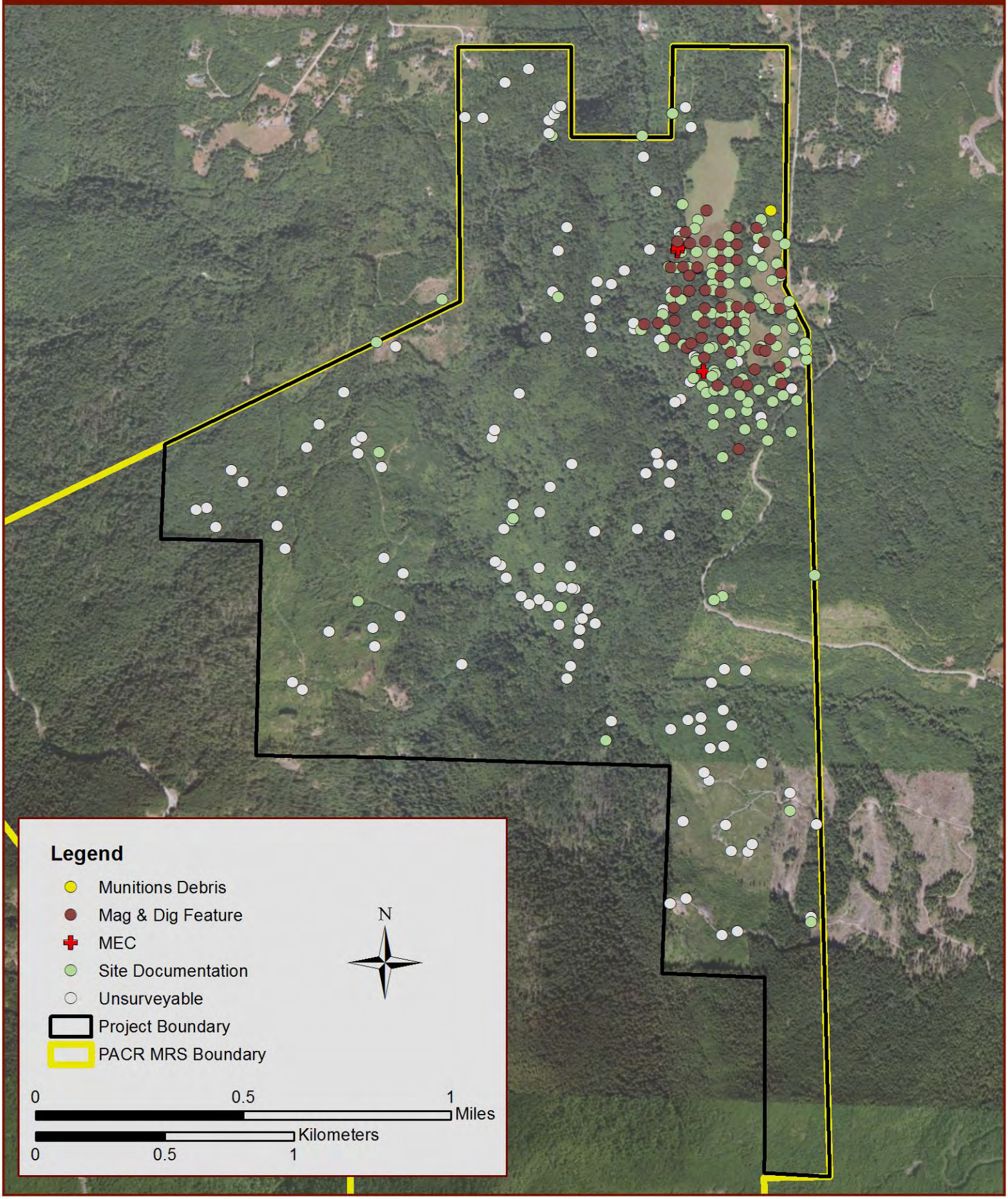
2014 PHOTOGRAPHIC LOG

Overview - All Photo Points

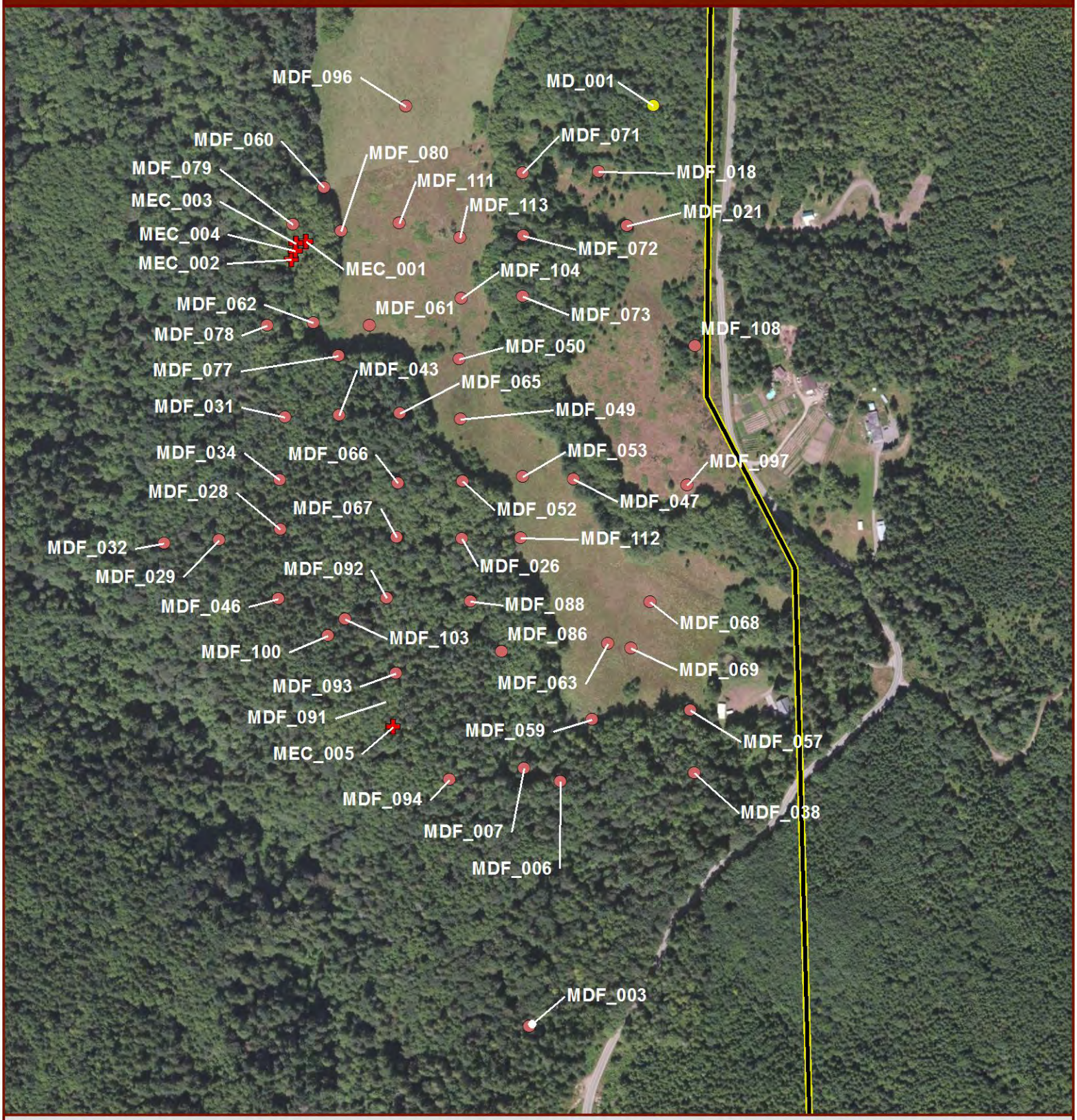
Port Angeles Combat Range, WA



2014 PHOTOGRAPHIC LOG

Photo Points - MEC, Munitions Debris, and Mag & Dig Features

Port Angeles Combat Range, WA



Legend

- Munitions Debris
- Mag & Dig Feature
- MEC
- Project Boundary
- PACR MRS Boundary

N

0 250 500 1,000 Feet

0 50 100 200 300 Meters

Photo ID	Photo	Latitude	Longitude	Page
MD_001	L0865	48° 2' 1.958" N	123° 20' 28.589" W	
MEC_001	L0987	48° 1' 57.177" N	123° 20' 45.155" W	
MEC_002	L0988	48° 1' 56.585" N	123° 20' 45.816" W	
MEC_003	L0989	48° 1' 57.098" N	123° 20' 45.617" W	
MEC_004	L0992	48° 1' 56.867" N	123° 20' 45.653" W	
MEC_005	L1079	48° 1' 41.541" N	123° 20' 40.192" W	
MDF_003	O9991	48° 1' 31.961" N	123° 20' 33.147" W	
MDF_006	L1054	48° 1' 39.928" N	123° 20' 32.018" W	
MDF_007	L1056	48° 1' 40.322" N	123° 20' 33.809" W	
MDF_018	L1047	48° 1' 59.760" N	123° 20' 31.137" W	
MDF_021	L1044	48° 1' 58.020" N	123° 20' 29.677" W	
MDF_026	O1316	48° 1' 47.713" N	123° 20' 37.162" W	
MDF_028	O1322	48° 1' 47.810" N	123° 20' 45.940" W	
MDF_029	O1323	48° 1' 47.397" N	123° 20' 48.892" W	
MDF_031	O1329	48° 1' 51.456" N	123° 20' 45.901" W	
MDF_032	O1334	48° 1' 47.237" N	123° 20' 51.527" W	
MDF_034	O1341	48° 1' 49.412" N	123° 20' 46.060" W	
MDF_038	L1030	48° 1' 40.354" N	123° 20' 25.545" W	
MDF_043	O1344	48° 1' 51.573" N	123° 20' 43.292" W	
MDF_046	O1348	48° 1' 45.571" N	123° 20' 45.923" W	
MDF_047	I1398	48° 1' 49.759" N	123° 20' 31.873" W	
MDF_049	O1279	48° 1' 51.571" N	123° 20' 37.411" W	
MDF_050	O1276	48° 1' 53.527" N	123° 20' 37.566" W	
MDF_052	I1403	48° 1' 49.578" N	123° 20' 37.230" W	
MDF_053	I1400	48° 1' 49.782" N	123° 20' 34.311" W	
MDF_057	L1021	48° 1' 42.384" N	123° 20' 25.853" W	
MDF_059	L1023	48° 1' 41.976" N	123° 20' 30.579" W	
MDF_060	L0996	48° 1' 58.939" N	123° 20' 44.387" W	
MDF_061	L0984	48° 1' 54.520" N	123° 20' 41.961" W	
MDF_062	L0981	48° 1' 54.551" N	123° 20' 44.674" W	
MDF_063	L1016	48° 1' 44.459" N	123° 20' 29.947" W	
MDF_065	O1308	48° 1' 51.709" N	123° 20' 40.341" W	
MDF_066	O1312	48° 1' 49.443" N	123° 20' 40.332" W	
MDF_067	O1315	48° 1' 47.687" N	123° 20' 40.325" W	
MDF_068	L1012	48° 1' 45.850" N	123° 20' 27.951" W	
MDF_069	L1014	48° 1' 44.329" N	123° 20' 28.803" W	
MDF_071	O1295	48° 1' 59.638" N	123° 20' 34.784" W	
MDF_072	O1296	48° 1' 57.601" N	123° 20' 34.672" W	
MDF_073	O1298	48° 1' 55.619" N	123° 20' 34.595" W	
MDF_077	O1306	48° 1' 53.506" N	123° 20' 43.405" W	
MDF_078	L0986	48° 1' 54.416" N	123° 20' 46.892" W	
MDF_079	L0993	48° 1' 57.718" N	123° 20' 45.818" W	
MDF_080	L0995	48° 1' 57.548" N	123° 20' 43.482" W	
MDF_086	L1064	48° 1' 44.086" N	123° 20' 35.074" W	
MDF_088	L1068	48° 1' 45.684" N	123° 20' 36.633" W	
MDF_092	L1101	48° 1' 45.696" N	123° 20' 40.699" W	
MDF_093	L1083	48° 1' 43.273" N	123° 20' 40.148" W	
MDF_094	L1076	48° 1' 39.871" N	123° 20' 37.396" W	
MDF_096	L1002	48° 2' 1.673" N	123° 20' 40.542" W	
MDF_097	L1116	48° 1' 49.678" N	123° 20' 26.371" W	
MDF_100	L1104	48° 1' 44.415" N	123° 20' 43.489" W	
MDF_103	L1106	48° 1' 44.981" N	123° 20' 42.688" W	
MDF_104	O1274	48° 1' 55.503" N	123° 20' 37.580" W	

MDF_108	L1123	48° 1' 54.205" N	123° 20' 26.197" W	
MDF_111	L1008	48° 1' 57.864" N	123° 20' 40.671" W	
MDF_112	I1406	48° 1' 47.797" N	123° 20' 34.308" W	
MDF_113	O1272	48° 1' 57.467" N	123° 20' 37.738" W	

2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MD_001
Date:
2013-10-23
Photo Name:
L0865
Photo Direction:
Close Up
Latitude:
48° 2' 1.958" N
Longitude:
123° 20' 28.589" W
Grid ID:
None
Number of Items:
1 MD
MD Weight(lb):
None
Comment:
Frag



Photo Point:
MEC_001
Date:
2013-11-18
Photo Name:
L0987
Photo Direction:
Close Up
Latitude:
48° 1' 57.177" N
Longitude:
123° 20' 45.155" W
Grid ID:
K-03
Number of Items:
1 MEC
MD Weight(lb):
None
Comment:
One M63 37mm HE projectile



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MEC_002
Date:
2013-11-18
Photo Name:
L0988
Photo Direction:
Close Up
Latitude:
48° 1' 56.585" N
Longitude:
123° 20' 45.816" W
Grid ID:
K-03
Number of Items:
1 MEC
MD Weight(lb):
None
Comment:
One M63 37mm HE projectile



Photo Point:
MEC_003
Date:
2013-11-18
Photo Name:
L0989
Photo Direction:
Close Up
Latitude:
48° 1' 57.098" N
Longitude:
123° 20' 45.617" W
Grid ID:
K-03
Number of Items:
1 MEC
MD Weight(lb):
None
Comment:
One M63 37mm HE projectile



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MEC_004
Date:
2013-11-18
Photo Name:
L0992
Photo Direction:
Close Up
Latitude:
48° 1' 56.867" N
Longitude:
123° 20' 45.653" W
Grid ID:
K-03
Number of Items:
1 MEC
MD Weight(lb):
None
Comment:
One M63 37mm HE projectile



Photo Point:
MEC_005
Date:
2013-12-06
Photo Name:
L1079
Photo Direction:
Close Up
Latitude:
48° 1' 41.541" N
Longitude:
123° 20' 40.192" W
Grid ID:
M-11
Number of Items:
1 MEC
MD Weight(lb):
None
Comment:
One M63 37mm HE projectile



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_003
Date:
2013-12-03
Photo Name:
O9991
Photo Direction:
None
Latitude:
48° 1' 31.961" N
Longitude:
123° 20' 33.147" W
Grid ID:
P-16
Number of Items:
1 MD
MD Weight(lb):
1.0
Comment:
One M48 point detonating fuze (expended)



Photo Point:
MDF_006
Date:
2013-12-04
Photo Name:
L1054
Photo Direction:
None
Latitude:
48° 1' 39.928" N
Longitude:
123° 20' 32.018" W
Grid ID:
Q-12
Number of Items:
2 MD
MD Weight(lb):
5.25
Comment:
One half of 75mm projectile (empty), one piece of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_007
Date:
2013-12-04
Photo Name:
L1056
Photo Direction:
None
Latitude:
48° 1' 40.322" N
Longitude:
123° 20' 33.809" W
Grid ID:
P-12
Number of Items:
1 MD
MD Weight(lb):
1.0
Comment:
One M51 37mm AP projectile



Photo Point:
MDF_018
Date:
2013-12-03
Photo Name:
L1047
Photo Direction:
None
Latitude:
48° 1' 59.760" N
Longitude:
123° 20' 31.137" W
Grid ID:
Q-02
Number of Items:
2 MD
MD Weight(lb):
0.25
Comment:
Two 81mm mortar tail fin pieces



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_021
Date:
2013-12-03
Photo Name:
L1044
Photo Direction:
None
Latitude:
48° 1' 58.020" N
Longitude:
123° 20' 29.677" W
Grid ID:
R-03
Number of Items:
1 MD
MD Weight(lb):
0.25
Comment:
One piece of frag



Photo Point:
MDF_026
Date:
2013-11-21
Photo Name:
O1316
Photo Direction:
None
Latitude:
48° 1' 47.713" N
Longitude:
123° 20' 37.162" W
Grid ID:
N-08
Number of Items:
4 MD
MD Weight(lb):
2.0
Comment:
Two M43A1 81mm HE mortar pieces, two pieces of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_028
Date:
2013-11-21
Photo Name:
O1322
Photo Direction:
None
Latitude:
48° 1' 47.810" N
Longitude:
123° 20' 45.940" W
Grid ID:
K-08
Number of Items:
2 MD
MD Weight(lb):
0.25
Comment:
Two pieces of frag

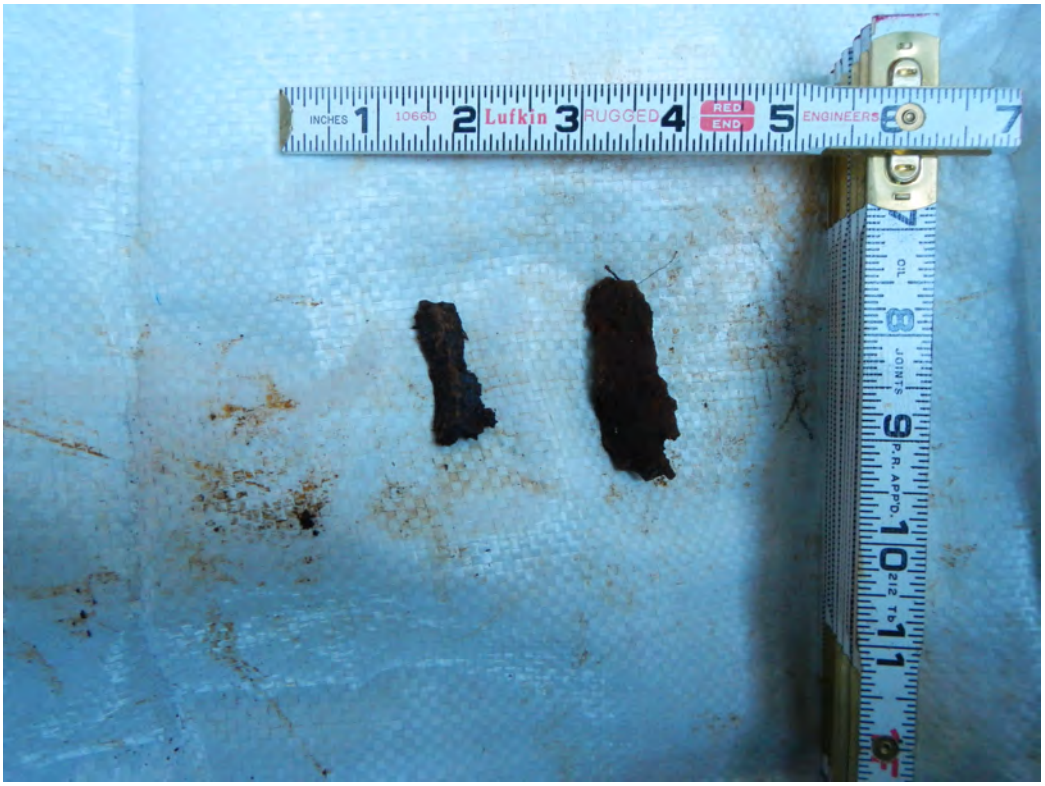
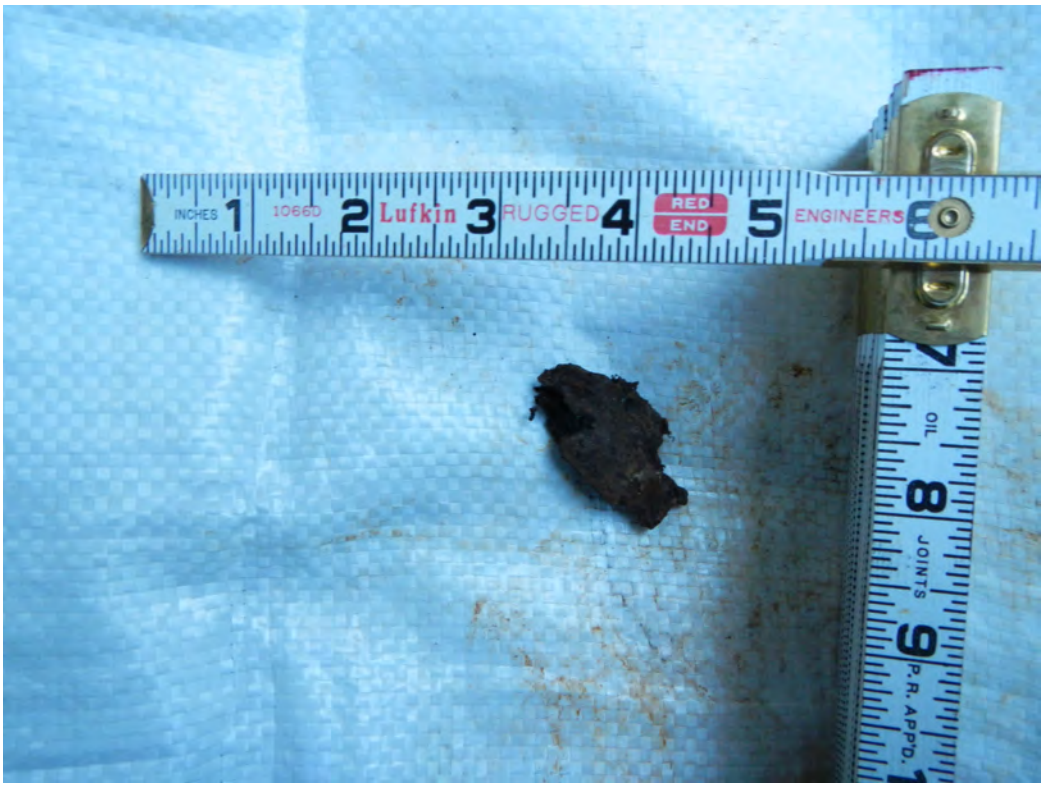


Photo Point:
MDF_029
Date:
2013-11-21
Photo Name:
O1323
Photo Direction:
None
Latitude:
48° 1' 47.397" N
Longitude:
123° 20' 48.892" W
Grid ID:
J-08
Number of Items:
1 MD
MD Weight(lb):
0.25
Comment:
One piece of frag



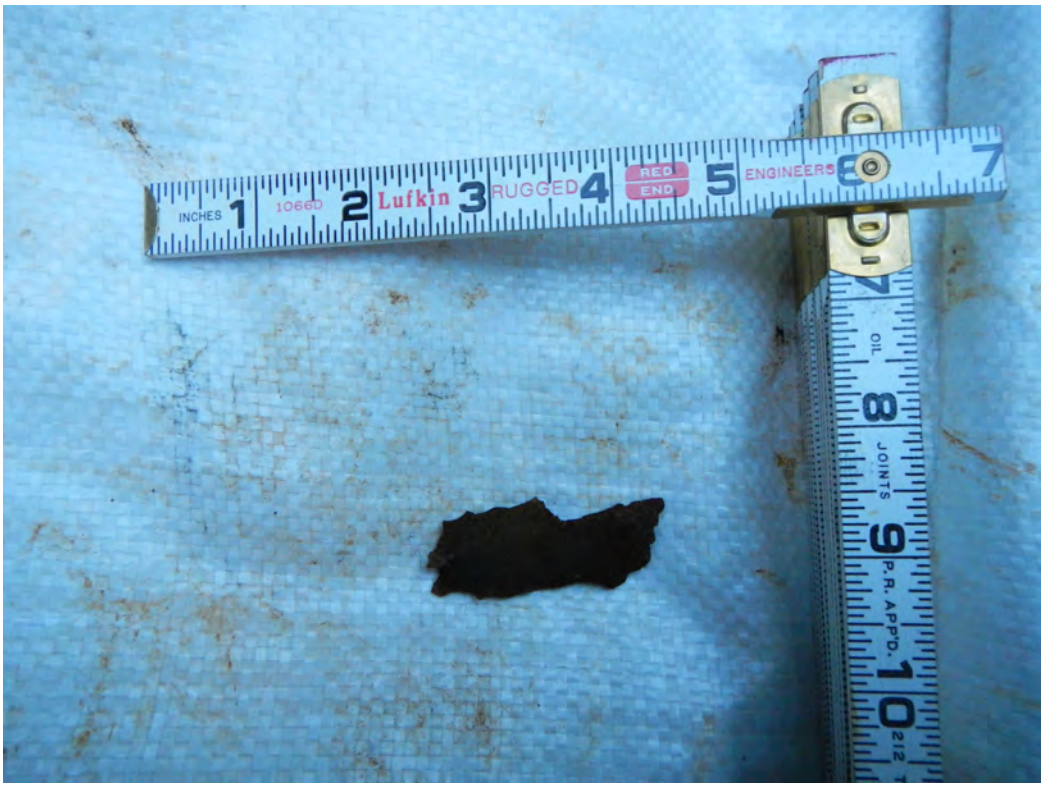
2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_031
Date:
2013-11-21
Photo Name:
O1329
Photo Direction:
None
Latitude:
48° 1' 51.456" N
Longitude:
123° 20' 45.901" W
Grid ID:
K-06
Number of Items:
1 MD
MD Weight(lb):
0.25
Comment:
One piece of frag



Photo Point:
MDF_032
Date:
2013-11-21
Photo Name:
O1334
Photo Direction:
None
Latitude:
48° 1' 47.237" N
Longitude:
123° 20' 51.527" W
Grid ID:
I-08
Number of Items:
1 MD
MD Weight(lb):
0.25
Comment:
One piece of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_034
Date:
2013-11-21
Photo Name:
O1341
Photo Direction:
None
Latitude:
48° 1' 49.412" N
Longitude:
123° 20' 46.060" W
Grid ID:
K-07
Number of Items:
1 MD
MD Weight(lb):
0.25
Comment:
One piece of frag

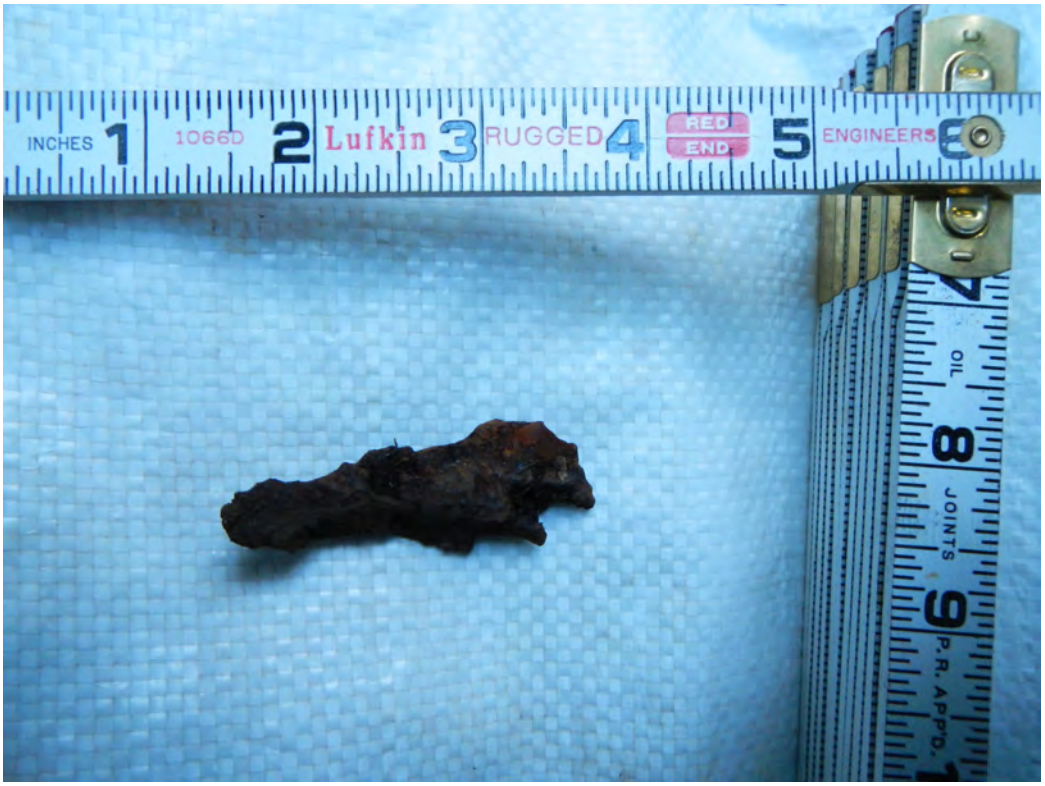


Photo Point:
MDF_038
Date:
2013-11-22
Photo Name:
L1030
Photo Direction:
None
Latitude:
48° 1' 40.354" N
Longitude:
123° 20' 25.545" W
Grid ID:
S-12
Number of Items:
2 MD
MD Weight(lb):
0.5
Comment:
Two pieces of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_043
Date:
2013-11-21
Photo Name:
O1344
Photo Direction:
None
Latitude:
48° 1' 51.573" N
Longitude:
123° 20' 43.292" W
Grid ID:
L-06
Number of Items:
3 MD
MD Weight(lb):
1.5
Comment:
One M51 37mm AP projectile, two pieces of frag



Photo Point:
MDF_046
Date:
2013-11-22
Photo Name:
O1348
Photo Direction:
None
Latitude:
48° 1' 45.571" N
Longitude:
123° 20' 45.923" W
Grid ID:
K-09
Number of Items:
1 MD
MD Weight(lb):
0.25
Comment:
One piece of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_047
Date:
2013-11-19
Photo Name:
I1398
Photo Direction:
None
Latitude:
48° 1' 49.759" N
Longitude:
123° 20' 31.873" W
Grid ID:
Q-07
Number of Items:
1 MD
MD Weight(lb):
0.25
Comment:
One piece of frag

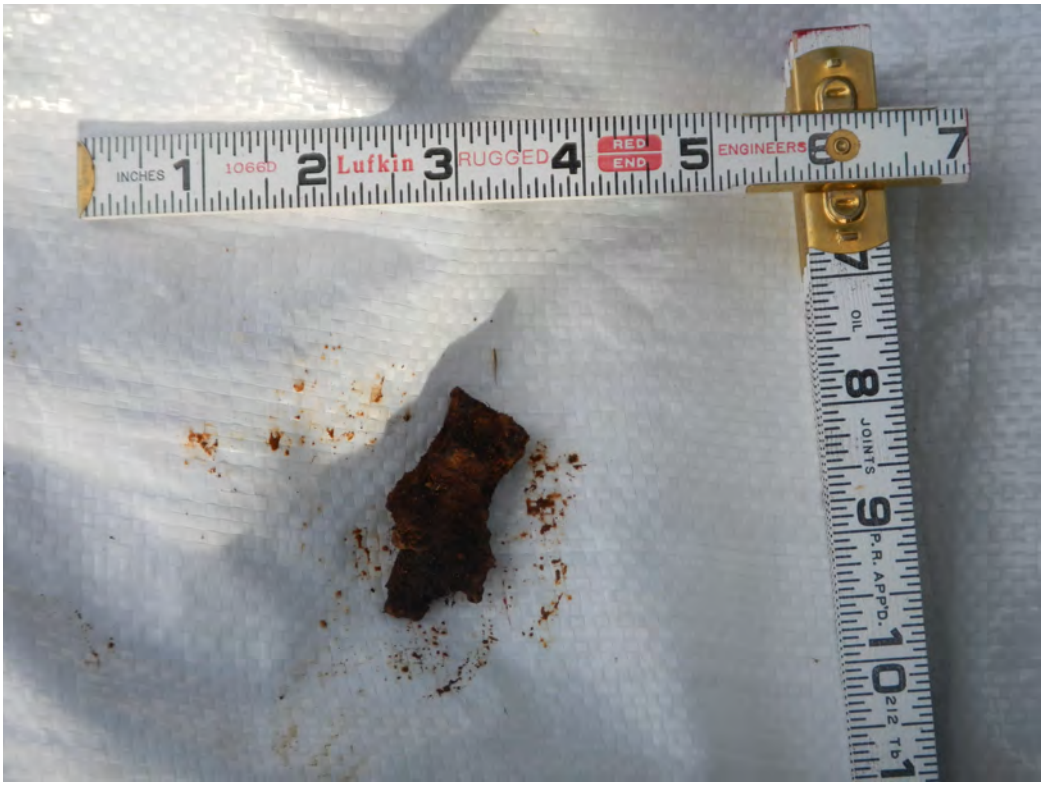
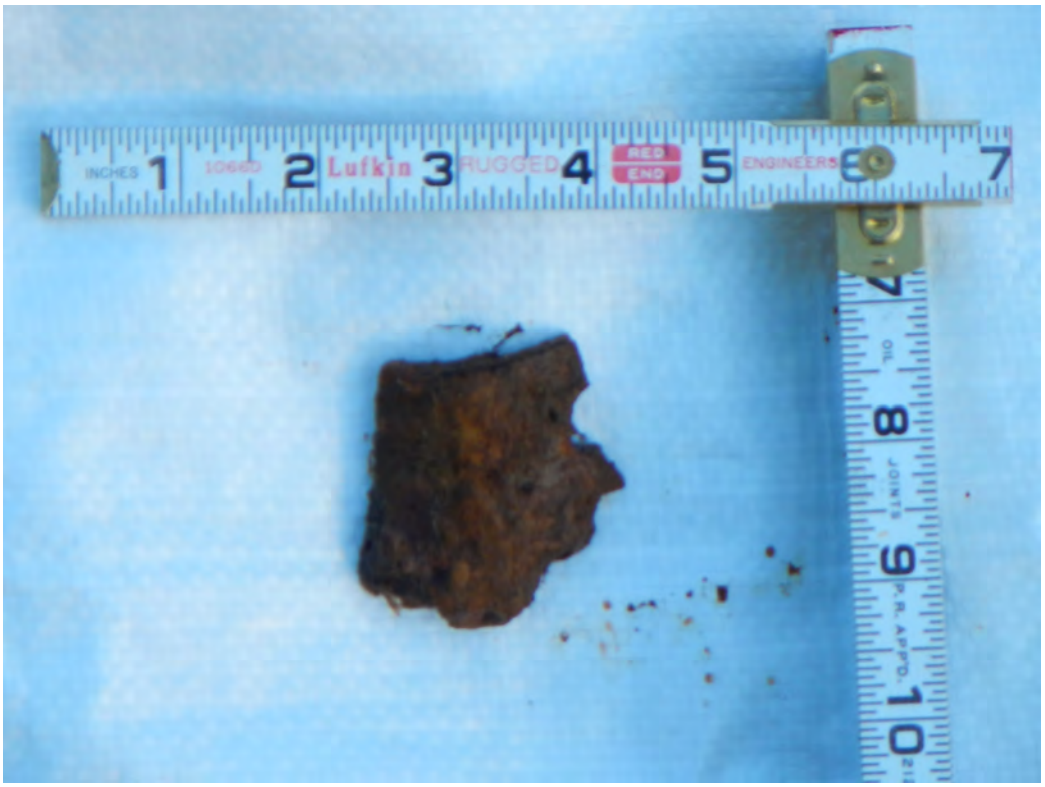


Photo Point:
MDF_049
Date:
2013-11-19
Photo Name:
O1279
Photo Direction:
None
Latitude:
48° 1' 51.571" N
Longitude:
123° 20' 37.411" W
Grid ID:
N-06
Number of Items:
1 MD
MD Weight(lb):
0.25
Comment:
One piece of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_050
Date:
2013-11-19
Photo Name:
O1276
Photo Direction:
None
Latitude:
48° 1' 53.527" N
Longitude:
123° 20' 37.566" W
Grid ID:
N-05
Number of Items:
1 MD
MD Weight(lb):
0.25
Comment:
One piece of frag

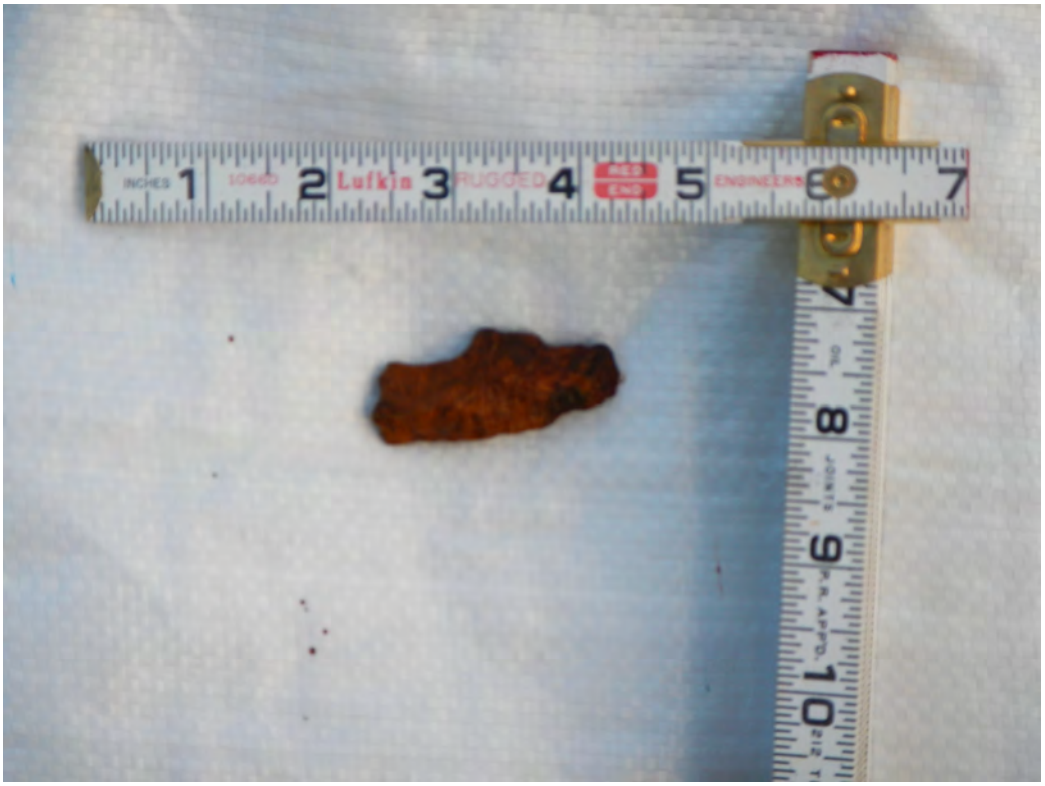


Photo Point:
MDF_052
Date:
2013-11-19
Photo Name:
I1403
Photo Direction:
None
Latitude:
48° 1' 49.578" N
Longitude:
123° 20' 37.230" W
Grid ID:
N-07
Number of Items:
1 MD
MD Weight(lb):
1.5
Comment:
One M51 37mm AP projectile



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_053
Date:
2013-11-19
Photo Name:
I1400
Photo Direction:
None
Latitude:
48° 1' 49.782" N
Longitude:
123° 20' 34.311" W
Grid ID:
P-07
Number of Items:
1 MD
MD Weight(lb):
0.25
Comment:
One piece of frag

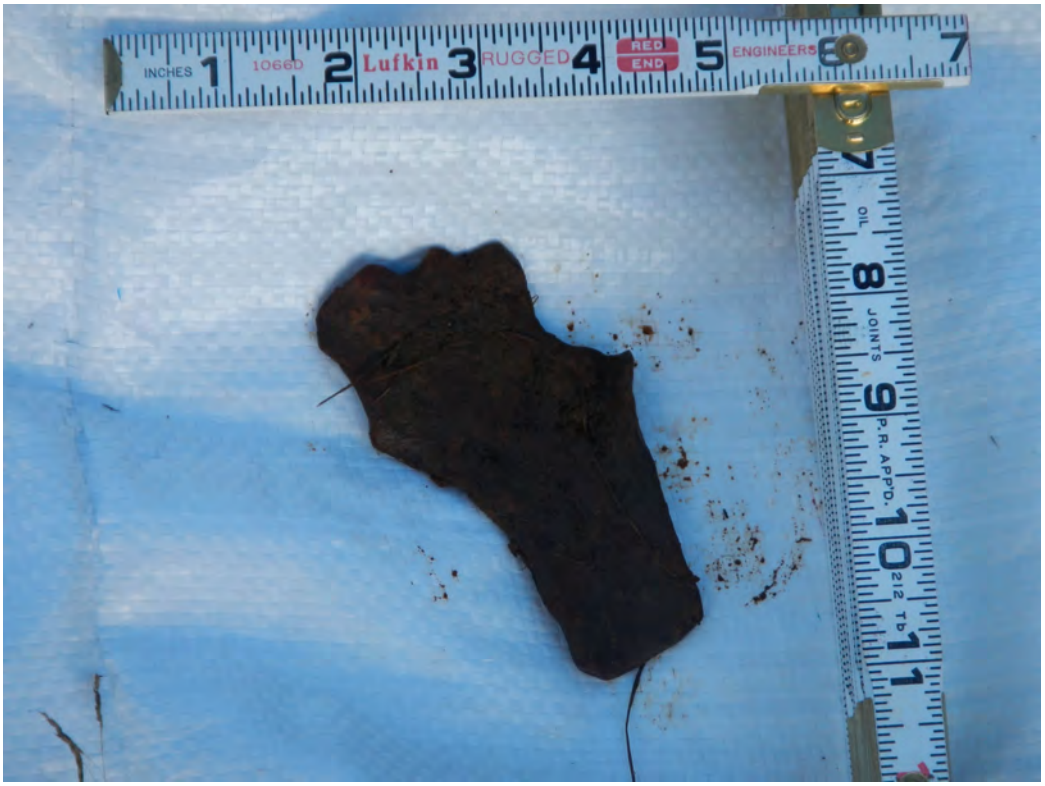


Photo Point:
MDF_057
Date:
2013-11-21
Photo Name:
L1021
Photo Direction:
None
Latitude:
48° 1' 42.384" N
Longitude:
123° 20' 25.853" W
Grid ID:
S-11
Number of Items:
1 MD
MD Weight(lb):
0.5
Comment:
One piece of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_059
Date:
2013-11-21
Photo Name:
L1023
Photo Direction:
None
Latitude:
48° 1' 41.976" N
Longitude:
123° 20' 30.579" W
Grid ID:
Q-11
Number of Items:
14 MD
MD Weight(lb):
1.0
Comment:
Fourteen pieces of frag



Photo Point:
MDF_060
Date:
2013-11-18
Photo Name:
L0996
Photo Direction:
None
Latitude:
48° 1' 58.939" N
Longitude:
123° 20' 44.387" W
Grid ID:
L-02
Number of Items:
3 MD
MD Weight(lb):
0.5
Comment:
Three pieces of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_061
Date:
2013-11-15
Photo Name:
L0984
Photo Direction:
None
Latitude:
48° 1' 54.520" N
Longitude:
123° 20' 41.961" W
Grid ID:
M-04
Number of Items:
4 MD
MD Weight(lb):
0.5
Comment:
One 81mm mortar tail fin piece, three pieces of frag



Photo Point:
MDF_062
Date:
2013-11-14
Photo Name:
L0981
Photo Direction:
None
Latitude:
48° 1' 54.551" N
Longitude:
123° 20' 44.674" W
Grid ID:
L-04
Number of Items:
15 MD (incl 5 links), 7 SA
MD Weight(lb):
None
Comment:
One M51 37mm AP projectile, nine pieces of frag, seven .50 caliber projectiles and five 0.50 caliber links



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_063
Date:
2013-11-20
Photo Name:
L1016
Photo Direction:
None
Latitude:
48° 1' 44.459" N
Longitude:
123° 20' 29.947" W
Grid ID:
Q-10
Number of Items:
8 MD
MD Weight(lb):
1.0
Comment:
Eight pieces of frag



Photo Point:
MDF_065
Date:
2013-11-20
Photo Name:
O1308
Photo Direction:
None
Latitude:
48° 1' 51.709" N
Longitude:
123° 20' 40.341" W
Grid ID:
M-06
Number of Items:
2 MD
MD Weight(lb):
3.0
Comment:
One M57 81mm WP mortar (lower part), one piece of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_066
Date:
2013-11-20
Photo Name:
O1312
Photo Direction:
None
Latitude:
48° 1' 49.443" N
Longitude:
123° 20' 40.332" W
Grid ID:
M-07
Number of Items:
3 MD
MD Weight(lb):
0.25
Comment:
Three pieces of frag



Photo Point:
MDF_067
Date:
2013-11-20
Photo Name:
O1315
Photo Direction:
None
Latitude:
48° 1' 47.687" N
Longitude:
123° 20' 40.325" W
Grid ID:
M-08
Number of Items:
2 MD
MD Weight(lb):
1.25
Comment:
One M51 37mm AP projectile, one piece of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_068
Date:
2013-11-20
Photo Name:
L1012
Photo Direction:
None
Latitude:
48° 1' 45.850" N
Longitude:
123° 20' 27.951" W
Grid ID:
R-09
Number of Items:
2 MD
MD Weight(lb):
1.0
Comment:
Two pieces of frag

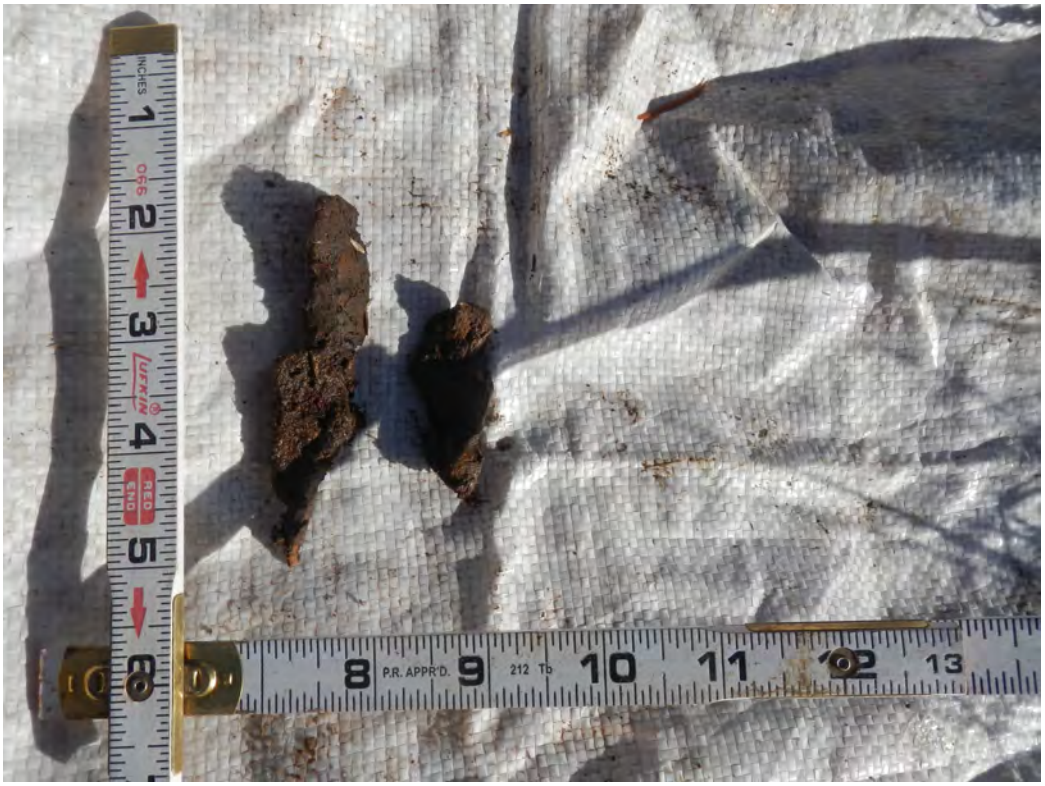


Photo Point:
MDF_069
Date:
2013-11-20
Photo Name:
L1014
Photo Direction:
None
Latitude:
48° 1' 44.329" N
Longitude:
123° 20' 28.803" W
Grid ID:
R-10
Number of Items:
1 MD
MD Weight(lb):
1.0
Comment:
One piece of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_071
Date:
2013-11-20
Photo Name:
O1295
Photo Direction:
None
Latitude:
48° 1' 59.638" N
Longitude:
123° 20' 34.784" W
Grid ID:
P-02
Number of Items:
1 MD
MD Weight(lb):
0.25
Comment:
One piece of frag

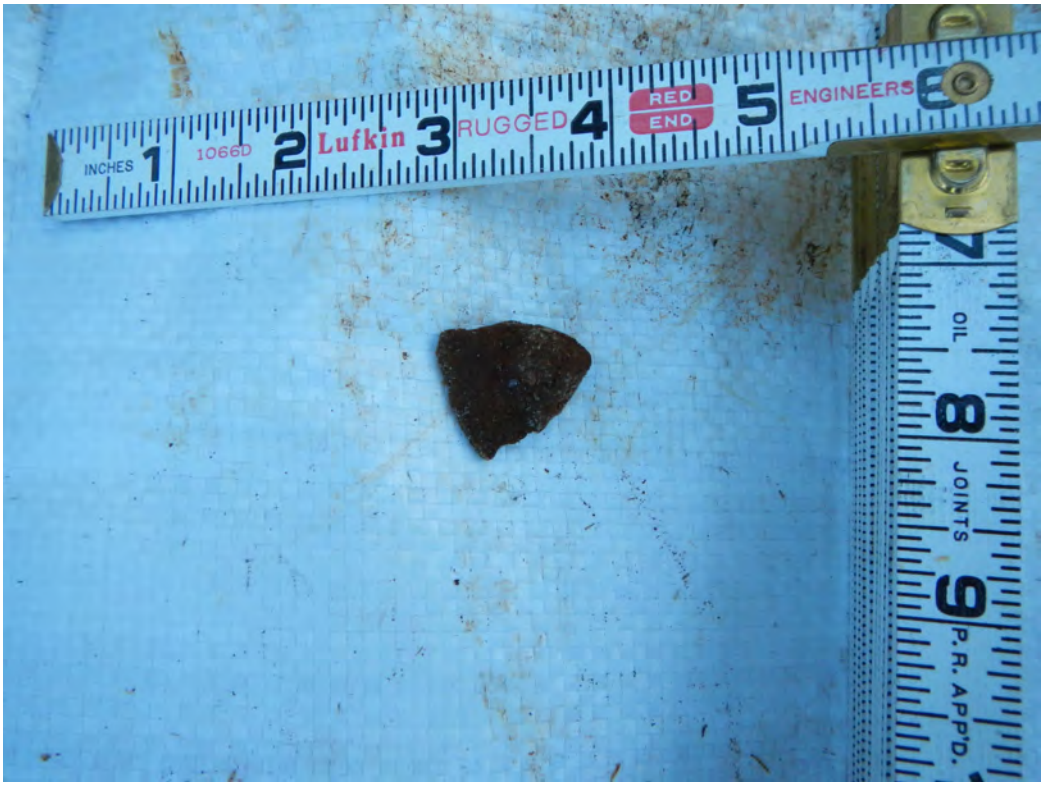


Photo Point:
MDF_072
Date:
2013-11-20
Photo Name:
O1296
Photo Direction:
None
Latitude:
48° 1' 57.601" N
Longitude:
123° 20' 34.672" W
Grid ID:
P-03
Number of Items:
1 MD
MD Weight(lb):
0.5
Comment:
One 81mm mortar tail fin



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_073
Date:
2013-11-20
Photo Name:
O1298
Photo Direction:
None
Latitude:
48° 1' 55.619" N
Longitude:
123° 20' 34.595" W
Grid ID:
P-04
Number of Items:
2 MD
MD Weight(lb):
1.25
Comment:
One M51 37mm AP projectile, one piece of frag



Photo Point:
MDF_077
Date:
2013-11-20
Photo Name:
O1306
Photo Direction:
None
Latitude:
48° 1' 53.506" N
Longitude:
123° 20' 43.405" W
Grid ID:
L-05
Number of Items:
3 MD
MD Weight(lb):
1.0
Comment:
One M51 37mm AP projectile, two pieces of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_078
Date:
2013-11-15
Photo Name:
L0986
Photo Direction:
None
Latitude:
48° 1' 54.416" N
Longitude:
123° 20' 46.892" W
Grid ID:
K-04
Number of Items:
10 MD, 5 SA
MD Weight(lb):
1.5
Comment:
One M51 37mm AP projectile, nine pieces of frag, five .50 caliber projectiles



Photo Point:
MDF_079
Date:
2013-11-18
Photo Name:
L0993
Photo Direction:
None
Latitude:
48° 1' 57.718" N
Longitude:
123° 20' 45.818" W
Grid ID:
K-03
Number of Items:
8 MD, 2 SA
MD Weight(lb):
10
Comment:
Eight pieces of frag, two .50 caliber projectiles



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_080
Date:
2013-11-18
Photo Name:
L0995
Photo Direction:
None
Latitude:
48° 1' 57.548" N
Longitude:
123° 20' 43.482" W
Grid ID:
L-03
Number of Items:
12 MD, 6 SA
MD Weight(lb):
1.0
Comment:
One M57 81mm WP mortar (lower part), eleven pieces of frag, six .50 caliber projectiles



Photo Point:
MDF_086
Date:
2013-12-05
Photo Name:
L1064
Photo Direction:
None
Latitude:
48° 1' 44.086" N
Longitude:
123° 20' 35.074" W
Grid ID:
P-10
Number of Items:
2 MD
MD Weight(lb):
0.25
Comment:
Two pieces of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_088
Date:
2013-12-05
Photo Name:
L1068
Photo Direction:
None
Latitude:
48° 1' 45.684" N
Longitude:
123° 20' 36.633" W
Grid ID:
N-09
Number of Items:
1 MD
MD Weight(lb):
1.0
Comment:
One M51 37mm AP projectile



Photo Point:
MDF_092
Date:
2013-12-06
Photo Name:
L1101
Photo Direction:
None
Latitude:
48° 1' 45.696" N
Longitude:
123° 20' 40.699" W
Grid ID:
M-09
Number of Items:
1 MD
MD Weight(lb):
0.25
Comment:
One piece of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_093
Date:
2013-12-06
Photo Name:
L1083
Photo Direction:
None
Latitude:
48° 1' 43.273" N
Longitude:
123° 20' 40.148" W
Grid ID:
M-10
Number of Items:
2 MD
MD Weight(lb):
0.25
Comment:
Two pieces of frag



Photo Point:
MDF_094
Date:
2013-12-06
Photo Name:
L1076
Photo Direction:
None
Latitude:
48° 1' 39.871" N
Longitude:
123° 20' 37.396" W
Grid ID:
N-12
Number of Items:
1 MD
MD Weight(lb):
10.0
Comment:
One 75mm practice projectile



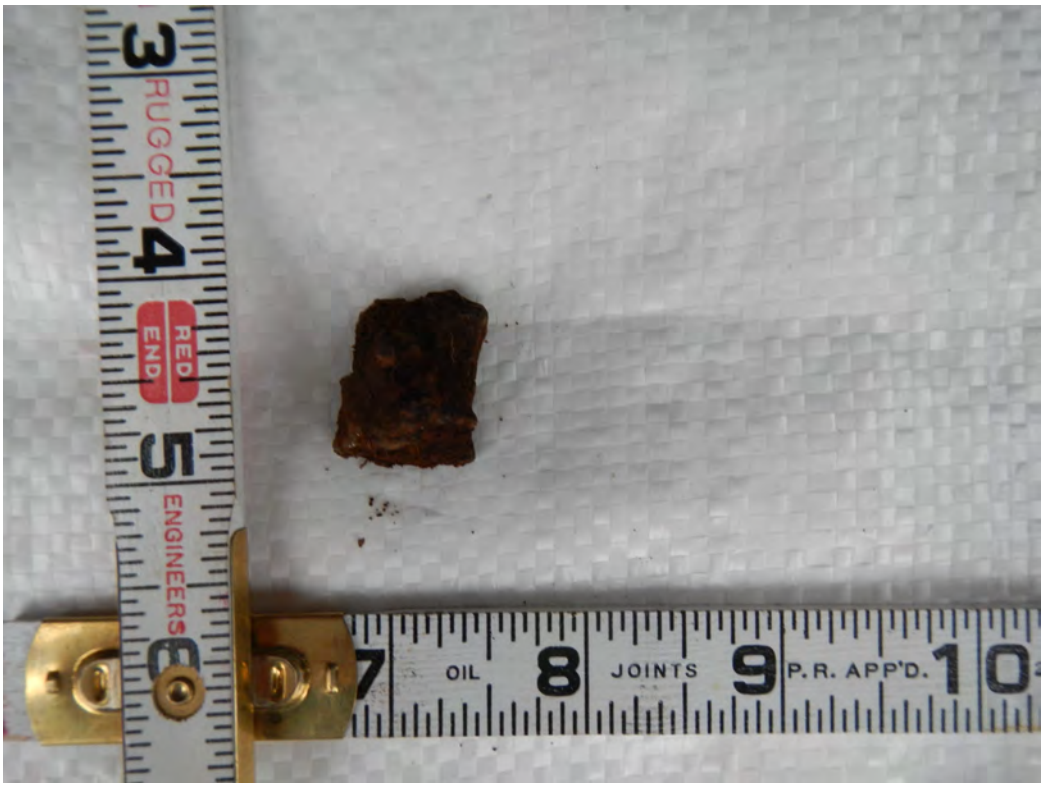
2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_096
Date:
2013-11-19
Photo Name:
L1002
Photo Direction:
None
Latitude:
48° 2' 1.673" N
Longitude:
123° 20' 40.542" W
Grid ID:
M-01
Number of Items:
2 MD
MD Weight(lb):
1.0
Comment:
One M51 37mm AP projectile, one piece of frag



Photo Point:
MDF_097
Date:
2013-12-09
Photo Name:
L1116
Photo Direction:
None
Latitude:
48° 1' 49.678" N
Longitude:
123° 20' 26.371" W
Grid ID:
S-07
Number of Items:
1 MD
MD Weight(lb):
0.25
Comment:
One piece of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_100
Date:
2013-12-09
Photo Name:
L1104
Photo Direction:
None
Latitude:
48° 1' 44.415" N
Longitude:
123° 20' 43.489" W
Grid ID:
L-10
Number of Items:
1 MD
MD Weight(lb):
0.25
Comment:
One piece of frag

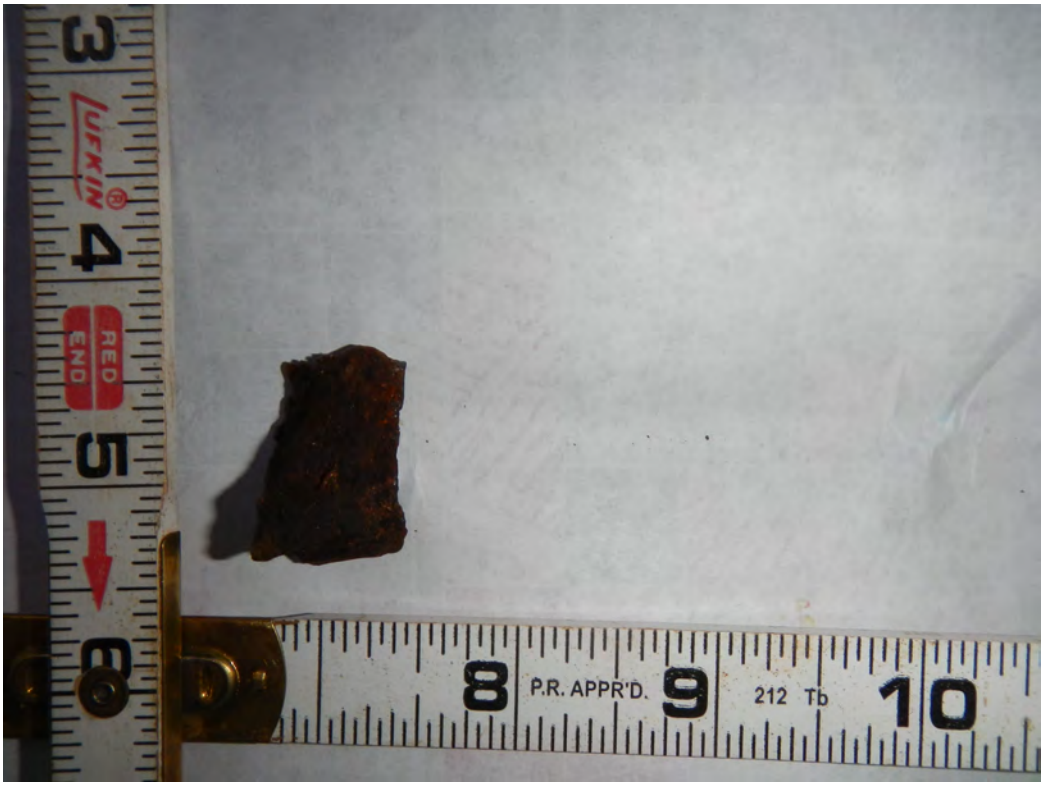


Photo Point:
MDF_103
Date:
2013-12-09
Photo Name:
L1106
Photo Direction:
None
Latitude:
48° 1' 44.981" N
Longitude:
123° 20' 42.688" W
Grid ID:
L-09
Number of Items:
6 MD
MD Weight(lb):
4.75
Comment:
Two M51 37mm AP projectiles and four pieces of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_104
Date:
2013-11-18
Photo Name:
O1274
Photo Direction:
None
Latitude:
48° 1' 55.503" N
Longitude:
123° 20' 37.580" W
Grid ID:
N-04
Number of Items:
3 MD
MD Weight(lb):
4.5
Comment:
One M51 37mm AP projectile, one 81mm mortar tail fin piece, one M43A1 81mm HE mortar base



Photo Point:
MDF_108
Date:
2013-12-10
Photo Name:
L1123
Photo Direction:
None
Latitude:
48° 1' 54.205" N
Longitude:
123° 20' 26.197" W
Grid ID:
S-05
Number of Items:
3 MD
MD Weight(lb):
0.25
Comment:
Three pieces of frag



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Photo Point:
MDF_111
Date:
2013-11-19
Photo Name:
L1008
Photo Direction:
None
Latitude:
48° 1' 57.864" N
Longitude:
123° 20' 40.671" W
Grid ID:
M-03
Number of Items:
3 MD
MD Weight(lb):
5.0
Comment:
One M44 81mm practice mortar, two pieces of frag



Photo Point:
MDF_112
Date:
2013-11-19
Photo Name:
I1406
Photo Direction:
None
Latitude:
48° 1' 47.797" N
Longitude:
123° 20' 34.308" W
Grid ID:
P-08
Number of Items:
1 MD
MD Weight(lb):
0.5
Comment:
One M57 81mm WP mortar (lower part)



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

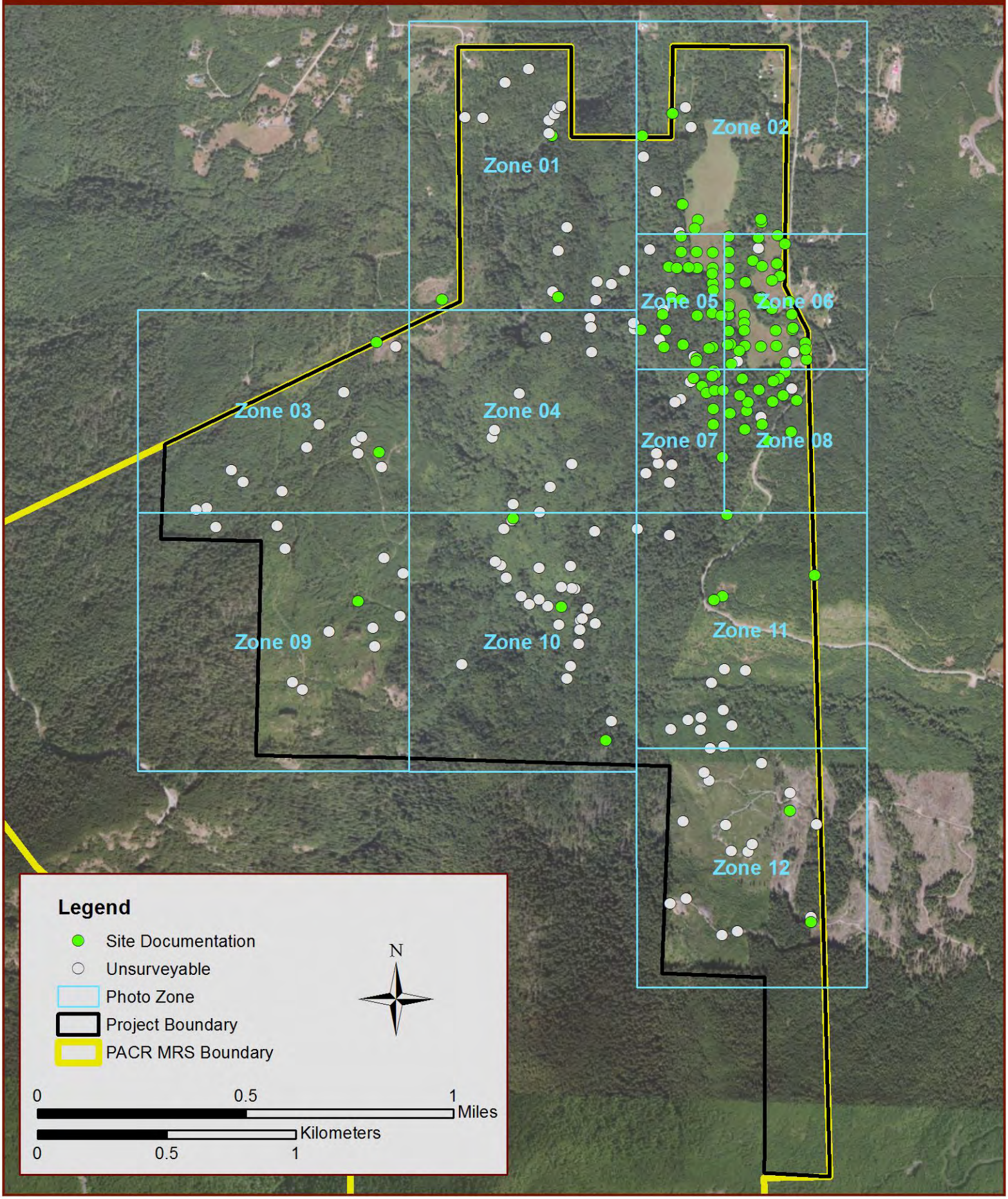
Photo Point:
MDF_113
Date:
2013-11-18
Photo Name:
O1272
Photo Direction:
None
Latitude:
48° 1' 57.467" N
Longitude:
123° 20' 37.738" W
Grid ID:
N-03
Number of Items:
5 MD
MD Weight(lb):
2.0
Comment:
One M51 37mm AP projectile, four pieces of frag



2014 PHOTOGRAPHIC LOG

Overview - Unsurveyable and Site Documentation - Photo Zones

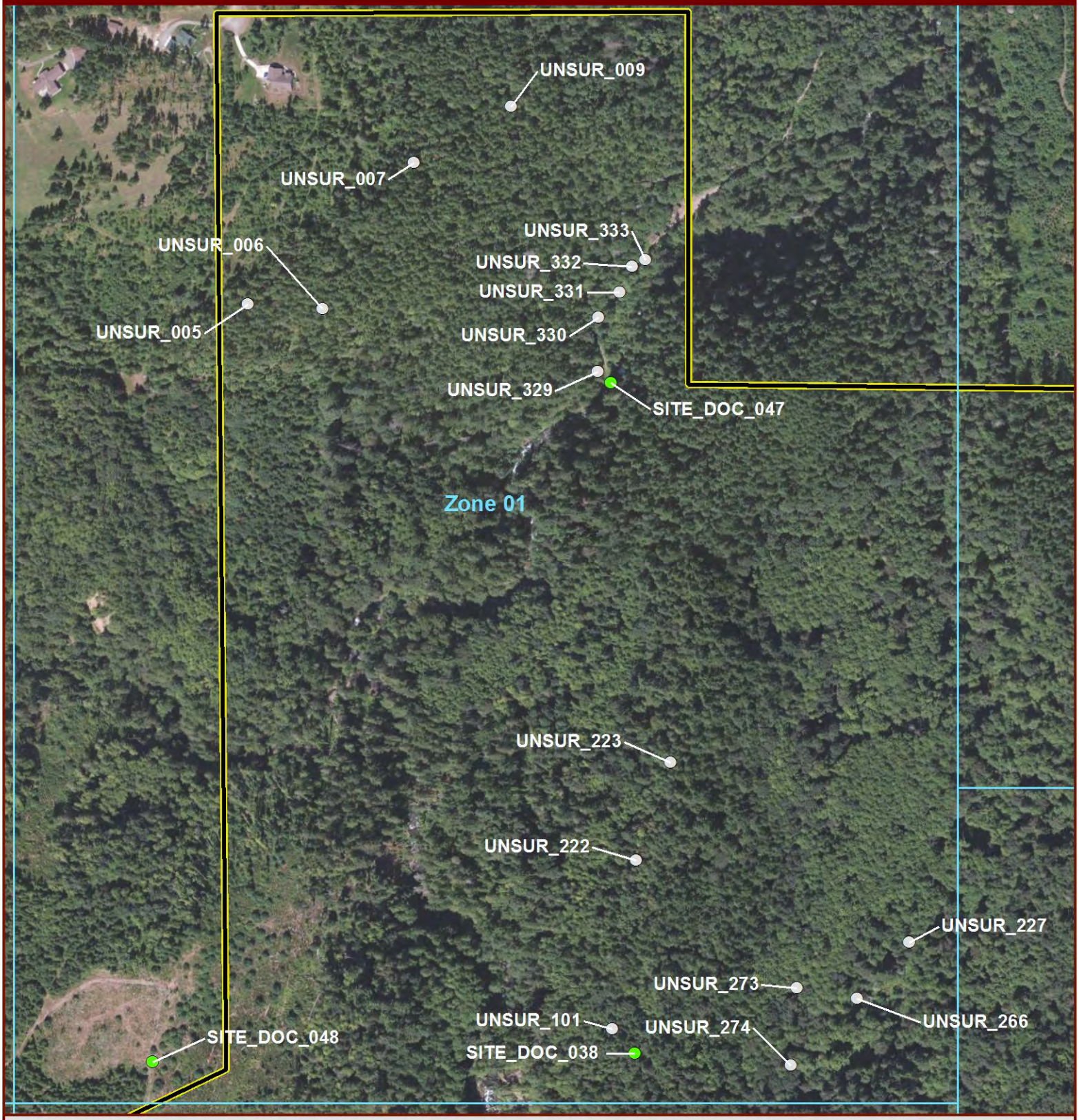
Port Angeles Combat Range, WA



2013 PHOTOGRAPHIC LOG

Zone 1 - Unsurveyable and Site Documentation

Port Angeles Combat Range, WA



Legend

- Site Documentation
- Unsurveyable
- Photo Zone
- Project Boundary
- PACR MRS Boundary

N

0 250 500 Feet

0 50 100 Meters

Zone	Title	Photo ID	Latitude	Longitude	Page
1	SITE_DOC_038	I1297	48° 1' 50.241" N	123° 21' 7.780" W	
1	SITE_DOC_047	L0973	48° 2' 10.429" N	123° 21' 9.845" W	
1	SITE_DOC_048	L0979	48° 1' 49.501" N	123° 21' 29.434" W	
1	UNSUR_005	L0868	48° 2' 12.446" N	123° 21' 26.290" W	
1	UNSUR_006	L0869	48° 2' 12.378" N	123° 21' 22.928" W	
1	UNSUR_007	L0870	48° 2' 16.887" N	123° 21' 19.037" W	
1	UNSUR_009	L0872	48° 2' 18.673" N	123° 21' 14.730" W	
1	UNSUR_101	I1304	48° 1' 50.940" N	123° 21' 8.816" W	
1	UNSUR_222	I1371	48° 1' 56.054" N	123° 21' 7.997" W	
1	UNSUR_223	I1372	48° 1' 59.049" N	123° 21' 6.618" W	
1	UNSUR_227	I1383	48° 1' 53.851" N	123° 20' 55.602" W	
1	UNSUR_266	I1416	48° 1' 52.116" N	123° 20' 57.883" W	
1	UNSUR_273	I1424	48° 1' 52.371" N	123° 21' 0.588" W	
1	UNSUR_274	I1425	48° 1' 50.031" N	123° 21' 0.754" W	
1	UNSUR_329	I1453, I1454	48° 2' 10.753" N	123° 21' 10.465" W	
1	UNSUR_330	I1455	48° 2' 12.405" N	123° 21' 10.517" W	
1	UNSUR_331	I1456	48° 2' 13.175" N	123° 21' 9.592" W	
1	UNSUR_332	I1457	48° 2' 13.967" N	123° 21' 9.063" W	
1	UNSUR_333	I1458	48° 2' 14.176" N	123° 21' 8.482" W	

2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 01
Photo Point:
SITE_DOC_038
Date:
2013-11-06
Photo Name:
I1297
Photo Direction:
West
Latitude:
48° 1' 50.241" N
Longitude:
123° 21' 7.780" W
Type:
Site Debris
Comment:
Large downed cable throughout area, 1 inch diameter



Zone:
Zone 01
Photo Point:
SITE_DOC_047
Date:
2013-11-12
Photo Name:
L0973
Photo Direction:
North
Latitude:
48° 2' 10.429" N
Longitude:
123° 21' 9.845" W
Type:
Other (See Comment)
Comment:
Morse Creek Dam



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 01
Photo Point:
SITE_DOC_048
Date:
2013-11-13
Photo Name:
L0979
Photo Direction:
North
Latitude:
48° 1' 49.501" N
Longitude:
123° 21' 29.434" W
Type:
Steep Terrain
Comment:
No access to area 1 from GPS location



Zone:
Zone 01
Photo Point:
UNSUR_005
Date:
2013-10-24
Photo Name:
L0868
Photo Direction:
South
Latitude:
48° 2' 12.446" N
Longitude:
123° 21' 26.290" W
Type:
Steep Terrain
Comment:
Large steep canyon unsurveyable to the south



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 01
Photo Point:
UNSUR_006
Date:
2013-10-25
Photo Name:
L0869
Photo Direction:
South
Latitude:
48° 2' 12.378" N
Longitude:
123° 21' 22.928" W
Type:
Steep Terrain
Comment:
Very steep terrain



Zone:
Zone 01
Photo Point:
UNSUR_007
Date:
2013-10-25
Photo Name:
L0870
Photo Direction:
North
Latitude:
48° 2' 16.887" N
Longitude:
123° 21' 19.037" W
Type:
Dense Vegetation
Comment:
Dense vegetation and walking safety hazard



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 01
Photo Point:
UNSUR_009
Date:
2013-10-25
Photo Name:
L0872
Photo Direction:
North
Latitude:
48° 2' 18.673" N
Longitude:
123° 21' 14.730" W
Type:
Dense Vegetation
Comment:
Dense vegetation causing walking safety hazard, unsurveyable to north and east



Zone:
Zone 01
Photo Point:
UNSUR_101
Date:
2013-11-06
Photo Name:
I1304
Photo Direction:
West
Latitude:
48° 1' 50.940" N
Longitude:
123° 21' 8.816" W
Type:
Steep Terrain
Comment:
Steep terrain and dense vegetation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 01
Photo Point:
UNSUR_222
Date:
2013-11-14
Photo Name:
I1371
Photo Direction:
SSW
Latitude:
48° 1' 56.054" N
Longitude:
123° 21' 7.997" W
Type:
Steep Terrain
Comment:
Steep slope down with fallen trees



Zone:
Zone 01
Photo Point:
UNSUR_223
Date:
2013-11-14
Photo Name:
I1372
Photo Direction:
SSW
Latitude:
48° 1' 59.049" N
Longitude:
123° 21' 6.618" W
Type:
Steep Terrain
Comment:
Steep slope down with fallen trees



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 01
Photo Point:
UNSUR_227
Date:
2013-11-14
Photo Name:
I1383
Photo Direction:
SSE
Latitude:
48° 1' 53.851" N
Longitude:
123° 20' 55.602" W
Type:
Water Body
Comment:
Dense vegetation



Zone:
Zone 01
Photo Point:
UNSUR_266
Date:
2013-11-20
Photo Name:
I1416
Photo Direction:
South
Latitude:
48° 1' 52.116" N
Longitude:
123° 20' 57.883" W
Type:
Dense Vegetation
Comment:
Large downed trees, vegetation is 6 to 9 ft tall



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 01
Photo Point:
UNSUR_273
Date:
2013-11-20
Photo Name:
I1424
Photo Direction:
South
Latitude:
48° 1' 52.371" N
Longitude:
123° 21' 0.588" W
Type:
Dense Vegetation
Comment:
Large downed trees, vegetation 6 to 9 ft tall, logs 24 inches in diameter



Zone:
Zone 01
Photo Point:
UNSUR_274
Date:
2013-11-20
Photo Name:
I1425
Photo Direction:
East
Latitude:
48° 1' 50.031" N
Longitude:
123° 21' 0.754" W
Type:
Dense Vegetation
Comment:
Large downed trees, vegetation 2 to 3 meters tall, logs 24 inches in diameter



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 01
Photo Point:
UNSUR_329
Date:
2013-12-11
Photo Name:
I1453
Photo Direction:
East
Latitude:
48° 2' 10.753" N
Longitude:
123° 21' 10.465" W
Type:
Water Body
Comment:
Steep side walls east and west of the river



Zone:
Zone 01
Photo Point:
UNSUR_329
Date:
2013-12-11
Photo Name:
I1454
Photo Direction:
East
Latitude:
48° 2' 10.753" N
Longitude:
123° 21' 10.465" W
Type:
Water Body
Comment:
Steep side walls east and west of the river



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 01
Photo Point:
UNSUR_330
Date:
2013-12-11
Photo Name:
I1455
Photo Direction:
West
Latitude:
48° 2' 12.405" N
Longitude:
123° 21' 10.517" W
Type:
Steep Terrain
Comment:
Steep slope with dense vegetation and large downed trees



Zone:
Zone 01
Photo Point:
UNSUR_331
Date:
2013-12-11
Photo Name:
I1456
Photo Direction:
East
Latitude:
48° 2' 13.175" N
Longitude:
123° 21' 9.592" W
Type:
Steep Terrain
Comment:
Steep slope with dense vegetation, river runs south to north at bottom of slope



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 01
Photo Point:
UNSUR_332
Date:
2013-12-11
Photo Name:
I1457
Photo Direction:
West
Latitude:
48° 2' 13.967" N
Longitude:
123° 21' 9.063" W
Type:
Steep Terrain
Comment:
Steep slope with dense vegetation



Zone:
Zone 01
Photo Point:
UNSUR_333
Date:
2013-12-11
Photo Name:
I1458
Photo Direction:
East
Latitude:
48° 2' 14.176" N
Longitude:
123° 21' 8.482" W
Type:
Steep Terrain
Comment:
Steep slope, river at bottom of slope



2014 PHOTOGRAPHIC LOG

Zone 2 - Unsurveyable and Site Documentation

Port Angeles Combat Range, WA



Legend

- Site Documentation
- Unsurveyable
- Photo Zone
- Project Boundary
- PACR MRS Boundary

N

0 250 500 Feet

0 50 100 Meters

Zone	Point ID	Photo	Latitude	Longitude	Page
2	SITE_DOC_041	L0938, L0939	48° 2' 13.735" N	123° 20' 47.520" W	
2	SITE_DOC_042	L0945	48° 2' 10.784" N	123° 20' 52.994" W	
2	SITE_DOC_065	L1001	48° 2' 0.499" N	123° 20' 42.153" W	
2	SITE_DOC_070	L1007	48° 2' 2.395" N	123° 20' 45.143" W	
2	SITE_DOC_135	L0883, L0884	48° 1' 59.385" N	123° 20' 42.633" W	
2	SITE_DOC_138	L1041	48° 2' 0.431" N	123° 20' 30.282" W	
2	SITE_DOC_139	L1042	48° 2' 0.869" N	123° 20' 30.389" W	
2	UNSUR_010	L0886	48° 1' 58.906" N	123° 20' 45.511" W	
2	UNSUR_114	L0940	48° 2' 13.728" N	123° 20' 47.543" W	
2	UNSUR_115	L0941	48° 2' 14.515" N	123° 20' 45.155" W	
2	UNSUR_120	L0947	48° 2' 8.181" N	123° 20' 52.688" W	
2	UNSUR_121	L0948	48° 2' 3.878" N	123° 20' 50.108" W	
2	UNSUR_124	L0951	48° 2' 12.095" N	123° 20' 43.939" W	

2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 02
Photo Point:
SITE_DOC_041
Date:
2013-11-07
Photo Name:
L0938
Photo Direction:
South, North
Latitude:
48° 2' 13.735" N
Longitude:
123° 20' 47.520" W
Type:
General Site Photo
Comment:
Very dense vegetation in all directions



Zone:
Zone 02
Photo Point:
SITE_DOC_041
Date:
2013-11-07
Photo Name:
L0939
Photo Direction:
South, North
Latitude:
48° 2' 13.735" N
Longitude:
123° 20' 47.520" W
Type:
General Site Photo
Comment:
Very dense vegetation in all directions



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 02
Photo Point:
SITE_DOC_042
Date:
2013-11-07
Photo Name:
L0945
Photo Direction:
South
Latitude:
48° 2' 10.784" N
Longitude:
123° 20' 52.994" W
Type:
General Site Photo
Comment:
Deviation from transect line due to dense vegetation



Zone:
Zone 02
Photo Point:
SITE_DOC_065
Date:
2013-11-19
Photo Name:
L1001
Photo Direction:
East
Latitude:
48° 2' 0.499" N
Longitude:
123° 20' 42.153" W
Type:
General Site Photo
Comment:
Mag and dig investigation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 02
Photo Point:
SITE_DOC_070
Date:
2013-11-19
Photo Name:
L1007
Photo Direction:
North
Latitude:
48° 2' 2.395" N
Longitude:
123° 20' 45.143" W
Type:
General Site Photo
Comment:
Mag and dig investigation



Zone:
Zone 02
Photo Point:
SITE_DOC_135
Date:
2013-10-28
Photo Name:
L0883
Photo Direction:
Close Up
Latitude:
48° 1' 59.385" N
Longitude:
123° 20' 42.633" W
Type:
Access Control Documentation
Comment:
Barb wire electric fence, impact to DGM



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 02
Photo Point:
SITE_DOC_135
Date:
2013-10-28
Photo Name:
L0884
Photo Direction:
Close Up
Latitude:
48° 1' 59.385" N
Longitude:
123° 20' 42.633" W
Type:
Access Control Documentation
Comment:
Barb wire electric fence, impact to DGM



Zone:
Zone 02
Photo Point:
SITE_DOC_138
Date:
2013-12-03
Photo Name:
L1041
Photo Direction:
East
Latitude:
48° 2' 0.431" N
Longitude:
123° 20' 30.282" W
Type:
General Site Photo
Comment:
Terrain documentation, dense forest



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 02
Photo Point:
SITE_DOC_139
Date:
2013-12-03
Photo Name:
L1042
Photo Direction:
North
Latitude:
48° 2' 0.869" N
Longitude:
123° 20' 30.389" W
Type:
General Site Photo
Comment:
Terrain documentation



Zone:
Zone 02
Photo Point:
UNSUR_010
Date:
2013-10-28
Photo Name:
L0886
Photo Direction:
North
Latitude:
48° 1' 58.906" N
Longitude:
123° 20' 45.511" W
Type:
Steep Terrain
Comment:
Steep terrain



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 02
Photo Point:
UNSUR_114
Date:
2013-11-07
Photo Name:
L0940
Photo Direction:
South
Latitude:
48° 2' 13.728" N
Longitude:
123° 20' 47.543" W
Type:
Dense Vegetation
Comment:
Dense vegetation, steep terrain leading to creek, small transect lines directly south are unsurveyable



Zone:
Zone 02
Photo Point:
UNSUR_115
Date:
2013-11-07
Photo Name:
L0941
Photo Direction:
South
Latitude:
48° 2' 14.515" N
Longitude:
123° 20' 45.155" W
Type:
Dense Vegetation
Comment:
Dense vegetation, unsurveyable in all directions



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 02
Photo Point:
UNSUR_120
Date:
2013-11-07
Photo Name:
L0947
Photo Direction:
West
Latitude:
48° 2' 8.181" N
Longitude:
123° 20' 52.688" W
Type:
Dense Vegetation
Comment:
Unsurveyable area to the west



Zone:
Zone 02
Photo Point:
UNSUR_121
Date:
2013-11-07
Photo Name:
L0948
Photo Direction:
West
Latitude:
48° 2' 3.878" N
Longitude:
123° 20' 50.108" W
Type:
Dense Vegetation
Comment:
Dense vegetation, thick thorn bushes, unsurveyable area to the west



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

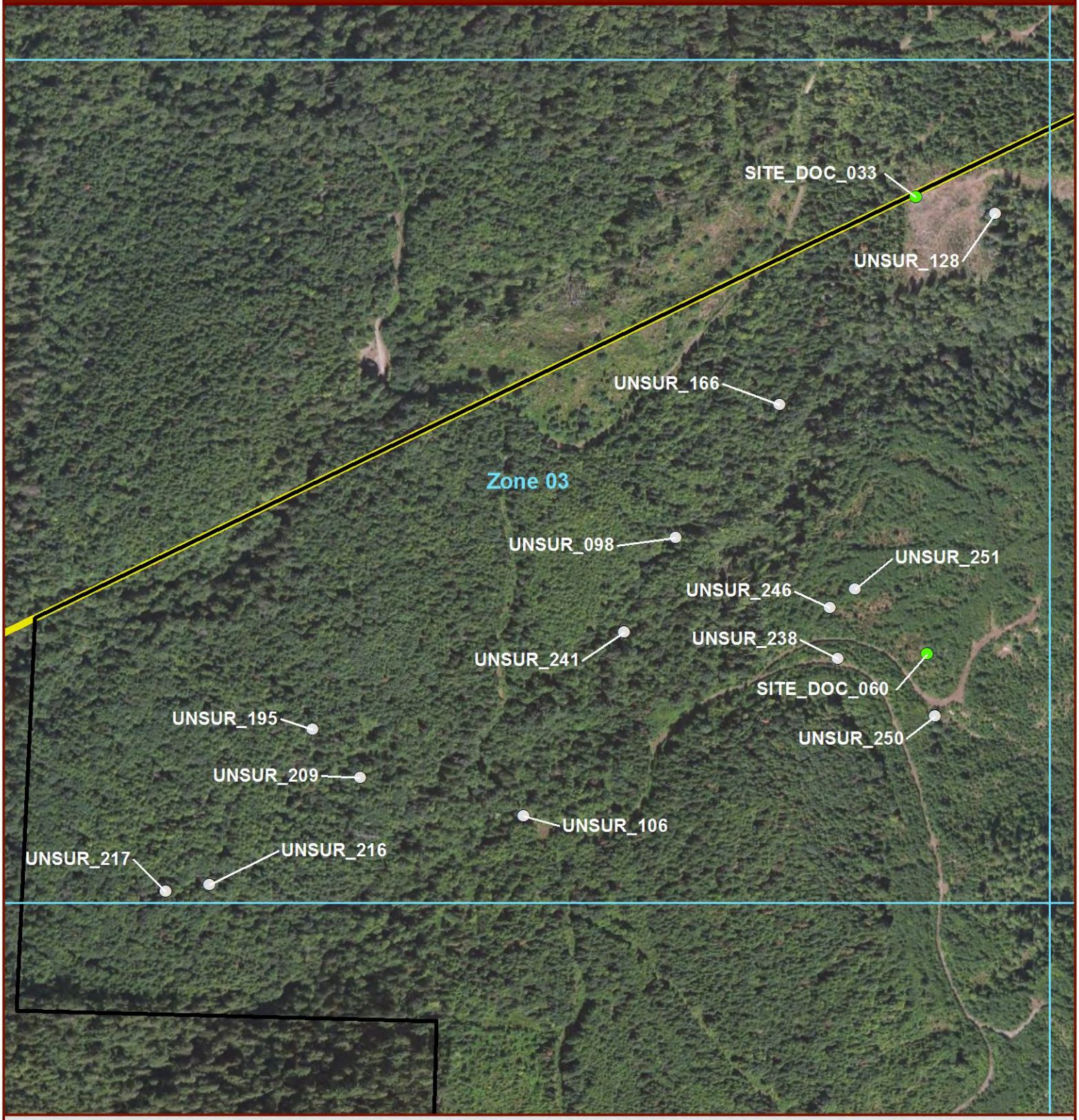
Zone:
Zone 02
Photo Point:
UNSUR_124
Date:
2013-11-07
Photo Name:
L0951
Photo Direction:
West
Latitude:
48° 2' 12.095" N
Longitude:
123° 20' 43.939" W
Type:
Dense Vegetation
Comment:
Clear cut forest, new growth dense vegetation and thorn bushes



2014 PHOTOGRAPHIC LOG

Zone 3 - Unsurveyable and Site Documentation

Port Angeles Combat Range, WA



Legend

- Site Documentation
- Unsurveyable
- Photo Zone
- Project Boundary
- PACR MRS Boundary

N

0 250 500 Feet

0 50 100 Meters

Zone	Point ID	Photo	Latitude	Longitude	Page
3	SITE_DOC_033	N1288	48° 1' 43.836" N	123° 21' 41.432" W	
3	SITE_DOC_060	N1363	48° 1' 30.082" N	123° 21' 40.252" W	
3	UNSUR_098	N1289	48° 1' 33.340" N	123° 21' 51.713" W	
3	UNSUR_106	N1293	48° 1' 24.786" N	123° 21' 58.137" W	
3	UNSUR_128	N1301	48° 1' 43.424" N	123° 21' 37.819" W	
3	UNSUR_166	N1307	48° 1' 37.445" N	123° 21' 47.231" W	
3	UNSUR_195	N1318	48° 1' 27.196" N	123° 22' 7.764" W	
3	UNSUR_209	N1325	48° 1' 25.788" N	123° 22' 5.548" W	
3	UNSUR_216	N1332	48° 1' 22.392" N	123° 22' 12.164" W	
3	UNSUR_217	N1333	48° 1' 22.158" N	123° 22' 14.109" W	
3	UNSUR_238	N1354	48° 1' 29.846" N	123° 21' 44.261" W	
3	UNSUR_241	N1349, N1350	48° 1' 30.424" N	123° 21' 53.881" W	
3	UNSUR_246	N1358	48° 1' 31.374" N	123° 21' 44.681" W	
3	UNSUR_250	N1362	48° 1' 28.217" N	123° 21' 39.783" W	
3	UNSUR_251	N1364	48° 1' 31.965" N	123° 21' 43.582" W	

2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 03
Photo Point:
SITE_DOC_033
Date:
2013-11-04
Photo Name:
N1288
Photo Direction:
South
Latitude:
48° 1' 43.836" N
Longitude:
123° 21' 41.432" W
Type:
General Site Photo
Comment:
Schonstedt investigation



Zone:
Zone 03
Photo Point:
SITE_DOC_060
Date:
2013-11-18
Photo Name:
N1363
Photo Direction:
North
Latitude:
48° 1' 30.082" N
Longitude:
123° 21' 40.252" W
Type:
General Site Photo
Comment:
Transect line through dense ferns



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 03
Photo Point:
UNSUR_098
Date:
2013-11-05
Photo Name:
N1289
Photo Direction:
South
Latitude:
48° 1' 33.340" N
Longitude:
123° 21' 51.713" W
Type:
Dense Vegetation
Comment:
Unsurveyable due to dense vegetation, thick thorn bushes



Zone:
Zone 03
Photo Point:
UNSUR_106
Date:
2013-11-06
Photo Name:
N1293
Photo Direction:
North
Latitude:
48° 1' 24.786" N
Longitude:
123° 21' 58.137" W
Type:
Dense Vegetation
Comment:
Unsurveyable due to dense vegetation to the west/northwest



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 03
Photo Point:
UNSUR_128
Date:
2013-11-07
Photo Name:
N1301
Photo Direction:
West
Latitude:
48° 1' 43.424" N
Longitude:
123° 21' 37.819" W
Type:
Steep Terrain
Comment:
Unsurveyable due to steep terrain to the east



Zone:
Zone 03
Photo Point:
UNSUR_166
Date:
2013-11-11
Photo Name:
N1307
Photo Direction:
East
Latitude:
48° 1' 37.445" N
Longitude:
123° 21' 47.231" W
Type:
Steep Terrain
Comment:
Unsurveyable to the south due to steep terrain leading to the river



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 03
Photo Point:
UNSUR_195
Date:
2013-11-12
Photo Name:
N1318
Photo Direction:
East
Latitude:
48° 1' 27.196" N
Longitude:
123° 22' 7.764" W
Type:
Dense Vegetation
Comment:
Unsurveyable due to dense vegetation to the east



Zone:
Zone 03
Photo Point:
UNSUR_209
Date:
2013-11-13
Photo Name:
N1325
Photo Direction:
North
Latitude:
48° 1' 25.788" N
Longitude:
123° 22' 5.548" W
Type:
Dense Vegetation
Comment:
Unsurveyable due to dense vegetation to the northwest



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 03
Photo Point:
UNSUR_216
Date:
2013-11-13
Photo Name:
N1332
Photo Direction:
North
Latitude:
48° 1' 22.392" N
Longitude:
123° 22' 12.164" W
Type:
Dense Vegetation
Comment:
Unsurveyable due to dense vegetation to the north



Zone:
Zone 03
Photo Point:
UNSUR_217
Date:
2013-11-13
Photo Name:
N1333
Photo Direction:
North
Latitude:
48° 1' 22.158" N
Longitude:
123° 22' 14.109" W
Type:
Dense Vegetation
Comment:
Unsurveyable due to dense vegetation to the north



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 03
Photo Point:
UNSUR_238
Date:
2013-11-15
Photo Name:
N1354
Photo Direction:
East
Latitude:
48° 1' 29.846" N
Longitude:
123° 21' 44.261" W
Type:
Steep Terrain
Comment:
Unsurveyable transect to the north and east due to steep terrain and dense forest



Zone:
Zone 03
Photo Point:
UNSUR_241
Date:
2013-11-15
Photo Name:
N1349
Photo Direction:
East
Latitude:
48° 1' 30.424" N
Longitude:
123° 21' 53.881" W
Type:
Steep Terrain
Comment:
Unsurveyable transects to the east and south due to steep terrain on both sides of river



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 03
Photo Point:
UNSUR_241
Date:
2013-11-15
Photo Name:
N1350
Photo Direction:
East
Latitude:
48° 1' 30.424" N
Longitude:
123° 21' 53.881" W
Type:
Steep Terrain
Comment:
Unsurveyable transects to the east and south due to steep terrain on both sides of river



Zone:
Zone 03
Photo Point:
UNSUR_246
Date:
2013-11-18
Photo Name:
N1358
Photo Direction:
North
Latitude:
48° 1' 31.374" N
Longitude:
123° 21' 44.681" W
Type:
Dense Vegetation
Comment:
Unsurveyable due to dense vegetation to the northeast



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 03
Photo Point:
UNSUR_250
Date:
2013-11-18
Photo Name:
N1362
Photo Direction:
East
Latitude:
48° 1' 28.217" N
Longitude:
123° 21' 39.783" W
Type:
Steep Terrain
Comment:
Transects partially unsurveyable to the east due to steep terrain and limited access



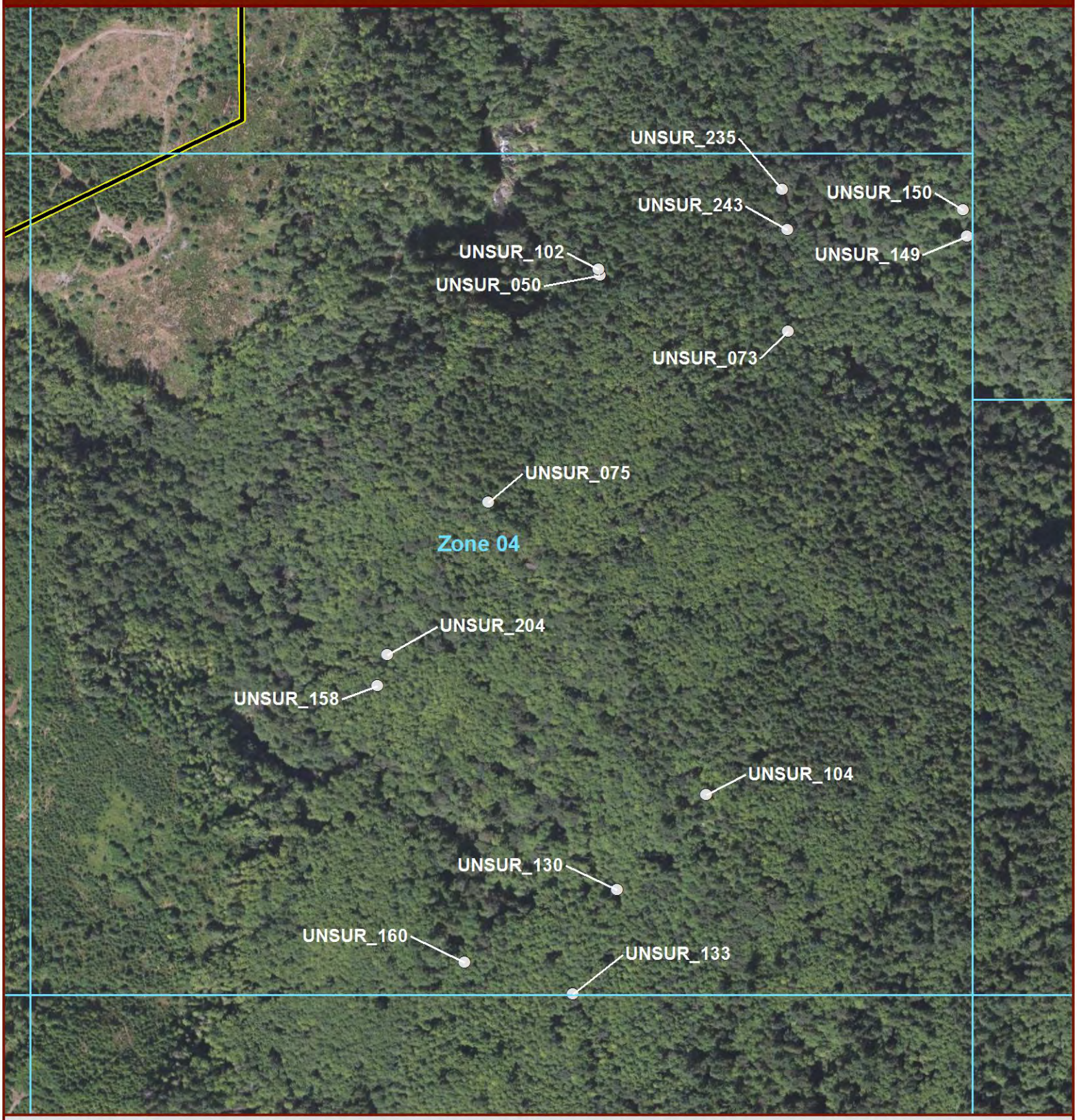
Zone:
Zone 03
Photo Point:
UNSUR_251
Date:
2013-11-18
Photo Name:
N1364
Photo Direction:
North
Latitude:
48° 1' 31.965" N
Longitude:
123° 21' 43.582" W
Type:
Dense Vegetation
Comment:
Unsurveyable to the north due to dense vegetation



2014 PHOTOGRAPHIC LOG

Zone 4 - Unsurveyable and Site Documentation

Port Angeles Combat Range, WA



Legend

- Site Documentation
- Unsurveyable
- Photo Zone
- Project Boundary
- PACR MRS Boundary

N

0 250 500 Feet

0 50 100 Meters

Zone	Point ID	Photo	Latitude	Longitude	Page
4	UNSUR_050	I1257	48° 1' 44.995" N	123° 21' 9.785" W	
4	UNSUR_073	I1283	48° 1' 43.487" N	123° 21' 1.222" W	
4	UNSUR_075	I1281	48° 1' 38.029" N	123° 21' 14.482" W	
4	UNSUR_102	I1305	48° 1' 45.170" N	123° 21' 9.843" W	
4	UNSUR_104	I1309	48° 1' 29.403" N	123° 21' 4.223" W	
4	UNSUR_130	I1320	48° 1' 26.445" N	123° 21' 8.098" W	
4	UNSUR_133	I1322	48° 1' 23.261" N	123° 21' 9.928" W	
4	UNSUR_149	L0962	48° 1' 46.540" N	123° 20' 53.304" W	
4	UNSUR_150	L0963	48° 1' 47.328" N	123° 20' 53.528" W	
4	UNSUR_158	I1329	48° 1' 32.375" N	123° 21' 19.211" W	
4	UNSUR_160	I1331	48° 1' 24.107" N	123° 21' 14.876" W	
4	UNSUR_204	I1362	48° 1' 33.319" N	123° 21' 18.793" W	
4	UNSUR_235	I1387	48° 1' 47.782" N	123° 21' 1.689" W	
4	UNSUR_243	I1390	48° 1' 46.563" N	123° 21' 1.403" W	

2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 04
Photo Point:
UNSUR_050
Date:
2013-10-30
Photo Name:
I1257
Photo Direction:
North
Latitude:
48° 1' 44.995" N
Longitude:
123° 21' 9.785" W
Type:
Cliff
Comment:
Steep cliff to the north



Zone:
Zone 04
Photo Point:
UNSUR_073
Date:
2013-10-31
Photo Name:
I1283
Photo Direction:
North
Latitude:
48° 1' 43.487" N
Longitude:
123° 21' 1.222" W
Type:
Cliff
Comment:
Steep cliff with dense vegetation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 04
Photo Point:
UNSUR_075
Date:
2013-10-31
Photo Name:
I1281
Photo Direction:
West
Latitude:
48° 1' 38.029" N
Longitude:
123° 21' 14.482" W
Type:
Cliff
Comment:
Steep cliff with dense vegetation



Zone:
Zone 04
Photo Point:
UNSUR_102
Date:
2013-11-06
Photo Name:
I1305
Photo Direction:
West
Latitude:
48° 1' 45.170" N
Longitude:
123° 21' 9.843" W
Type:
Steep Terrain
Comment:
Steep terrain with dense vegetation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 04
Photo Point:
UNSUR_104
Date:
2013-11-06
Photo Name:
I1309
Photo Direction:
South
Latitude:
48° 1' 29.403" N
Longitude:
123° 21' 4.223" W
Type:
Steep Terrain
Comment:
Steep terrain, dense vegetation, and large downed trees



Zone:
Zone 04
Photo Point:
UNSUR_130
Date:
2013-11-08
Photo Name:
I1320
Photo Direction:
North
Latitude:
48° 1' 26.445" N
Longitude:
123° 21' 8.098" W
Type:
Standing Water
Comment:
Dense vegetation and standing water



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 04
Photo Point:
UNSUR_133
Date:
2013-11-08
Photo Name:
I1322
Photo Direction:
South
Latitude:
48° 1' 23.261" N
Longitude:
123° 21' 9.928" W
Type:
Cliff
Comment:
Steep terrain with dense vegetation



Zone:
Zone 04
Photo Point:
UNSUR_149
Date:
2013-11-08
Photo Name:
L0962
Photo Direction:
South
Latitude:
48° 1' 46.540" N
Longitude:
123° 20' 53.304" W
Type:
General Site Photo
Comment:
Steep terrain, dense vegetation, and thorn bushes



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 04
Photo Point:
UNSUR_150
Date:
2013-11-08
Photo Name:
L0963
Photo Direction:
North
Latitude:
48° 1' 47.328" N
Longitude:
123° 20' 53.528" W
Type:
General Site Photo
Comment:
Steep terrain, dense vegetation, and thorn bushes



Zone:
Zone 04
Photo Point:
UNSUR_158
Date:
2013-11-11
Photo Name:
I1329
Photo Direction:
South
Latitude:
48° 1' 32.375" N
Longitude:
123° 21' 19.211" W
Type:
Dense Vegetation
Comment:
Dense vegetation and standing water



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 04
Photo Point:
UNSUR_160
Date:
2013-11-11
Photo Name:
I1331
Photo Direction:
West
Latitude:
48° 1' 24.107" N
Longitude:
123° 21' 14.876" W
Type:
Standing Water
Comment:
Dense vegetation and standing water



Zone:
Zone 04
Photo Point:
UNSUR_204
Date:
2013-11-13
Photo Name:
I1362
Photo Direction:
SSE
Latitude:
48° 1' 33.319" N
Longitude:
123° 21' 18.793" W
Type:
Dense Vegetation
Comment:
Dense vegetation and large downed trees, standing water present



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 04
Photo Point:
UNSUR_235
Date:
2013-11-15
Photo Name:
I1387
Photo Direction:
West
Latitude:
48° 1' 47.782" N
Longitude:
123° 21' 1.689" W
Type:
Steep Terrain
Comment:
Steep terrain, downed trees, and heavy vegetation



Zone:
Zone 04
Photo Point:
UNSUR_243
Date:
2013-11-15
Photo Name:
I1390
Photo Direction:
WNW
Latitude:
48° 1' 46.563" N
Longitude:
123° 21' 1.403" W
Type:
Steep Terrain
Comment:
Steep terrain, downed trees, and heavy vegetation



2014 PHOTOGRAPHIC LOG

Zone 5 - Unsurveyable and Site Documentation

Port Angeles Combat Range, WA



Legend

- Site Documentation
- Unsurveyable
- Photo Zone
- Project Boundary
- PACR MRS Boundary

N

0 100 200 Feet

0 25 50 Meters

Zone	Point ID	Photo	Latitude	Longitude	Page
5	SITE_DOC_029	L0912	48° 1' 48.836" N	123° 20' 38.868" W	
5	SITE_DOC_031	L0913	48° 1' 43.126" N	123° 20' 41.476" W	
5	SITE_DOC_032	L0917	48° 1' 48.515" N	123° 20' 48.125" W	
5	SITE_DOC_050	L0980	48° 1' 54.488" N	123° 20' 42.009" W	
5	SITE_DOC_058	L0994	48° 1' 56.437" N	123° 20' 45.068" W	
5	SITE_DOC_059	L0997	48° 1' 58.328" N	123° 20' 45.138" W	
5	SITE_DOC_062	O1269	48° 1' 56.495" N	123° 20' 39.177" W	
5	SITE_DOC_063	O1271	48° 1' 54.565" N	123° 20' 39.053" W	
5	SITE_DOC_071	L1009	48° 1' 56.457" N	123° 20' 42.211" W	
5	SITE_DOC_073	O1275	48° 1' 52.604" N	123° 20' 38.922" W	
5	SITE_DOC_093	O1300	48° 1' 53.837" N	123° 20' 39.135" W	
5	SITE_DOC_095	O1303	48° 1' 54.471" N	123° 20' 47.261" W	
5	SITE_DOC_096	O1304	48° 1' 54.406" N	123° 20' 45.791" W	
5	SITE_DOC_097	O1305	48° 1' 54.480" N	123° 20' 43.540" W	
5	SITE_DOC_098	O1307	48° 1' 51.748" N	123° 20' 38.873" W	
5	SITE_DOC_099	O1309	48° 1' 48.519" N	123° 20' 41.619" W	
5	SITE_DOC_101	O1314	48° 1' 48.612" N	123° 20' 37.214" W	
5	SITE_DOC_110	O1319	48° 1' 46.599" N	123° 20' 47.414" W	
5	SITE_DOC_113	O1328	48° 1' 50.650" N	123° 20' 46.579" W	
5	SITE_DOC_114	O1331, O1333	48° 1' 46.453" N	123° 20' 52.139" W	
5	SITE_DOC_115	O1335	48° 1' 44.443" N	123° 20' 47.680" W	
5	SITE_DOC_118	O1340	48° 1' 50.484" N	123° 20' 44.762" W	
5	SITE_DOC_160	L1069	48° 1' 44.636" N	123° 20' 38.556" W	
5	SITE_DOC_166	L1082	48° 1' 44.436" N	123° 20' 39.298" W	
5	SITE_DOC_170	L1102	48° 1' 42.781" N	123° 20' 41.594" W	
5	SITE_DOC_171	L1105	48° 1' 44.784" N	123° 20' 44.143" W	
5	UNSUR_089	L0914, L0916	48° 1' 43.344" N	123° 20' 42.022" W	
5	UNSUR_156	L0969	48° 1' 56.585" N	123° 20' 51.008" W	
5	UNSUR_282	O1324	48° 1' 49.103" N	123° 20' 48.089" W	
5	UNSUR_283	O1327	48° 1' 51.329" N	123° 20' 46.639" W	
5	UNSUR_284	O1336	48° 1' 45.356" N	123° 20' 48.565" W	

2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
SITE_DOC_029
Date:
2013-11-01
Photo Name:
L0912
Photo Direction:
North
Latitude:
48° 1' 48.836" N
Longitude:
123° 20' 38.868" W
Type:
General Site Photo
Comment:
Site terrain/vegetation



Zone:
Zone 05
Photo Point:
SITE_DOC_031
Date:
2013-11-04
Photo Name:
L0913
Photo Direction:
North
Latitude:
48° 1' 43.126" N
Longitude:
123° 20' 41.476" W
Type:
General Site Photo
Comment:
Site terrain/vegetation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
SITE_DOC_032
Date:
2013-11-04
Photo Name:
L0917
Photo Direction:
West
Latitude:
48° 1' 48.515" N
Longitude:
123° 20' 48.125" W
Type:
General Site Photo
Comment:
Old road/trail



Zone:
Zone 05
Photo Point:
SITE_DOC_050
Date:
2013-11-14
Photo Name:
L0980
Photo Direction:
North
Latitude:
48° 1' 54.488" N
Longitude:
123° 20' 42.009" W
Type:
General Site Photo
Comment:
Southeast corner of Grid I-04



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
SITE_DOC_058
Date:
2013-11-18
Photo Name:
L0994
Photo Direction:
North
Latitude:
48° 1' 56.437" N
Longitude:
123° 20' 45.068" W
Type:
General Site Photo
Comment:
Southwest corner of Grid L-03



Zone:
Zone 05
Photo Point:
SITE_DOC_059
Date:
2013-11-18
Photo Name:
L0997
Photo Direction:
North
Latitude:
48° 1' 58.328" N
Longitude:
123° 20' 45.138" W
Type:
General Site Photo
Comment:
Southwest corner of Grid L-02



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
SITE_DOC_062
Date:
2013-11-18
Photo Name:
O1269
Photo Direction:
North
Latitude:
48° 1' 56.495" N
Longitude:
123° 20' 39.177" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid N-03



Zone:
Zone 05
Photo Point:
SITE_DOC_063
Date:
2013-11-18
Photo Name:
O1271
Photo Direction:
North
Latitude:
48° 1' 54.565" N
Longitude:
123° 20' 39.053" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid N-04



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
SITE_DOC_071
Date:
2013-11-19
Photo Name:
L1009
Photo Direction:
North
Latitude:
48° 1' 56.457" N
Longitude:
123° 20' 42.211" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid M-03



Zone:
Zone 05
Photo Point:
SITE_DOC_073
Date:
2013-11-19
Photo Name:
O1275
Photo Direction:
North
Latitude:
48° 1' 52.604" N
Longitude:
123° 20' 38.922" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid N-05



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
SITE_DOC_093
Date:
2013-11-20
Photo Name:
O1300
Photo Direction:
West
Latitude:
48° 1' 53.837" N
Longitude:
123° 20' 39.135" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid M-05



Zone:
Zone 05
Photo Point:
SITE_DOC_095
Date:
2013-11-20
Photo Name:
O1303
Photo Direction:
South
Latitude:
48° 1' 54.471" N
Longitude:
123° 20' 47.261" W
Type:
Cliff
Comment:
Steep cliff



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
SITE_DOC_096
Date:
2013-11-20
Photo Name:
O1304
Photo Direction:
South
Latitude:
48° 1' 54.406" N
Longitude:
123° 20' 45.791" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid K-05



Zone:
Zone 05
Photo Point:
SITE_DOC_097
Date:
2013-11-20
Photo Name:
O1305
Photo Direction:
South
Latitude:
48° 1' 54.480" N
Longitude:
123° 20' 43.540" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid L-05



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
SITE_DOC_098
Date:
2013-11-20
Photo Name:
O1307
Photo Direction:
West
Latitude:
48° 1' 51.748" N
Longitude:
123° 20' 38.873" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid M-06



Zone:
Zone 05
Photo Point:
SITE_DOC_099
Date:
2013-11-20
Photo Name:
O1309
Photo Direction:
North
Latitude:
48° 1' 48.519" N
Longitude:
123° 20' 41.619" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid M-07



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
SITE_DOC_101
Date:
2013-11-20
Photo Name:
O1314
Photo Direction:
South
Latitude:
48° 1' 48.612" N
Longitude:
123° 20' 37.214" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid N-08



Zone:
Zone 05
Photo Point:
SITE_DOC_110
Date:
2013-11-21
Photo Name:
O1319
Photo Direction:
North
Latitude:
48° 1' 46.599" N
Longitude:
123° 20' 47.414" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid K-08



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
SITE_DOC_113
Date:
2013-11-21
Photo Name:
O1328
Photo Direction:
North
Latitude:
48° 1' 50.650" N
Longitude:
123° 20' 46.579" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid K-06



Zone:
Zone 05
Photo Point:
SITE_DOC_114
Date:
2013-11-21
Photo Name:
O1331
Photo Direction:
North, West
Latitude:
48° 1' 46.453" N
Longitude:
123° 20' 52.139" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid I-08



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
SITE_DOC_114
Date:
2013-11-21
Photo Name:
O1333
Photo Direction:
North, West
Latitude:
48° 1' 46.453" N
Longitude:
123° 20' 52.139" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid I-08



Zone:
Zone 05
Photo Point:
SITE_DOC_115
Date:
2013-11-21
Photo Name:
O1335
Photo Direction:
North
Latitude:
48° 1' 44.443" N
Longitude:
123° 20' 47.680" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid J-09



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
SITE_DOC_118
Date:
2013-11-21
Photo Name:
O1340
Photo Direction:
North
Latitude:
48° 1' 50.484" N
Longitude:
123° 20' 44.762" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid L-06



Zone:
Zone 05
Photo Point:
SITE_DOC_160
Date:
2013-12-05
Photo Name:
L1069
Photo Direction:
South
Latitude:
48° 1' 44.636" N
Longitude:
123° 20' 38.556" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid N-10



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
SITE_DOC_166
Date:
2013-12-06
Photo Name:
L1082
Photo Direction:
West
Latitude:
48° 1' 44.436" N
Longitude:
123° 20' 39.298" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid M-10



Zone:
Zone 05
Photo Point:
SITE_DOC_170
Date:
2013-12-09
Photo Name:
L1102
Photo Direction:
North
Latitude:
48° 1' 42.781" N
Longitude:
123° 20' 41.594" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid L-10



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
SITE_DOC_171
Date:
2013-12-09
Photo Name:
L1105
Photo Direction:
North
Latitude:
48° 1' 44.784" N
Longitude:
123° 20' 44.143" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid L-09



Zone:
Zone 05
Photo Point:
UNSUR_089
Date:
2013-11-04
Photo Name:
L0914
Photo Direction:
South
Latitude:
48° 1' 43.344" N
Longitude:
123° 20' 42.022" W
Type:
Dense Vegetation
Comment:
Dense vegetation including thick thorn bushes



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
UNSUR_089
Date:
2013-11-04
Photo Name:
L0916
Photo Direction:
South
Latitude:
48° 1' 43.344" N
Longitude:
123° 20' 42.022" W
Type:
Dense Vegetation
Comment:
Dense vegetation including thick thorn bushes



Zone:
Zone 05
Photo Point:
UNSUR_156
Date:
2013-11-08
Photo Name:
L0969
Photo Direction:
West
Latitude:
48° 1' 56.585" N
Longitude:
123° 20' 51.008" W
Type:
General Site Photo
Comment:
Steep terrain, dense vegetation including thick thorn bushes



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 05
Photo Point:
UNSUR_282
Date:
2013-11-21
Photo Name:
O1324
Photo Direction:
North
Latitude:
48° 1' 49.103" N
Longitude:
123° 20' 48.089" W
Type:
Cliff
Comment:
Unsurveyable area west of line in Grid J-07



Zone:
Zone 05
Photo Point:
UNSUR_283
Date:
2013-11-21
Photo Name:
O1327
Photo Direction:
South
Latitude:
48° 1' 51.329" N
Longitude:
123° 20' 46.639" W
Type:
Cliff
Comment:
Unsurveyable west of line in Grid K-06



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

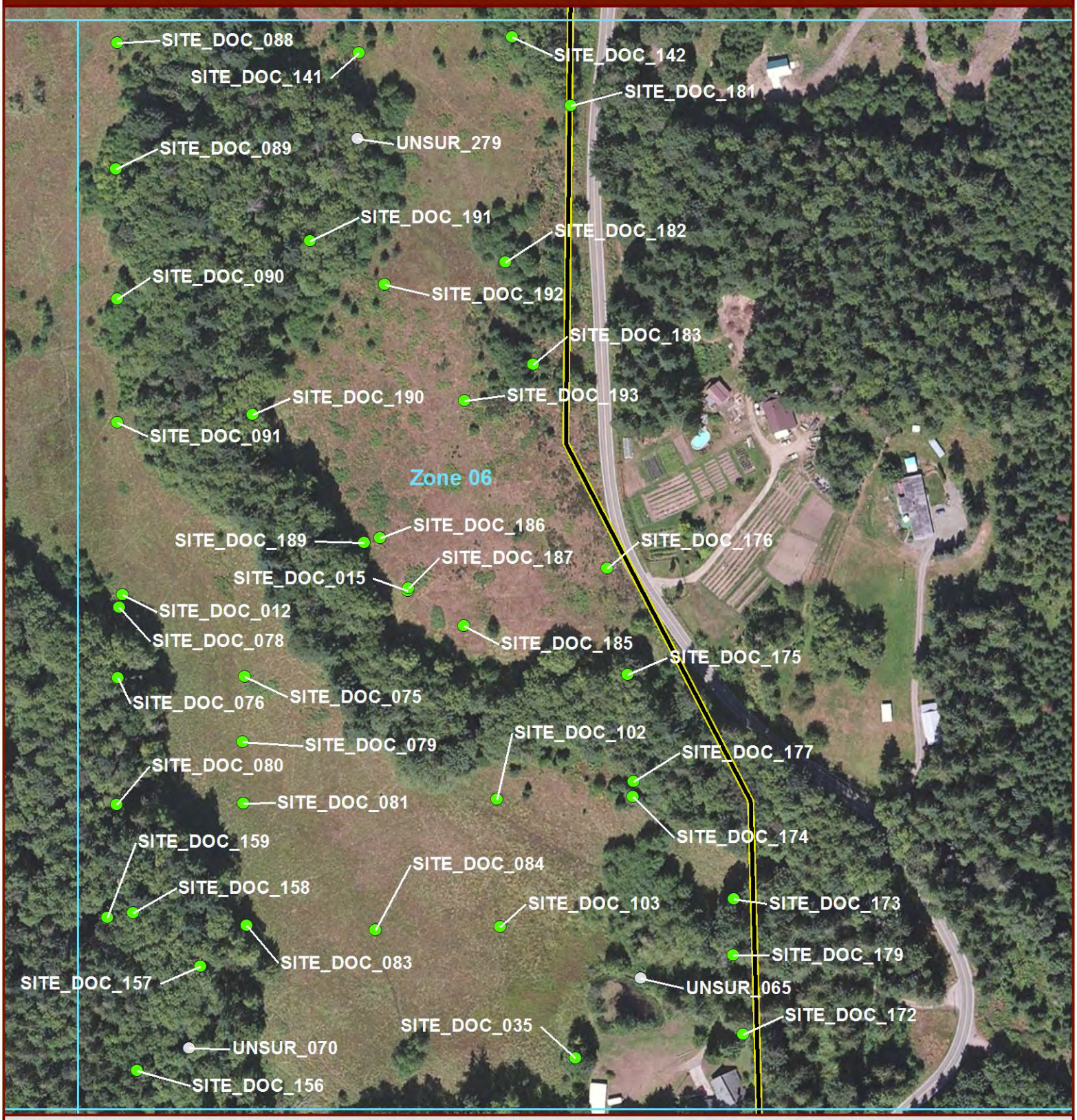
Zone:
Zone 05
Photo Point:
UNSUR_284
Date:
2013-11-21
Photo Name:
O1336
Photo Direction:
North
Latitude:
48° 1' 45.356" N
Longitude:
123° 20' 48.565" W
Type:
Cliff
Comment:
Unsurveyable west of line in Grid J-09



2014 PHOTOGRAPHIC LOG

Zone 6 - Unsurveyable and Site Documentation

Port Angeles Combat Range, WA



Legend

- Site Documentation
- Unsurveyable
- Photo Zone
- Project Boundary
- PACR MRS Boundary

N

0 100 200 Feet

0 25 50 Meters

Zone	Point ID	Photo	Latitude	Longitude	Page
6	SITE_DOC_012	L0880	48° 1' 49.997" N	123° 20' 35.752" W	
6	SITE_DOC_015	L0894	48° 1' 50.204" N	123° 20' 29.138" W	
6	SITE_DOC_035	L0920	48° 1' 43.013" N	123° 20' 24.885" W	
6	SITE_DOC_075	I1397	48° 1' 48.782" N	123° 20' 32.856" W	
6	SITE_DOC_076	I1399	48° 1' 48.701" N	123° 20' 35.792" W	
6	SITE_DOC_078	I1402	48° 1' 49.799" N	123° 20' 35.817" W	
6	SITE_DOC_079	I1404	48° 1' 47.770" N	123° 20' 32.846" W	
6	SITE_DOC_080	I1405	48° 1' 46.723" N	123° 20' 35.717" W	
6	SITE_DOC_081	I1407	48° 1' 46.813" N	123° 20' 32.781" W	
6	SITE_DOC_083	L1010	48° 1' 44.916" N	123° 20' 32.613" W	
6	SITE_DOC_084	L1011	48° 1' 44.908" N	123° 20' 29.620" W	
6	SITE_DOC_088	O1292	48° 1' 58.579" N	123° 20' 36.291" W	
6	SITE_DOC_089	O1293	48° 1' 56.619" N	123° 20' 36.216" W	
6	SITE_DOC_090	O1294	48° 1' 54.595" N	123° 20' 36.084" W	
6	SITE_DOC_091	O1297	48° 1' 52.670" N	123° 20' 36.002" W	
6	SITE_DOC_102	L1017	48° 1' 46.998" N	123° 20' 26.911" W	
6	SITE_DOC_103	L1018	48° 1' 45.016" N	123° 20' 26.726" W	
6	SITE_DOC_141	L1045	48° 1' 58.549" N	123° 20' 30.666" W	
6	SITE_DOC_142	L1046	48° 1' 58.875" N	123° 20' 27.123" W	
6	SITE_DOC_156	L1062	48° 1' 42.599" N	123° 20' 35.041" W	
6	SITE_DOC_157	L1063	48° 1' 44.254" N	123° 20' 33.654" W	
6	SITE_DOC_158	L1065	48° 1' 45.050" N	123° 20' 35.261" W	
6	SITE_DOC_159	L1067	48° 1' 44.959" N	123° 20' 35.859" W	
6	SITE_DOC_172	L1107	48° 1' 43.468" N	123° 20' 21.008" W	
6	SITE_DOC_173	L1109	48° 1' 45.574" N	123° 20' 21.330" W	
6	SITE_DOC_174	L1110	48° 1' 47.110" N	123° 20' 23.753" W	
6	SITE_DOC_175	L1113	48° 1' 49.007" N	123° 20' 23.961" W	
6	SITE_DOC_176	L1115	48° 1' 50.652" N	123° 20' 24.514" W	
6	SITE_DOC_177	L1112	48° 1' 47.347" N	123° 20' 23.747" W	
6	SITE_DOC_179	L1108	48° 1' 44.691" N	123° 20' 21.304" W	
6	SITE_DOC_181	L1117	48° 1' 57.837" N	123° 20' 25.716" W	
6	SITE_DOC_182	L1121	48° 1' 55.372" N	123° 20' 27.108" W	
6	SITE_DOC_183	L1122	48° 1' 53.786" N	123° 20' 26.397" W	
6	SITE_DOC_185	L1126	48° 1' 49.692" N	123° 20' 27.795" W	
6	SITE_DOC_186	L1152	48° 1' 51.009" N	123° 20' 29.821" W	
6	SITE_DOC_187	L1150	48° 1' 50.240" N	123° 20' 29.117" W	
6	SITE_DOC_189	L1153	48° 1' 50.926" N	123° 20' 30.173" W	
6	SITE_DOC_190	L1155	48° 1' 52.862" N	123° 20' 32.871" W	
6	SITE_DOC_191	L1157	48° 1' 55.595" N	123° 20' 31.657" W	
6	SITE_DOC_192	L1158	48° 1' 54.957" N	123° 20' 29.898" W	
6	SITE_DOC_193	L1159	48° 1' 53.190" N	123° 20' 27.950" W	
6	UNSUR_065	L0901	48° 1' 44.291" N	123° 20' 23.434" W	
6	UNSUR_070	L0908	48° 1' 42.971" N	123° 20' 33.850" W	
6	UNSUR_279	L0892	48° 1' 57.212" N	123° 20' 30.640" W	

2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_012
Date:
2013-10-28
Photo Name:
L0880
Photo Direction:
North
Latitude:
48° 1' 49.997" N
Longitude:
123° 20' 35.752" W
Type:
General Site Photo
Comment:
Terrain documentation



Zone:
Zone 06
Photo Point:
SITE_DOC_015
Date:
2013-10-29
Photo Name:
L0894
Photo Direction:
(None)
Latitude:
48° 1' 50.204" N
Longitude:
123° 20' 29.138" W
Type:
Site Debris
Comment:
Surface trash, impact to DGM



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_035
Date:
2013-11-05
Photo Name:
L0920
Photo Direction:
Close Up
Latitude:
48° 1' 43.013" N
Longitude:
123° 20' 24.885" W
Type:
Access Control Documentation
Comment:
Barb wire fence on ground, impact to DGM



Zone:
Zone 06
Photo Point:
SITE_DOC_075
Date:
2013-11-19
Photo Name:
I1397
Photo Direction:
North
Latitude:
48° 1' 48.782" N
Longitude:
123° 20' 32.856" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid Q-07



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_076
Date:
2013-11-19
Photo Name:
I1399
Photo Direction:
North
Latitude:
48° 1' 48.701" N
Longitude:
123° 20' 35.792" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid P-07



Zone:
Zone 06
Photo Point:
SITE_DOC_078
Date:
2013-11-19
Photo Name:
I1402
Photo Direction:
West
Latitude:
48° 1' 49.799" N
Longitude:
123° 20' 35.817" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid N-07



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_079
Date:
2013-11-19
Photo Name:
I1404
Photo Direction:
West
Latitude:
48° 1' 47.770" N
Longitude:
123° 20' 32.846" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid P-08



Zone:
Zone 06
Photo Point:
SITE_DOC_080
Date:
2013-11-19
Photo Name:
I1405
Photo Direction:
North
Latitude:
48° 1' 46.723" N
Longitude:
123° 20' 35.717" W
Type:
General Site Photo
Comment:
Steep terrain



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_081
Date:
2013-11-19
Photo Name:
I1407
Photo Direction:
North
Latitude:
48° 1' 46.813" N
Longitude:
123° 20' 32.781" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid Q-08



Zone:
Zone 06
Photo Point:
SITE_DOC_083
Date:
2013-11-20
Photo Name:
L1010
Photo Direction:
North
Latitude:
48° 1' 44.916" N
Longitude:
123° 20' 32.613" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid Q-09



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_084
Date:
2013-11-20
Photo Name:
L1011
Photo Direction:
North
Latitude:
48° 1' 44.908" N
Longitude:
123° 20' 29.620" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid R-09



Zone:
Zone 06
Photo Point:
SITE_DOC_088
Date:
2013-11-20
Photo Name:
O1292
Photo Direction:
North
Latitude:
48° 1' 58.579" N
Longitude:
123° 20' 36.291" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid P-02



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_089
Date:
2013-11-20
Photo Name:
O1293
Photo Direction:
North
Latitude:
48° 1' 56.619" N
Longitude:
123° 20' 36.216" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid P-03



Zone:
Zone 06
Photo Point:
SITE_DOC_090
Date:
2013-11-20
Photo Name:
O1294
Photo Direction:
North
Latitude:
48° 1' 54.595" N
Longitude:
123° 20' 36.084" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid P-04



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_091
Date:
2013-11-20
Photo Name:
O1297
Photo Direction:
North
Latitude:
48° 1' 52.670" N
Longitude:
123° 20' 36.002" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid P-05



Zone:
Zone 06
Photo Point:
SITE_DOC_102
Date:
2013-11-21
Photo Name:
L1017
Photo Direction:
North
Latitude:
48° 1' 46.998" N
Longitude:
123° 20' 26.911" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid S-08



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_103
Date:
2013-11-21
Photo Name:
L1018
Photo Direction:
North
Latitude:
48° 1' 45.016" N
Longitude:
123° 20' 26.726" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid S-09



Zone:
Zone 06
Photo Point:
SITE_DOC_141
Date:
2013-12-03
Photo Name:
L1045
Photo Direction:
South
Latitude:
48° 1' 58.549" N
Longitude:
123° 20' 30.666" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid Q-03



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_142
Date:
2013-12-03
Photo Name:
L1046
Photo Direction:
North
Latitude:
48° 1' 58.875" N
Longitude:
123° 20' 27.123" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid S-02



Zone:
Zone 06
Photo Point:
SITE_DOC_156
Date:
2013-12-05
Photo Name:
L1062
Photo Direction:
South
Latitude:
48° 1' 42.599" N
Longitude:
123° 20' 35.041" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid P-11



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_157
Date:
2013-12-05
Photo Name:
L1063
Photo Direction:
West
Latitude:
48° 1' 44.254" N
Longitude:
123° 20' 33.654" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid P-10



Zone:
Zone 06
Photo Point:
SITE_DOC_158
Date:
2013-12-05
Photo Name:
L1065
Photo Direction:
North
Latitude:
48° 1' 45.050" N
Longitude:
123° 20' 35.261" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid P-09



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_159
Date:
2013-12-05
Photo Name:
L1067
Photo Direction:
North
Latitude:
48° 1' 44.959" N
Longitude:
123° 20' 35.859" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid N-09



Zone:
Zone 06
Photo Point:
SITE_DOC_172
Date:
2013-12-09
Photo Name:
L1107
Photo Direction:
North
Latitude:
48° 1' 43.468" N
Longitude:
123° 20' 21.008" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid T-10



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_173
Date:
2013-12-09
Photo Name:
L1109
Photo Direction:
North
Latitude:
48° 1' 45.574" N
Longitude:
123° 20' 21.330" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid T-09



Zone:
Zone 06
Photo Point:
SITE_DOC_174
Date:
2013-12-09
Photo Name:
L1110
Photo Direction:
North
Latitude:
48° 1' 47.110" N
Longitude:
123° 20' 23.753" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid T-08



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_175
Date:
2013-12-09
Photo Name:
L1113
Photo Direction:
North
Latitude:
48° 1' 49.007" N
Longitude:
123° 20' 23.961" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid T-07



Zone:
Zone 06
Photo Point:
SITE_DOC_176
Date:
2013-12-09
Photo Name:
L1115
Photo Direction:
South
Latitude:
48° 1' 50.652" N
Longitude:
123° 20' 24.514" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid S-07



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_177
Date:
2013-12-09
Photo Name:
L1112
Photo Direction:
(None)
Latitude:
48° 1' 47.347" N
Longitude:
123° 20' 23.747" W
Type:
Site Debris
Comment:
Trash



Zone:
Zone 06
Photo Point:
SITE_DOC_179
Date:
2013-12-09
Photo Name:
L1108
Photo Direction:
(None)
Latitude:
48° 1' 44.691" N
Longitude:
123° 20' 21.304" W
Type:
Site Debris
Comment:
Pile of metal debris and trash



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_181
Date:
2013-12-10
Photo Name:
L1117
Photo Direction:
South
Latitude:
48° 1' 57.837" N
Longitude:
123° 20' 25.716" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid S-03



Zone:
Zone 06
Photo Point:
SITE_DOC_182
Date:
2013-12-10
Photo Name:
L1121
Photo Direction:
South
Latitude:
48° 1' 55.372" N
Longitude:
123° 20' 27.108" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid S-04



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_183
Date:
2013-12-10
Photo Name:
L1122
Photo Direction:
North
Latitude:
48° 1' 53.786" N
Longitude:
123° 20' 26.397" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid S-05



Zone:
Zone 06
Photo Point:
SITE_DOC_185
Date:
2013-12-10
Photo Name:
L1126
Photo Direction:
West
Latitude:
48° 1' 49.692" N
Longitude:
123° 20' 27.795" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid R-07



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_186
Date:
2013-12-10
Photo Name:
L1152
Photo Direction:
North
Latitude:
48° 1' 51.009" N
Longitude:
123° 20' 29.821" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid R-06



Zone:
Zone 06
Photo Point:
SITE_DOC_187
Date:
2013-12-10
Photo Name:
L1150
Photo Direction:
(None)
Latitude:
48° 1' 50.240" N
Longitude:
123° 20' 29.117" W
Type:
Site Debris
Comment:
Metal debris/trash



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_189
Date:
2013-12-11
Photo Name:
L1153
Photo Direction:
North
Latitude:
48° 1' 50.926" N
Longitude:
123° 20' 30.173" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid Q-06



Zone:
Zone 06
Photo Point:
SITE_DOC_190
Date:
2013-12-11
Photo Name:
L1155
Photo Direction:
North
Latitude:
48° 1' 52.862" N
Longitude:
123° 20' 32.871" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid Q-05



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_191
Date:
2013-12-11
Photo Name:
L1157
Photo Direction:
North
Latitude:
48° 1' 55.595" N
Longitude:
123° 20' 31.657" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid Q-04



Zone:
Zone 06
Photo Point:
SITE_DOC_192
Date:
2013-12-11
Photo Name:
L1158
Photo Direction:
North
Latitude:
48° 1' 54.957" N
Longitude:
123° 20' 29.898" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid R-04



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
SITE_DOC_193
Date:
2013-12-11
Photo Name:
L1159
Photo Direction:
North
Latitude:
48° 1' 53.190" N
Longitude:
123° 20' 27.950" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid R-05



Zone:
Zone 06
Photo Point:
UNSUR_065
Date:
2013-10-30
Photo Name:
L0901
Photo Direction:
West
Latitude:
48° 1' 44.291" N
Longitude:
123° 20' 23.434" W
Type:
Water Body
Comment:
Small pond



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 06
Photo Point:
UNSUR_070
Date:
2013-10-30
Photo Name:
L0908
Photo Direction:
West
Latitude:
48° 1' 42.971" N
Longitude:
123° 20' 33.850" W
Type:
Dense Vegetation
Comment:
Tall dense vegetation with thorn bushes



Zone:
Zone 06
Photo Point:
UNSUR_279
Date:
2013-10-29
Photo Name:
L0892
Photo Direction:
South
Latitude:
48° 1' 57.212" N
Longitude:
123° 20' 30.640" W
Type:
Dense Vegetation
Comment:
Dense vegetation leading down to creek



2014 PHOTOGRAPHIC LOG

Zone 7 - Unsurveyable and Site Documentation

Port Angeles Combat Range, WA



Legend

- Site Documentation
- Unsurveyable
- Photo Zone
- Project Boundary
- PACR MRS Boundary

N

0 100 200 Feet

0 25 50 Meters

Zone	Point ID	Photo	Latitude	Longitude	Page
7	SITE_DOC_018	L0909	48° 1' 39.713" N	123° 20' 40.331" W	
7	SITE_DOC_129	O1351	48° 1' 40.684" N	123° 20' 41.955" W	
7	SITE_DOC_130	O1353	48° 1' 38.838" N	123° 20' 39.458" W	
7	SITE_DOC_131	O1355	48° 1' 36.840" N	123° 20' 38.136" W	
7	SITE_DOC_132	O1356	48° 1' 34.948" N	123° 20' 38.050" W	
7	SITE_DOC_134	O1358	48° 1' 30.910" N	123° 20' 36.023" W	
7	SITE_DOC_162	L1073	48° 1' 41.698" N	123° 20' 38.184" W	
7	SITE_DOC_163	L1071	48° 1' 41.277" N	123° 20' 37.945" W	
7	SITE_DOC_164	L1075	48° 1' 39.164" N	123° 20' 37.985" W	
7	SITE_DOC_165	L1077	48° 1' 40.954" N	123° 20' 38.563" W	
7	SITE_DOC_169	L1078	48° 1' 39.265" N	123° 20' 36.366" W	
7	UNSUR_048	I1264	48° 1' 27.452" N	123° 20' 45.826" W	
7	UNSUR_049	I1265	48° 1' 29.720" N	123° 20' 45.482" W	
7	UNSUR_086	I1291	48° 1' 28.533" N	123° 20' 50.278" W	
7	UNSUR_087	I1292	48° 1' 29.828" N	123° 20' 48.003" W	
7	UNSUR_088	I1293	48° 1' 31.040" N	123° 20' 48.490" W	
7	UNSUR_142	L0953	48° 1' 40.203" N	123° 20' 42.590" W	
7	UNSUR_144	L0955, L0956	48° 1' 37.974" N	123° 20' 44.313" W	
7	UNSUR_145	L0957, L0958	48° 1' 37.589" N	123° 20' 45.327" W	

2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 07
Photo Point:
SITE_DOC_018
Date:
2013-10-30
Photo Name:
L0909
Photo Direction:
North
Latitude:
48° 1' 39.713" N
Longitude:
123° 20' 40.331" W
Type:
General Site Photo
Comment:
Terrain documentation



Zone:
Zone 07
Photo Point:
SITE_DOC_129
Date:
2013-11-22
Photo Name:
O1351
Photo Direction:
North
Latitude:
48° 1' 40.684" N
Longitude:
123° 20' 41.955" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid L-11



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 07
Photo Point:
SITE_DOC_130
Date:
2013-11-22
Photo Name:
O1353
Photo Direction:
North
Latitude:
48° 1' 38.838" N
Longitude:
123° 20' 39.458" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid M-12



Zone:
Zone 07
Photo Point:
SITE_DOC_131
Date:
2013-11-22
Photo Name:
O1355
Photo Direction:
North
Latitude:
48° 1' 36.840" N
Longitude:
123° 20' 38.136" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid N-13



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 07
Photo Point:
SITE_DOC_132
Date:
2013-11-22
Photo Name:
O1356
Photo Direction:
North
Latitude:
48° 1' 34.948" N
Longitude:
123° 20' 38.050" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid N-14



Zone:
Zone 07
Photo Point:
SITE_DOC_134
Date:
2013-11-22
Photo Name:
O1358
Photo Direction:
North
Latitude:
48° 1' 30.910" N
Longitude:
123° 20' 36.023" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid N-16



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 07
Photo Point:
SITE_DOC_162
Date:
2013-12-05
Photo Name:
L1073
Photo Direction:
(None)
Latitude:
48° 1' 41.698" N
Longitude:
123° 20' 38.184" W
Type:
Site Debris
Comment:
Trash found within Grid N-11



Zone:
Zone 07
Photo Point:
SITE_DOC_163
Date:
2013-12-05
Photo Name:
L1071
Photo Direction:
(None)
Latitude:
48° 1' 41.277" N
Longitude:
123° 20' 37.945" W
Type:
Site Debris
Comment:
Trash found within Grid N-11



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 07
Photo Point:
SITE_DOC_164
Date:
2013-12-06
Photo Name:
L1075
Photo Direction:
North
Latitude:
48° 1' 39.164" N
Longitude:
123° 20' 37.985" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid N-12



Zone:
Zone 07
Photo Point:
SITE_DOC_165
Date:
2013-12-06
Photo Name:
L1077
Photo Direction:
North
Latitude:
48° 1' 40.954" N
Longitude:
123° 20' 38.563" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid M-11



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 07
Photo Point:
SITE_DOC_169
Date:
2013-12-06
Photo Name:
L1078
Photo Direction:
(None)
Latitude:
48° 1' 39.265" N
Longitude:
123° 20' 36.366" W
Type:
Site Debris
Comment:
Metal debris/trash



Zone:
Zone 07
Photo Point:
UNSUR_048
Date:
2013-10-30
Photo Name:
I1264
Photo Direction:
East
Latitude:
48° 1' 27.452" N
Longitude:
123° 20' 45.826" W
Type:
Cliff
Comment:
Steep cliff



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 07
Photo Point:
UNSUR_049
Date:
2013-10-30
Photo Name:
I1265
Photo Direction:
East
Latitude:
48° 1' 29.720" N
Longitude:
123° 20' 45.482" W
Type:
Cliff
Comment:
Steep cliff, downed trees and thick vegetation



Zone:
Zone 07
Photo Point:
UNSUR_086
Date:
2013-11-04
Photo Name:
I1291
Photo Direction:
South
Latitude:
48° 1' 28.533" N
Longitude:
123° 20' 50.278" W
Type:
Dense Vegetation
Comment:
Dense vegetation and large downed trees



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 07
Photo Point:
UNSUR_087
Date:
2013-11-04
Photo Name:
I1292
Photo Direction:
North
Latitude:
48° 1' 29.828" N
Longitude:
123° 20' 48.003" W
Type:
Marsh/Wetland/Bog
Comment:
Standing water



Zone:
Zone 07
Photo Point:
UNSUR_088
Date:
2013-11-04
Photo Name:
I1293
Photo Direction:
South
Latitude:
48° 1' 31.040" N
Longitude:
123° 20' 48.490" W
Type:
Standing Water
Comment:
Standing water



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 07
Photo Point:
UNSUR_142
Date:
2013-11-08
Photo Name:
L0953
Photo Direction:
East
Latitude:
48° 1' 40.203" N
Longitude:
123° 20' 42.590" W
Type:
General Site Photo
Comment:
Steep terrain



Zone:
Zone 07
Photo Point:
UNSUR_144
Date:
2013-11-08
Photo Name:
L0955
Photo Direction:
South
Latitude:
48° 1' 37.974" N
Longitude:
123° 20' 44.313" W
Type:
General Site Photo
Comment:
Steep terrain, dense vegetation, thick thorn bushes



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 07
Photo Point:
UNSUR_144
Date:
2013-11-08
Photo Name:
L0956
Photo Direction:
South
Latitude:
48° 1' 37.974" N
Longitude:
123° 20' 44.313" W
Type:
General Site Photo
Comment:
Steep terrain, dense vegetation, thick thorn bushes



Zone:
Zone 07
Photo Point:
UNSUR_145
Date:
2013-11-08
Photo Name:
L0957
Photo Direction:
West, North
Latitude:
48° 1' 37.589" N
Longitude:
123° 20' 45.327" W
Type:
General Site Photo
Comment:
Dense vegetation, thick thorn bushes



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 07
Photo Point:
UNSUR_145
Date:
2013-11-08
Photo Name:
L0958
Photo Direction:
West, North
Latitude:
48° 1' 37.589" N
Longitude:
123° 20' 45.327" W
Type:
General Site Photo
Comment:
Dense vegetation, thick thorn bushes



2014 PHOTOGRAPHIC LOG

Zone 8 - Unsurveyable and Site Documentation

Port Angeles Combat Range, WA



Legend

- Site Documentation
- Unsurveyable
- Photo Zone
- Project Boundary
- PACR MRS Boundary

N

0 100 200 Feet

0 25 50 Meters

Zone	Point ID	Photo	Latitude	Longitude	Page
8	SITE_DOC_034	L0919	48Â° 1' 41.765"" N	123Â° 20' 24.922"" W	
8	SITE_DOC_039	L0936	48Â° 1' 34.356"" N	123Â° 20' 23.409"" W	
8	SITE_DOC_045	L0970	48Â° 1' 34.485"" N	123Â° 20' 32.082"" W	
8	SITE_DOC_120	L1029	48Â° 1' 40.906"" N	123Â° 20' 26.057"" W	
8	SITE_DOC_121	L1031	48Â° 1' 38.291"" N	123Â° 20' 22.569"" W	
8	SITE_DOC_122	L1032	48Â° 1' 38.872"" N	123Â° 20' 25.137"" W	
8	SITE_DOC_124	L1034	48Â° 1' 33.145"" N	123Â° 20' 27.787"" W	
8	SITE_DOC_125	L1035	48Â° 1' 35.149"" N	123Â° 20' 28.915"" W	
8	SITE_DOC_126	L1037	48Â° 1' 38.073"" N	123Â° 20' 27.090"" W	
8	SITE_DOC_149	L1050	48Â° 1' 36.431"" N	123Â° 20' 34.919"" W	
8	SITE_DOC_150	L1051	48Â° 1' 36.750"" N	123Â° 20' 31.872"" W	
8	SITE_DOC_151	L1052	48Â° 1' 37.848"" N	123Â° 20' 31.695"" W	
8	SITE_DOC_152	L1053	48Â° 1' 39.429"" N	123Â° 20' 29.633"" W	
8	SITE_DOC_153	L1055	48Â° 1' 40.809"" N	123Â° 20' 32.861"" W	
8	SITE_DOC_154	L1058	48Â° 1' 38.652"" N	123Â° 20' 33.177"" W	
8	SITE_DOC_155	L1059, L1060	48Â° 1' 40.569"" N	123Â° 20' 27.075"" W	
8	UNSUR_095	L0925	48Â° 1' 39.770"" N	123Â° 20' 23.532"" W	
8	UNSUR_162	L0971	48Â° 1' 36.080"" N	123Â° 20' 29.140"" W	

2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 08
Photo Point:
SITE_DOC_034
Date:
2013-11-05
Photo Name:
L0919
Photo Direction:
East
Latitude:
48° 1' 41.765" N
Longitude:
123° 20' 24.922" W
Type:
Access Control Documentation
Comment:
Barb wire fence, deviation from transect line to cross fence safely



Zone:
Zone 08
Photo Point:
SITE_DOC_039
Date:
2013-11-06
Photo Name:
L0936
Photo Direction:
South
Latitude:
48° 1' 34.356" N
Longitude:
123° 20' 23.409" W
Type:
General Site Photo
Comment:
Dense vegetation and steep terrain



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 08
Photo Point:
SITE_DOC_045
Date:
2013-11-11
Photo Name:
L0970
Photo Direction:
North
Latitude:
48° 1' 34.485" N
Longitude:
123° 20' 32.082" W
Type:
General Site Photo
Comment:
Dense vegetation and steep terrain



Zone:
Zone 08
Photo Point:
SITE_DOC_120
Date:
2013-11-22
Photo Name:
L1029
Photo Direction:
North
Latitude:
48° 1' 40.906" N
Longitude:
123° 20' 26.057" W
Type:
General Site Photo
Comment:
Anomaly investigation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 08
Photo Point:
SITE_DOC_121
Date:
2013-11-22
Photo Name:
L1031
Photo Direction:
South
Latitude:
48° 1' 38.291" N
Longitude:
123° 20' 22.569" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid T-13



Zone:
Zone 08
Photo Point:
SITE_DOC_122
Date:
2013-11-22
Photo Name:
L1032
Photo Direction:
South
Latitude:
48° 1' 38.872" N
Longitude:
123° 20' 25.137" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid S-13



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 08
Photo Point:
SITE_DOC_124
Date:
2013-11-22
Photo Name:
L1034
Photo Direction:
North
Latitude:
48° 1' 33.145" N
Longitude:
123° 20' 27.787" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid R-15



Zone:
Zone 08
Photo Point:
SITE_DOC_125
Date:
2013-11-22
Photo Name:
L1035
Photo Direction:
North
Latitude:
48° 1' 35.149" N
Longitude:
123° 20' 28.915" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid R-14



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 08
Photo Point:
SITE_DOC_126
Date:
2013-11-22
Photo Name:
L1037
Photo Direction:
North
Latitude:
48° 1' 38.073" N
Longitude:
123° 20' 27.090" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid R-13



Zone:
Zone 08
Photo Point:
SITE_DOC_149
Date:
2013-12-04
Photo Name:
L1050
Photo Direction:
North
Latitude:
48° 1' 36.431" N
Longitude:
123° 20' 34.919" W
Type:
General Site Photo
Comment:
Schonstedt survey



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 08
Photo Point:
SITE_DOC_150
Date:
2013-12-04
Photo Name:
L1051
Photo Direction:
South
Latitude:
48° 1' 36.750" N
Longitude:
123° 20' 31.872" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid Q14



Zone:
Zone 08
Photo Point:
SITE_DOC_151
Date:
2013-12-04
Photo Name:
L1052
Photo Direction:
South
Latitude:
48° 1' 37.848" N
Longitude:
123° 20' 31.695" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid Q-13 and standing water



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 08
Photo Point:
SITE_DOC_152
Date:
2013-12-04
Photo Name:
L1053
Photo Direction:
South
Latitude:
48° 1' 39.429" N
Longitude:
123° 20' 29.633" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid Q-12



Zone:
Zone 08
Photo Point:
SITE_DOC_153
Date:
2013-12-04
Photo Name:
L1055
Photo Direction:
South
Latitude:
48° 1' 40.809" N
Longitude:
123° 20' 32.861" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid P-12



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 08
Photo Point:
SITE_DOC_154
Date:
2013-12-04
Photo Name:
L1058
Photo Direction:
South
Latitude:
48° 1' 38.652" N
Longitude:
123° 20' 33.177" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid P-13



Zone:
Zone 08
Photo Point:
SITE_DOC_155
Date:
2013-12-05
Photo Name:
L1059
Photo Direction:
South
Latitude:
48° 1' 40.569" N
Longitude:
123° 20' 27.075" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid R-12



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 08
Photo Point:
SITE_DOC_155
Date:
2013-12-05
Photo Name:
L1060
Photo Direction:
South
Latitude:
48° 1' 40.569" N
Longitude:
123° 20' 27.075" W
Type:
General Site Photo
Comment:
Terrain documentation at Grid R-12



Zone:
Zone 08
Photo Point:
UNSUR_095
Date:
2013-11-05
Photo Name:
L0925
Photo Direction:
East
Latitude:
48° 1' 39.770" N
Longitude:
123° 20' 23.532" W
Type:
Dense Vegetation
Comment:
Dense vegetation including thick thorn bushes



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

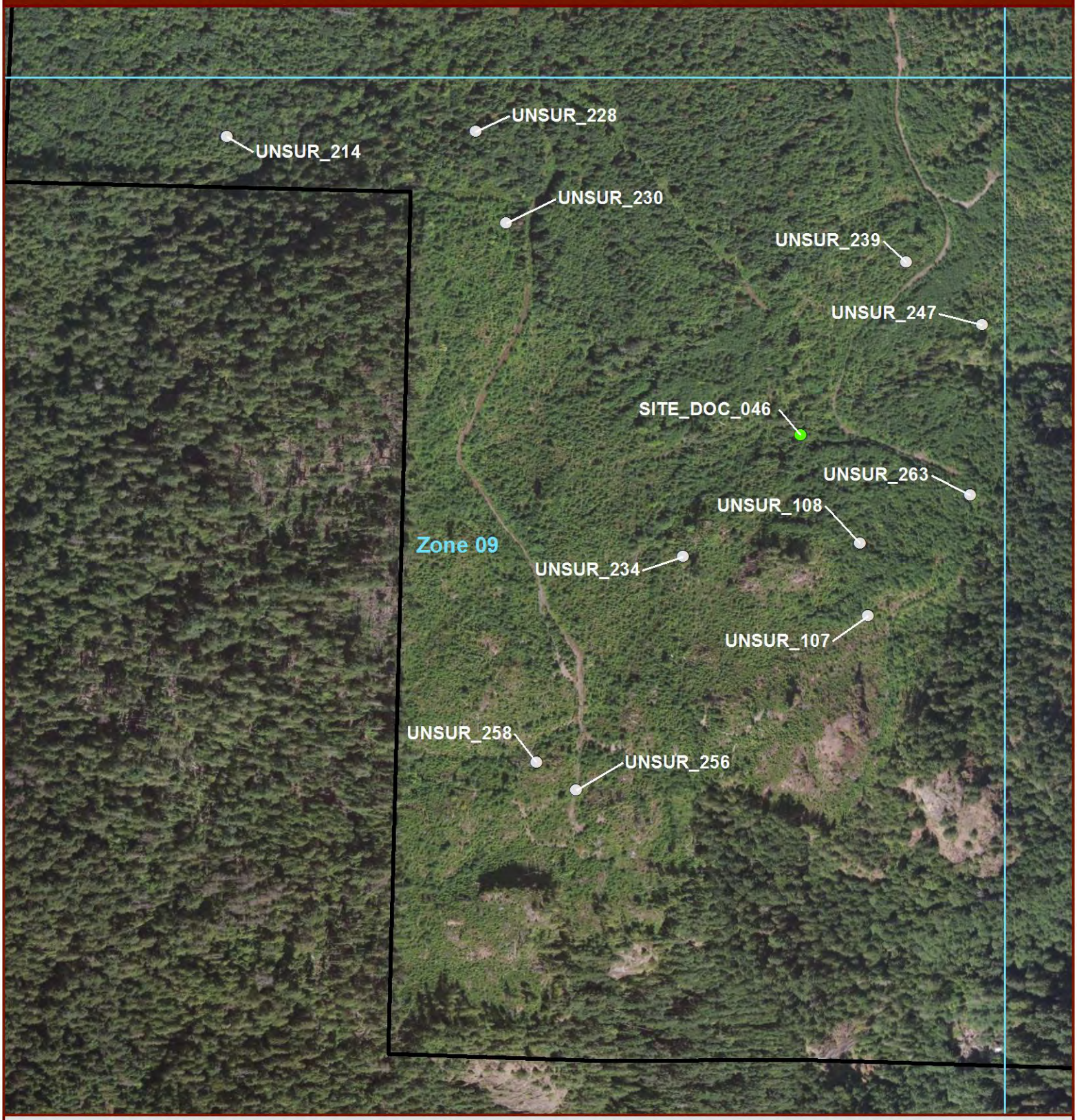
Zone:
Zone 08
Photo Point:
UNSUR_162
Date:
2013-11-11
Photo Name:
L0971
Photo Direction:
East
Latitude:
48° 1' 36.080" N
Longitude:
123° 20' 29.140" W
Type:
Dense Vegetation
Comment:
Dense vegetation including thick thorn bushes



2014 PHOTOGRAPHIC LOG

Zone 9 - Unsurveyable and Site Documentation

Port Angeles Combat Range, WA



Legend

- Site Documentation
- Unsurveyable
- Photo Zone
- Project Boundary
- PACR MRS Boundary

N

0 100 200 400 Feet

0 25 50 100 150 Meters

Zone	Point ID	Photo	Latitude	Longitude	Page
9	SITE_DOC_046	N1313	48° 1' 11.350" N	123° 21' 43.302" W	
9	UNSUR_107	N1294	48° 1' 5.782" N	123° 21' 39.877" W	
9	UNSUR_108	N1297	48° 1' 8.039" N	123° 21' 40.367" W	
9	UNSUR_214	N1330	48° 1' 20.039" N	123° 22' 10.351" W	
9	UNSUR_228	N1340	48° 1' 20.468" N	123° 21' 58.834" W	
9	UNSUR_230	N1343	48° 1' 17.630" N	123° 21' 57.261" W	
9	UNSUR_234	N1347	48° 1' 7.440" N	123° 21' 48.561" W	
9	UNSUR_239	N1353	48° 1' 16.836" N	123° 21' 38.663" W	
9	UNSUR_247	N1360	48° 1' 14.967" N	123° 21' 35.033" W	
9	UNSUR_256	N1369	48° 1' 0.050" N	123° 21' 53.161" W	
9	UNSUR_258	N1371	48° 1' 0.879" N	123° 21' 55.049" W	
9	UNSUR_263	N1381	48° 1' 9.636" N	123° 21' 35.325" W	

2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 09
Photo Point:
SITE_DOC_046
Date:
2013-11-11
Photo Name:
N1313
Photo Direction:
West
Latitude:
48° 1' 11.350" N
Longitude:
123° 21' 43.302" W
Type:
General Site Photo
Comment:
Thick vegetation



Zone:
Zone 09
Photo Point:
UNSUR_107
Date:
2013-11-06
Photo Name:
N1294
Photo Direction:
North
Latitude:
48° 1' 5.782" N
Longitude:
123° 21' 39.877" W
Type:
Cliff
Comment:
Unsurveyable due to steep cliff



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 09
Photo Point:
UNSUR_108
Date:
2013-11-06
Photo Name:
N1297
Photo Direction:
North
Latitude:
48° 1' 8.039" N
Longitude:
123° 21' 40.367" W
Type:
Steep Terrain
Comment:
Unsurveyable due to steep terrain and dense vegetation



Zone:
Zone 09
Photo Point:
UNSUR_214
Date:
2013-11-13
Photo Name:
N1330
Photo Direction:
South
Latitude:
48° 1' 20.039" N
Longitude:
123° 22' 10.351" W
Type:
Steep Terrain
Comment:
Unsurveyable due to steep terrain and dense vegetation to the south



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 09
Photo Point:
UNSUR_228
Date:
2013-11-14
Photo Name:
N1340
Photo Direction:
West
Latitude:
48° 1' 20.468" N
Longitude:
123° 21' 58.834" W
Type:
Dense Vegetation
Comment:
Unsurveyable to the west due to dense vegetation



Zone:
Zone 09
Photo Point:
UNSUR_230
Date:
2013-11-14
Photo Name:
N1343
Photo Direction:
West
Latitude:
48° 1' 17.630" N
Longitude:
123° 21' 57.261" W
Type:
Dense Vegetation
Comment:
Unsurveyable to the west due to dense vegetation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 09
Photo Point:
UNSUR_234
Date:
2013-11-14
Photo Name:
N1347
Photo Direction:
South
Latitude:
48° 1' 7.440" N
Longitude:
123° 21' 48.561" W
Type:
Steep Terrain
Comment:
Unsurveyable to the southeast due to steep terrain and thick vegetation



Zone:
Zone 09
Photo Point:
UNSUR_239
Date:
2013-11-15
Photo Name:
N1353
Photo Direction:
North
Latitude:
48° 1' 16.836" N
Longitude:
123° 21' 38.663" W
Type:
Dense Vegetation
Comment:
Unsurveyable transect to the north and east due to dense vegetation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 09
Photo Point:
UNSUR_247
Date:
2013-11-18
Photo Name:
N1360
Photo Direction:
North
Latitude:
48° 1' 14.967" N
Longitude:
123° 21' 35.033" W
Type:
Steep Terrain
Comment:
Unsurveyable due to steep terrain to the northeast



Zone:
Zone 09
Photo Point:
UNSUR_256
Date:
2013-11-19
Photo Name:
N1369
Photo Direction:
East
Latitude:
48° 1' 0.050" N
Longitude:
123° 21' 53.161" W
Type:
Steep Terrain
Comment:
Unsurveyable to the southeast due to steep terrain



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 09
Photo Point:
UNSUR_258
Date:
2013-11-19
Photo Name:
N1371
Photo Direction:
North
Latitude:
48° 1' 0.879" N
Longitude:
123° 21' 55.049" W
Type:
Steep Terrain
Comment:
Unsurveyable to the northwest due to steep terrain and dense vegetation, no access to survey area



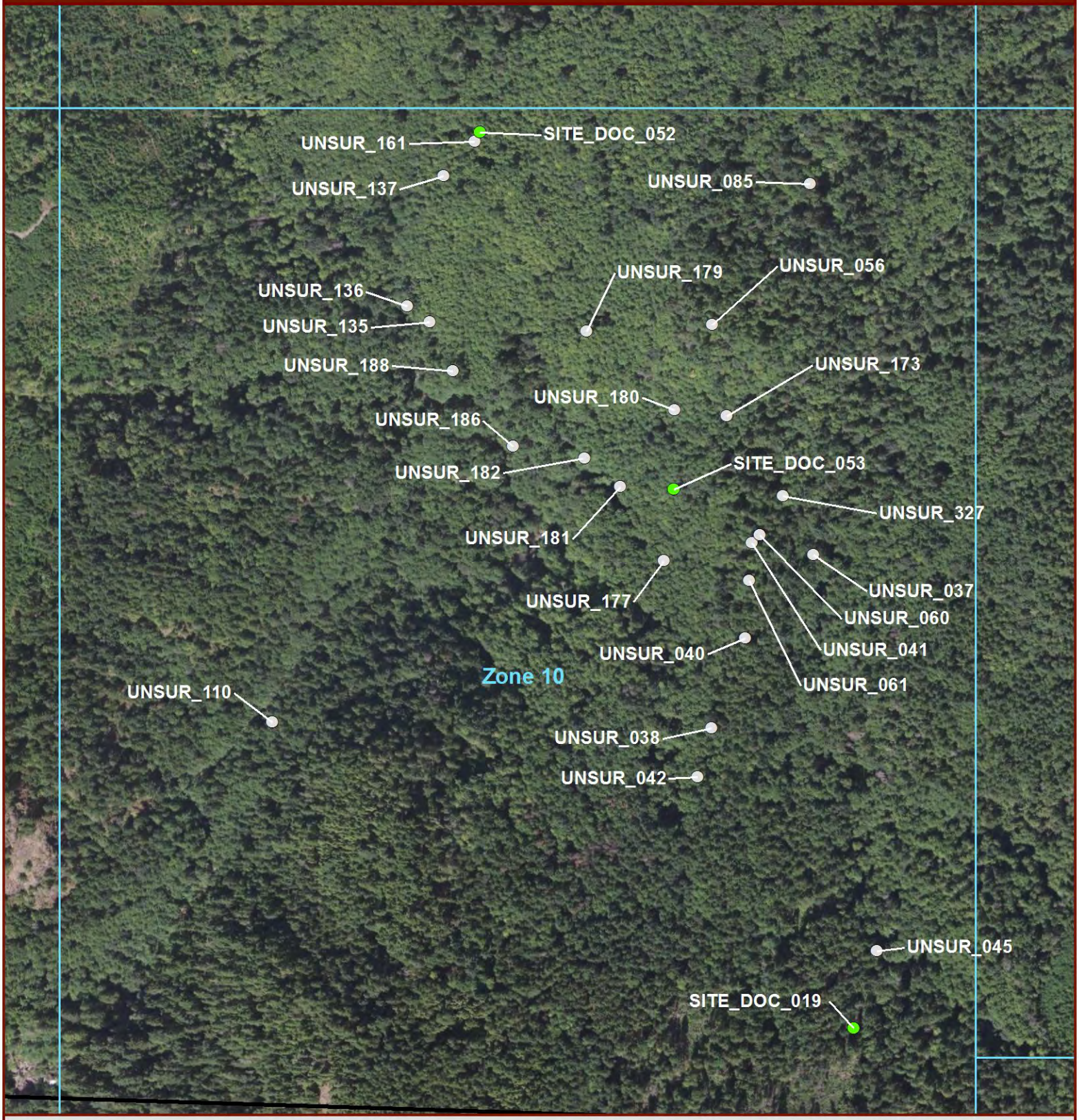
Zone:
Zone 09
Photo Point:
UNSUR_263
Date:
2013-11-19
Photo Name:
N1381
Photo Direction:
East
Latitude:
48° 1' 9.636" N
Longitude:
123° 21' 35.325" W
Type:
Dense Vegetation
Comment:
Unsurveyable to the southeast due to dense vegetation and steep terrain, no access to survey area



2014 PHOTOGRAPHIC LOG

Zone 10 - Unsurveyable and Site Documentation

Port Angeles Combat Range, WA



Legend

- Site Documentation
- Unsurveyable
- Photo Zone
- Project Boundary
- PACR MRS Boundary

N

0 100 200 400 Feet

0 25 50 100 Meters

Zone	Pont ID	Photo	Latitude	Longitude	Page
10	SITE_DOC_019	N1276	48° 0' 54.887" N	123° 20' 56.191" W	
10	SITE_DOC_052	I1332	48° 1' 22.346" N	123° 21' 14.858" W	
10	SITE_DOC_053	I1334	48° 1' 11.447" N	123° 21' 5.324" W	
10	UNSUR_037	N1265	48° 1' 9.553" N	123° 20' 58.785" W	
10	UNSUR_038	N1266	48° 1' 4.075" N	123° 21' 3.240" W	
10	UNSUR_040	N1268	48° 1' 6.897" N	123° 21' 1.790" W	
10	UNSUR_041	N1269	48° 1' 9.872" N	123° 21' 1.640" W	
10	UNSUR_042	N1270	48° 1' 2.546" N	123° 21' 3.800" W	
10	UNSUR_045	N1274	48° 0' 57.321" N	123° 20' 55.238" W	
10	UNSUR_056	I1263	48° 1' 16.622" N	123° 21' 3.797" W	
10	UNSUR_060	I1259	48° 1' 10.117" N	123° 21' 1.291" W	
10	UNSUR_061	I1258	48° 1' 8.687" N	123° 21' 1.719" W	
10	UNSUR_085	I1289	48° 1' 21.086" N	123° 20' 59.477" W	
10	UNSUR_110	I1315	48° 1' 3.824" N	123° 21' 23.566" W	
10	UNSUR_135	I1324	48° 1' 16.416" N	123° 21' 16.893" W	
10	UNSUR_136	I1325	48° 1' 16.886" N	123° 21' 17.955" W	
10	UNSUR_137	I1326	48° 1' 20.963" N	123° 21' 16.462" W	
10	UNSUR_161	I1333	48° 1' 22.069" N	123° 21' 15.095" W	
10	UNSUR_173	I1335	48° 1' 13.790" N	123° 21' 3.010" W	
10	UNSUR_177	I1341	48° 1' 9.216" N	123° 21' 5.671" W	
10	UNSUR_179	I1343	48° 1' 16.283" N	123° 21' 9.634" W	
10	UNSUR_180	I1344	48° 1' 13.931" N	123° 21' 5.437" W	
10	UNSUR_181	I1345	48° 1' 11.491" N	123° 21' 7.813" W	
10	UNSUR_182	I1346	48° 1' 12.330" N	123° 21' 9.528" W	
10	UNSUR_186	I1350	48° 1' 12.635" N	123° 21' 12.839" W	
10	UNSUR_188	I1352	48° 1' 14.905" N	123° 21' 15.741" W	
10	UNSUR_327	N1471	48° 1' 11.351" N	123° 21' 0.283" W	

2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 10
Photo Point:
SITE_DOC_019
Date:
2013-10-30 00:00:00
Photo Name:
N1276
Photo Direction:
South
Latitude:
48° 0' 54.887" N
Longitude:
123° 20' 56.191" W
Type:
General Site Photo
Comment:
Dense vegetation and downed trees, unsurveyable area



Zone:
Zone 10
Photo Point:
SITE_DOC_052
Date:
2013-11-11 00:00:00
Photo Name:
I1332
Photo Direction:
(None)
Latitude:
48° 1' 22.346" N
Longitude:
123° 21' 14.858" W
Type:
Site Debris
Comment:
Large cable



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 10
Photo Point:
SITE_DOC_053
Date:
2013-11-12
Photo Name:
I1334
Photo Direction:
(None)
Latitude:
48° 1' 11.447" N
Longitude:
123° 21' 5.324" W
Type:
Site Debris
Comment:
Large cable



Zone:
Zone 10
Photo Point:
UNSUR_037
Date:
2013-10-30
Photo Name:
N1265
Photo Direction:
East
Latitude:
48° 1' 9.553" N
Longitude:
123° 20' 58.785" W
Type:
Steep Terrain
Comment:
Unsurveyable to the east due to steep terrain



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 10
Photo Point:
UNSUR_038
Date:
2013-10-30
Photo Name:
N1266
Photo Direction:
West
Latitude:
48° 1' 4.075" N
Longitude:
123° 21' 3.240" W
Type:
Steep Terrain
Comment:
Unsurveyable to the west due to steep terrain



Zone:
Zone 10
Photo Point:
UNSUR_040
Date:
2013-10-30
Photo Name:
N1268
Photo Direction:
West
Latitude:
48° 1' 6.897" N
Longitude:
123° 21' 1.790" W
Type:
Steep Terrain
Comment:
Unsurveyable to the west due to steep terrain



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 10
Photo Point:
UNSUR_041
Date:
2013-10-30
Photo Name:
N1269
Photo Direction:
West
Latitude:
48° 1' 9.872" N
Longitude:
123° 21' 1.640" W
Type:
Steep Terrain
Comment:
Unsurveyable to the west due to steep terrain



Zone:
Zone 10
Photo Point:
UNSUR_042
Date:
2013-10-30
Photo Name:
N1270
Photo Direction:
West
Latitude:
48° 1' 2.546" N
Longitude:
123° 21' 3.800" W
Type:
Steep Terrain
Comment:
Unsurveyable to the west due to steep terrain



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 10
Photo Point:
UNSUR_045
Date:
2013-10-30
Photo Name:
N1274
Photo Direction:
North
Latitude:
48° 0' 57.321" N
Longitude:
123° 20' 55.238" W
Type:
Steep Terrain
Comment:
Unsurveyable to the north and east due to steep terrain and dense forest



Zone:
Zone 10
Photo Point:
UNSUR_056
Date:
2013-10-30
Photo Name:
I1263
Photo Direction:
South
Latitude:
48° 1' 16.622" N
Longitude:
123° 21' 3.797" W
Type:
Cliff
Comment:
Steep cliff



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 10
Photo Point:
UNSUR_060
Date:
2013-10-30
Photo Name:
I1259
Photo Direction:
West
Latitude:
48° 1' 10.117" N
Longitude:
123° 21' 1.291" W
Type:
Cliff
Comment:
Steep cliff and dense vegetation



Zone:
Zone 10
Photo Point:
UNSUR_061
Date:
2013-10-30
Photo Name:
I1258
Photo Direction:
West
Latitude:
48° 1' 8.687" N
Longitude:
123° 21' 1.719" W
Type:
Cliff
Comment:
Steep cliff



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 10
Photo Point:
UNSUR_085
Date:
2013-11-04
Photo Name:
I1289
Photo Direction:
East
Latitude:
48° 1' 21.086" N
Longitude:
123° 20' 59.477" W
Type:
Standing Water
Comment:
Dense vegetation and standing water



Zone:
Zone 10
Photo Point:
UNSUR_110
Date:
2013-11-07
Photo Name:
I1315
Photo Direction:
Northeast
Latitude:
48° 1' 3.824" N
Longitude:
123° 21' 23.566" W
Type:
Cliff
Comment:
Steep slope and dense vegetation down to river



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 10
Photo Point:
UNSUR_135
Date:
2013-11-08
Photo Name:
I1324
Photo Direction:
South
Latitude:
48° 1' 16.416" N
Longitude:
123° 21' 16.893" W
Type:
Dense Vegetation
Comment:
Dense vegetation and mud



Zone:
Zone 10
Photo Point:
UNSUR_136
Date:
2013-11-08
Photo Name:
I1325
Photo Direction:
South
Latitude:
48° 1' 16.886" N
Longitude:
123° 21' 17.955" W
Type:
Water Body
Comment:
Stream flow at bottom of ravine



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 10
Photo Point:
UNSUR_137
Date:
2013-11-08
Photo Name:
I1326
Photo Direction:
South
Latitude:
48° 1' 20.963" N
Longitude:
123° 21' 16.462" W
Type:
Dense Vegetation
Comment:
Dense vegetation including thick thorn bushes, deep water/mud



Zone:
Zone 10
Photo Point:
UNSUR_161
Date:
2013-11-11
Photo Name:
I1333
Photo Direction:
West
Latitude:
48° 1' 22.069" N
Longitude:
123° 21' 15.095" W
Type:
Dense Vegetation
Comment:
Deep mud and dense vegetation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 10
Photo Point:
UNSUR_173
Date:
2013-11-12
Photo Name:
I1335
Photo Direction:
NNE
Latitude:
48° 1' 13.790" N
Longitude:
123° 21' 3.010" W
Type:
Marsh
Comment:
Deep mud and downed trees



Zone:
Zone 10
Photo Point:
UNSUR_177
Date:
2013-11-12
Photo Name:
I1341
Photo Direction:
South
Latitude:
48° 1' 9.216" N
Longitude:
123° 21' 5.671" W
Type:
Marsh
Comment:
Deep mud and dense vegetation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 10
Photo Point:
UNSUR_179
Date:
2013-11-12
Photo Name:
I1343
Photo Direction:
North
Latitude:
48° 1' 16.283" N
Longitude:
123° 21' 9.634" W
Type:
Steep Terrain
Comment:
Steep terrain, dense vegetation and fallen trees



Zone:
Zone 10
Photo Point:
UNSUR_180
Date:
2013-11-12
Photo Name:
I1344
Photo Direction:
South
Latitude:
48° 1' 13.931" N
Longitude:
123° 21' 5.437" W
Type:
Marsh
Comment:
Dense vegetation, deep water and mud



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 10
Photo Point:
UNSUR_181
Date:
2013-11-12
Photo Name:
I1345
Photo Direction:
West
Latitude:
48° 1' 11.491" N
Longitude:
123° 21' 7.813" W
Type:
Marsh
Comment:
Dense vegetation, deep water and mud



Zone:
Zone 10
Photo Point:
UNSUR_182
Date:
2013-11-12
Photo Name:
I1346
Photo Direction:
South
Latitude:
48° 1' 12.330" N
Longitude:
123° 21' 9.528" W
Type:
Steep Terrain
Comment:
Steep terrain and dense vegetation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 10
Photo Point:
UNSUR_186
Date:
2013-11-12
Photo Name:
I1350
Photo Direction:
South
Latitude:
48° 1' 12.635" N
Longitude:
123° 21' 12.839" W
Type:
Water Body
Comment:
Stream



Zone:
Zone 10
Photo Point:
UNSUR_188
Date:
2013-11-12
Photo Name:
I1352
Photo Direction:
West
Latitude:
48° 1' 14.905" N
Longitude:
123° 21' 15.741" W
Type:
Dense Vegetation
Comment:
Dense vegetation and stream



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

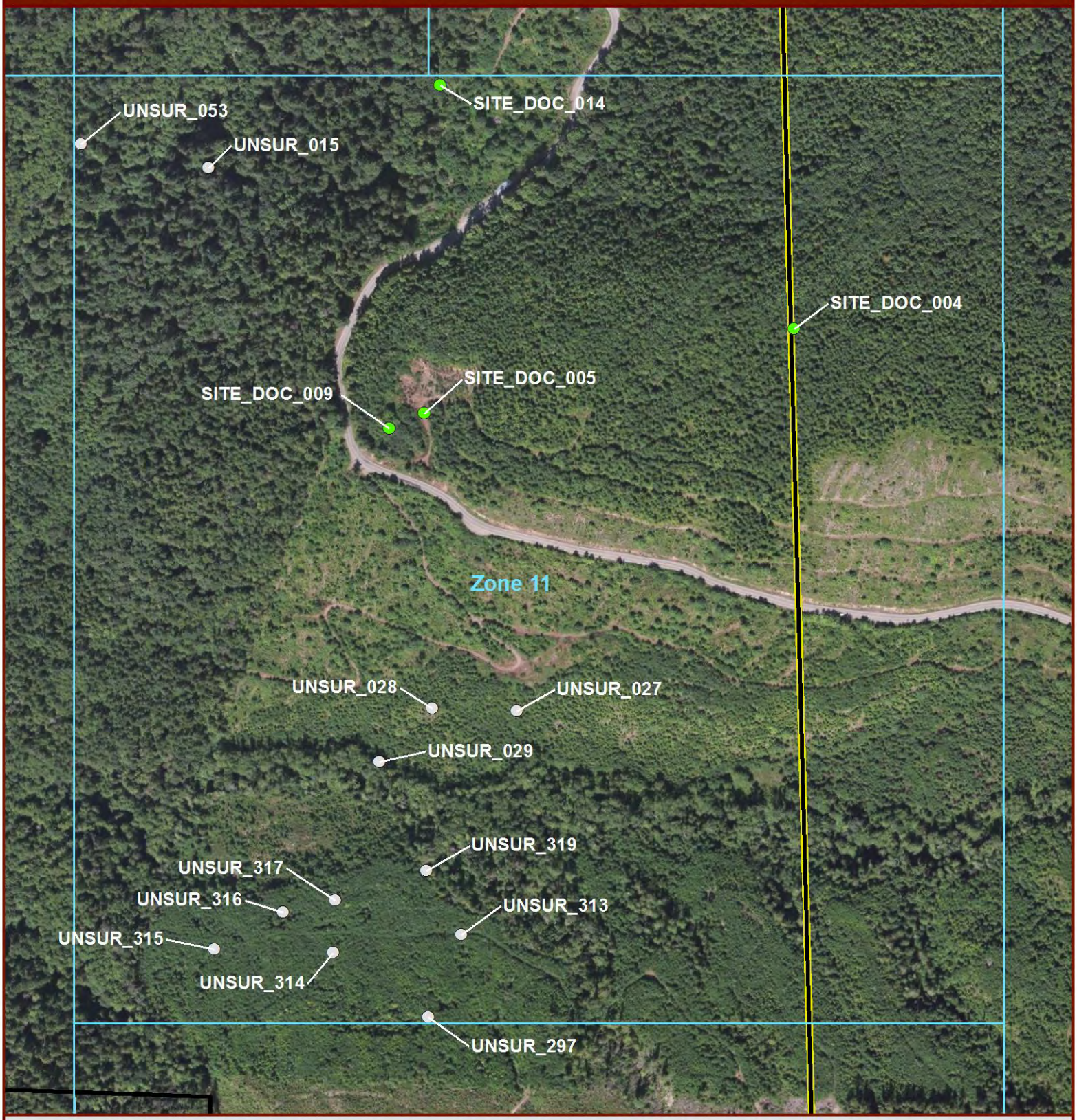
Zone:
Zone 10
Photo Point:
UNSUR_327
Date:
2013-12-10
Photo Name:
N1471
Photo Direction:
South
Latitude:
48° 1' 11.351" N
Longitude:
123° 21' 0.283" W
Type:
Steep Terrain
Comment:
No access to transects to the south due to steep terrain



2014 PHOTOGRAPHIC LOG

Zone 11 - Unsurveyable and Site Documentation

Port Angeles Combat Range, WA



Legend

- Site Documentation
- Unsurveyable
- Photo Zone
- Project Boundary
- PACR MRS Boundary

N

0 100 200 400 Feet

0 25 50 100 Meters

Zone	Point ID	Photo	Latitude	Longitude	Page
11	SITE_DOC_004	N0036	48° 1' 16.466" N	123° 20' 18.166" W	
11	SITE_DOC_005	N0037	48° 1' 13.473" N	123° 20' 35.188" W	
11	SITE_DOC_009	N0832	48° 1' 12.951" N	123° 20' 36.799" W	
11	SITE_DOC_014	I1251	48° 1' 23.693" N	123° 20' 34.956" W	
11	UNSUR_015	I1254	48° 1' 20.894" N	123° 20' 45.561" W	
11	UNSUR_027	N0004	48° 1' 4.281" N	123° 20' 30.449" W	
11	UNSUR_028	N0006	48° 1' 4.296" N	123° 20' 34.377" W	
11	UNSUR_029	N0008	48° 1' 2.578" N	123° 20' 36.739" W	
11	UNSUR_053	I1269	48° 1' 21.506" N	123° 20' 51.534" W	
11	UNSUR_297	I1439	48° 0' 54.656" N	123° 20' 34.100" W	
11	UNSUR_313	N1443	48° 0' 57.263" N	123° 20' 32.689" W	
11	UNSUR_314	N1445	48° 0' 56.590" N	123° 20' 38.610" W	
11	UNSUR_315	N1447	48° 0' 56.569" N	123° 20' 44.099" W	
11	UNSUR_316	N1448	48° 0' 57.790" N	123° 20' 40.983" W	
11	UNSUR_317	N1449	48° 0' 58.205" N	123° 20' 38.580" W	
11	UNSUR_319	N1451, N1452	48° 0' 59.215" N	123° 20' 34.398" W	

2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 11
Photo Point:
SITE_DOC_004
Date:
2013-10-23
Photo Name:
N0036
Photo Direction:
(None)
Latitude:
48° 1' 16.466" N
Longitude:
123° 20' 18.166" W
Type:
Site Debris
Comment:
Metal debris/trash



Zone:
Zone 11
Photo Point:
SITE_DOC_005
Date:
2013-10-23
Photo Name:
N0037
Photo Direction:
(None)
Latitude:
48° 1' 13.473" N
Longitude:
123° 20' 35.188" W
Type:
Site Debris
Comment:
Metal debris/trash



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 11
Photo Point:
SITE_DOC_009
Date:
2013-10-24
Photo Name:
N0832
Photo Direction:
(None)
Latitude:
48° 1' 12.951" N
Longitude:
123° 20' 36.799" W
Type:
Site Debris
Comment:
Large cable



Zone:
Zone 11
Photo Point:
SITE_DOC_014
Date:
2013-10-29
Photo Name:
I1251
Photo Direction:
North
Latitude:
48° 1' 23.693" N
Longitude:
123° 20' 34.956" W
Type:
General Site Photo
Comment:
Anomaly investigation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 11
Photo Point:
UNSUR_015
Date:
2013-10-29
Photo Name:
I1254
Photo Direction:
North
Latitude:
48° 1' 20.894" N
Longitude:
123° 20' 45.561" W
Type:
Dense Vegetation
Comment:
Steep cliff with dense vegatation



Zone:
Zone 11
Photo Point:
UNSUR_027
Date:
2013-10-29
Photo Name:
N0004
Photo Direction:
South
Latitude:
48° 1' 4.281" N
Longitude:
123° 20' 30.449" W
Type:
Cliff
Comment:
Unsurveyable area to the south due to steep terrain and dense vegetation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 11
Photo Point:
UNSUR_028
Date:
2013-10-29
Photo Name:
N0006
Photo Direction:
South
Latitude:
48° 1' 4.296" N
Longitude:
123° 20' 34.377" W
Type:
Cliff
Comment:
Unsurveyable area to the south due to steep terrain and dense vegetation



Zone:
Zone 11
Photo Point:
UNSUR_029
Date:
2013-10-29
Photo Name:
N0008
Photo Direction:
North
Latitude:
48° 1' 2.578" N
Longitude:
123° 20' 36.739" W
Type:
Dense Vegetation
Comment:
Unsurveyable area to the north due to steep terrain and dense vegetation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 11
Photo Point:
UNSUR_053
Date:
2013-10-30
Photo Name:
I1269
Photo Direction:
East
Latitude:
48° 1' 21.506" N
Longitude:
123° 20' 51.534" W
Type:
Cliff
Comment:
Steep cliff with dense vegetation



Zone:
Zone 11
Photo Point:
UNSUR_297
Date:
2013-12-05
Photo Name:
I1439
Photo Direction:
West
Latitude:
48° 0' 54.656" N
Longitude:
123° 20' 34.100" W
Type:
Dense Vegetation
Comment:
Steep terrain and dense vegetation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 11
Photo Point:
UNSUR_313
Date:
2013-12-06
Photo Name:
N1443
Photo Direction:
South
Latitude:
48° 0' 57.263" N
Longitude:
123° 20' 32.689" W
Type:
Dense Vegetation
Comment:
Unsurveyable area due to dense vegetation and downed trees



Zone:
Zone 11
Photo Point:
UNSUR_314
Date:
2013-12-06
Photo Name:
N1445
Photo Direction:
West
Latitude:
48° 0' 56.590" N
Longitude:
123° 20' 38.610" W
Type:
Dense Vegetation
Comment:
Unsurveyable area due to dense vegetation and downed trees



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 11
Photo Point:
UNSUR_315
Date:
2013-12-06
Photo Name:
N1447
Photo Direction:
West
Latitude:
48° 0' 56.569" N
Longitude:
123° 20' 44.099" W
Type:
Dense Vegetation
Comment:
Thick pile of downed trees and vegetation



Zone:
Zone 11
Photo Point:
UNSUR_316
Date:
2013-12-06
Photo Name:
N1448
Photo Direction:
South
Latitude:
48° 0' 57.790" N
Longitude:
123° 20' 40.983" W
Type:
Dense Vegetation
Comment:
Unsurveyable to the north due to fallen trees and dense vegetation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 11
Photo Point:
UNSUR_317
Date:
2013-12-06
Photo Name:
N1449
Photo Direction:
North
Latitude:
48° 0' 58.205" N
Longitude:
123° 20' 38.580" W
Type:
Dense Vegetation
Comment:
Unsurveyable to the north due to fallen trees and dense vegetation



Zone:
Zone 11
Photo Point:
UNSUR_319
Date:
2013-12-06
Photo Name:
N1451
Photo Direction:
North
Latitude:
48° 0' 59.215" N
Longitude:
123° 20' 34.398" W
Type:
Dense Vegetation
Comment:
Unsurveyable to the north due to fallen trees and dense vegetation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

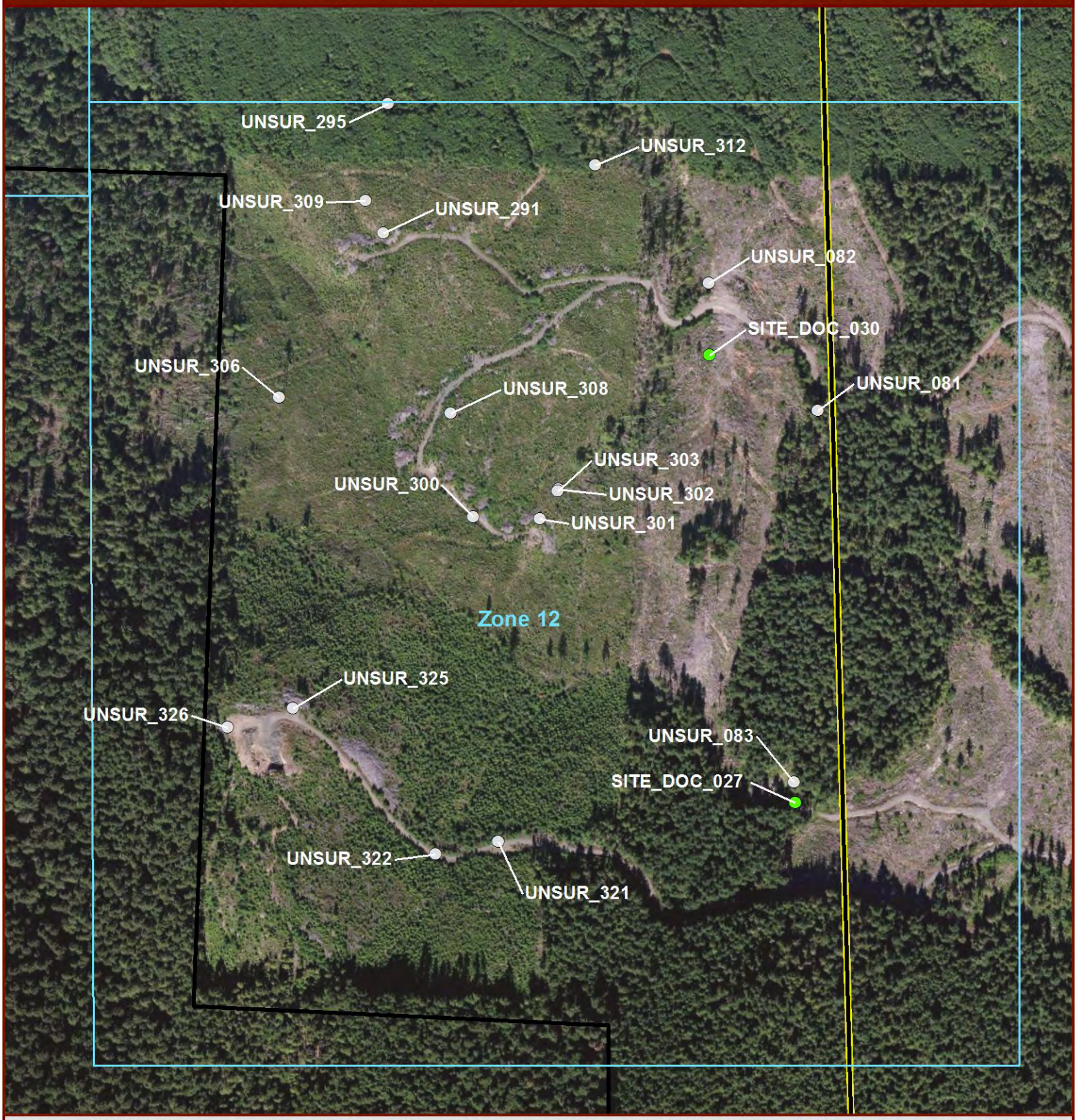
Zone:
Zone 11
Photo Point:
UNSUR_319
Date:
2013-12-06
Photo Name:
N1452
Photo Direction:
North
Latitude:
48° 0' 59.215" N
Longitude:
123° 20' 34.398" W
Type:
Dense Vegetation
Comment:
Unsurveyable to the north due to fallen trees and dense vegetation



2014 PHOTOGRAPHIC LOG

Zone 12 - Unsurveyable and Site Documentation

Port Angeles Combat Range, WA



Legend

- Site Documentation
- Unsurveyable
- Photo Zone
- Project Boundary
- PACR MRS Boundary

N

0 100 200 400 Feet

0 25 50 100 Meters

Contract No.: W9128F-10-D-0058
Delivery Order 0006

Zone	Point ID	Photo	Latitude	Longitude	Page
12	SITE_DOC_027	N1279	48° 0' 33.021" N	123° 20' 16.716" W	
12	SITE_DOC_030	N1285	48° 0' 46.868" N	123° 20' 21.353" W	
12	UNSUR_081	N1283	48° 0' 45.238" N	123° 20' 16.249" W	
12	UNSUR_082	N1286, N1287	48° 0' 49.110" N	123° 20' 21.492" W	
12	UNSUR_083	N1280, N1281	48° 0' 33.650" N	123° 20' 16.808" W	
12	UNSUR_291	I1430	48° 0' 50.326" N	123° 20' 36.680" W	
12	UNSUR_295	I1435, I1437	48° 0' 54.363" N	123° 20' 36.640" W	
12	UNSUR_300	N1418, N1421	48° 0' 41.594" N	123° 20' 32.070" W	
12	UNSUR_301	N1422	48° 0' 41.599" N	123° 20' 28.974" W	
12	UNSUR_302	N1425	48° 0' 42.533" N	123° 20' 28.165" W	
12	UNSUR_303	N1426, N1427	48° 0' 42.477" N	123° 20' 28.209" W	
12	UNSUR_306	N1431	48° 0' 45.108" N	123° 20' 41.252" W	
12	UNSUR_308	N1434	48° 0' 44.788" N	123° 20' 33.265" W	
12	UNSUR_309	N1437	48° 0' 51.325" N	123° 20' 37.563" W	
12	UNSUR_312	N1441, N1442	48° 0' 52.663" N	123° 20' 26.942" W	
12	UNSUR_321	N9991	48° 0' 31.496" N	123° 20' 30.418" W	
12	UNSUR_322	N9992	48° 0' 31.042" N	123° 20' 33.320" W	
12	UNSUR_325	N1462	48° 0' 35.452" N	123° 20' 40.137" W	
12	UNSUR_326	N1464	48° 0' 34.772" N	123° 20' 43.165" W	

2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 12
Photo Point:
SITE_DOC_027
Date:
2013-10-31
Photo Name:
N1279
Photo Direction:
West
Latitude:
48° 0' 33.021" N
Longitude:
123° 20' 16.716" W
Type:
Land Use Documentation
Comment:
Logging road



Zone:
Zone 12
Photo Point:
SITE_DOC_030
Date:
2013-11-01
Photo Name:
N1285
Photo Direction:
North
Latitude:
48° 0' 46.868" N
Longitude:
123° 20' 21.353" W
Type:
General Site Photo
Comment:
Clear cut mountainside



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 12
Photo Point:
UNSUR_081
Date:
2013-11-01
Photo Name:
N1283
Photo Direction:
East
Latitude:
48° 0' 45.238" N
Longitude:
123° 20' 16.249" W
Type:
Dense Vegetation
Comment:
Downed trees obstructing transect line



Zone:
Zone 12
Photo Point:
UNSUR_082
Date:
2013-11-01
Photo Name:
N1286
Photo Direction:
East
Latitude:
48° 0' 49.110" N
Longitude:
123° 20' 21.492" W
Type:
Dense Vegetation
Comment:
Downed trees obstructing end of transect line



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 12
Photo Point:
UNSUR_082
Date:
2013-11-01
Photo Name:
N1287
Photo Direction:
East
Latitude:
48° 0' 49.110" N
Longitude:
123° 20' 21.492" W
Type:
Dense Vegetation
Comment:
Downed trees obstructing end of transect line



Zone:
Zone 12
Photo Point:
UNSUR_083
Date:
2013-11-01
Photo Name:
N1280
Photo Direction:
West
Latitude:
48° 0' 33.650" N
Longitude:
123° 20' 16.808" W
Type:
Dense Vegetation
Comment:
Downed trees obstructing transect line, thick pile of vegetative debris



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 12
Photo Point:
UNSUR_083
Date:
2013-11-01
Photo Name:
N1281
Photo Direction:
West
Latitude:
48° 0' 33.650" N
Longitude:
123° 20' 16.808" W
Type:
Dense Vegetation
Comment:
Downed trees obstructing transect line, thick pile of vegetative debris



Zone:
Zone 12
Photo Point:
UNSUR_291
Date:
2013-12-05
Photo Name:
I1430
Photo Direction:
North
Latitude:
48° 0' 50.326" N
Longitude:
123° 20' 36.680" W
Type:
Dense Vegetation
Comment:
Thick pile of downed trees in ravine



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 12
Photo Point:
UNSUR_295
Date:
2013-12-05
Photo Name:
I1435
Photo Direction:
North
Latitude:
48° 0' 54.363" N
Longitude:
123° 20' 36.640" W
Type:
Dense Vegetation
Comment:
Dense vegetation and downed trees



Zone:
Zone 12
Photo Point:
UNSUR_295
Date:
2013-12-05
Photo Name:
I1437
Photo Direction:
North
Latitude:
48° 0' 54.363" N
Longitude:
123° 20' 36.640" W
Type:
Dense Vegetation
Comment:
Dense vegetation and downed trees



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 12
Photo Point:
UNSUR_300
Date:
2013-12-05
Photo Name:
N1418
Photo Direction:
East
Latitude:
48° 0' 41.594" N
Longitude:
123° 20' 32.070" W
Type:
Dense Vegetation
Comment:
Thick pile of downed trees obstructing transect line



Zone:
Zone 12
Photo Point:
UNSUR_300
Date:
2013-12-05
Photo Name:
N1421
Photo Direction:
East
Latitude:
48° 0' 41.594" N
Longitude:
123° 20' 32.070" W
Type:
Dense Vegetation
Comment:
Thick pile of downed trees obstructing transect line



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 12
Photo Point:
UNSUR_301
Date:
2013-12-05
Photo Name:
N1422
Photo Direction:
East
Latitude:
48° 0' 41.599" N
Longitude:
123° 20' 28.974" W
Type:
Dense Vegetation
Comment:
Thick pile of downed trees and debris obstructing transect line



Zone:
Zone 12
Photo Point:
UNSUR_302
Date:
2013-12-05
Photo Name:
N1425
Photo Direction:
North
Latitude:
48° 0' 42.533" N
Longitude:
123° 20' 28.165" W
Type:
Dense Vegetation
Comment:
Thick pile of downed trees and debris obstructing transect line



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 12
Photo Point:
UNSUR_303
Date:
2013-12-05
Photo Name:
N1426
Photo Direction:
North
Latitude:
48° 0' 42.477" N
Longitude:
123° 20' 28.209" W
Type:
Dense Vegetation
Comment:
Thick pile of downed trees and debris obstructing transect line



Zone:
Zone 12
Photo Point:
UNSUR_303
Date:
2013-12-05
Photo Name:
N1427
Photo Direction:
North
Latitude:
48° 0' 42.477" N
Longitude:
123° 20' 28.209" W
Type:
Dense Vegetation
Comment:
Thick pile of downed trees and debris obstructing transect line



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 12
Photo Point:
UNSUR_306
Date:
2013-12-05
Photo Name:
N1431
Photo Direction:
West
Latitude:
48° 0' 45.108" N
Longitude:
123° 20' 41.252" W
Type:
Dense Vegetation
Comment:
Thick pile of downed trees and debris obstructing transect line



Zone:
Zone 12
Photo Point:
UNSUR_308
Date:
2013-12-05
Photo Name:
N1434
Photo Direction:
East
Latitude:
48° 0' 44.788" N
Longitude:
123° 20' 33.265" W
Type:
Dense Vegetation
Comment:
Thick pile of downed trees and debris obstructing transect line



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 12
Photo Point:
UNSUR_309
Date:
2013-12-05
Photo Name:
N1437
Photo Direction:
West
Latitude:
48° 0' 51.325" N
Longitude:
123° 20' 37.563" W
Type:
Dense Vegetation
Comment:
Thick pile of downed trees and debris obstructing transect line



Zone:
Zone 12
Photo Point:
UNSUR_312
Date:
2013-12-06
Photo Name:
N1441
Photo Direction:
North
Latitude:
48° 0' 52.663" N
Longitude:
123° 20' 26.942" W
Type:
Dense Vegetation
Comment:
Thick pile of downed trees and debris obstructing transect line



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 12
Photo Point:
UNSUR_312
Date:
2013-12-06
Photo Name:
N1442
Photo Direction:
North
Latitude:
48° 0' 52.663" N
Longitude:
123° 20' 26.942" W
Type:
Dense Vegetation
Comment:
Thick pile of downed trees and debris obstructing transect line



Zone:
Zone 12
Photo Point:
UNSUR_321
Date:
2013-12-09
Photo Name:
N9991
Photo Direction:
South
Latitude:
48° 0' 31.496" N
Longitude:
123° 20' 30.418" W
Type:
Steep Terrain
Comment:
Unsurveyable due to steep terrain on both sides of road to north and south



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 12
Photo Point:
UNSUR_322
Date:
2013-12-09
Photo Name:
N9992
Photo Direction:
South
Latitude:
48° 0' 31.042" N
Longitude:
123° 20' 33.320" W
Type:
Steep Terrain
Comment:
Unsurveyable due to steep terrain on both sides of road to north and south



Zone:
Zone 12
Photo Point:
UNSUR_325
Date:
2013-12-09
Photo Name:
N1462
Photo Direction:
West
Latitude:
48° 0' 35.452" N
Longitude:
123° 20' 40.137" W
Type:
Steep Terrain
Comment:
Unsurveyable due to steep terrain and dense vegetation



2014 PHOTOGRAPHIC LOG

Remedial Investigation - Port Angeles Combat Range, WA

Zone:
Zone 12
Photo Point:
UNSUR_326
Date:
2013-12-09
Photo Name:
N1464
Photo Direction:
North
Latitude:
48° 0' 34.772" N
Longitude:
123° 20' 43.165" W
Type:
Steep Terrain
Comment:
Unsurveyable due to steep terrain, downed trees and debris



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APPENDIX

Survey Control

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Wengler Surveying & Mapping

James Wengler, Professional Land Surveyor, Certified Federal Surveyor
703 East Eighth Street
Port Angeles, WA 98362

(360) 457-9600
Fax (360) 457-9556
james@wenglersurveying.com

October 28, 2013

HDR Environmental, Operations and Construction, Inc.
Lawrence Devries, PLS, Project Manager
12850 E Control Tower Rd.
Centennial, CO 80112

Dear Lawrence:

Below are the results of our field survey to determine coordinates of six control points at the Port Angeles Combat Range in Clallam County, Washington.

Geographic Coordinates relative to the North American datum of 1983, 2011 adjustment, (Epoch 2010)

Station	Latitude (N)	Longitude (W)	Ellipsoid Ht. (meters)	Designation
1	48-01-50.871256	123-20-25.960574	297.8587	PACR CP-1
2	48-01-49.891523	123-20-26.103502	299.9530	PACR CP-2
3	48-01-48.993130	123-20-33.489424	289.8653	PACR CP-3
4	48-01-48.003272	123-20-35.662573	291.7262	PACR CP-4
5	48-01-55.432872	123-20-35.633110	281.9665	PACR CP-5
6	48-01-52.515194	123-20-40.453339	285.1182	PACR CP-6

Washington State plane coordinates (North zone), North American datum of 1983, 2011 adjustment, (Epoch 2010)

Station	Northing (meters)	Easting (meters)	Orthometric Elevation (meters)	Designation
1	117651.769502	313053.517103	317.9122	PACR CP-1
2	117621.623339	313049.572147	320.0047	PACR CP-2
3	117598.877641	312895.743110	309.9115	PACR CP-3
4	117569.790361	312849.751287	311.7690	PACR CP-4
5	117799.108796	312857.843719	302.0219	PACR CP-5
6	117712.302323	312755.104643	305.1647	PACR CP-6

Convergence Angles (DMS) and Grid Factors at Stations
(Grid Azimuth = Geodetic Azimuth - Convergence)
(Elevation Factor Includes a Geoid Height Correction at Each Station))

Station	Convergence Angle	------- Factors ------- Scale	x Elevation	= Combined
1	-1-52-00.01	0.99994341	0.99995332	0.99989673
2	-1-52-00.12	0.99994341	0.99995299	0.99989641
3	-1-52-05.62	0.99994342	0.99995457	0.99989799
4	-1-52-07.23	0.99994343	0.99995428	0.99989771
5	-1-52-07.21	0.99994337	0.99995581	0.99989918
6	-1-52-10.80	0.99994339	0.99995532	0.99989871

Physical characteristics of control points

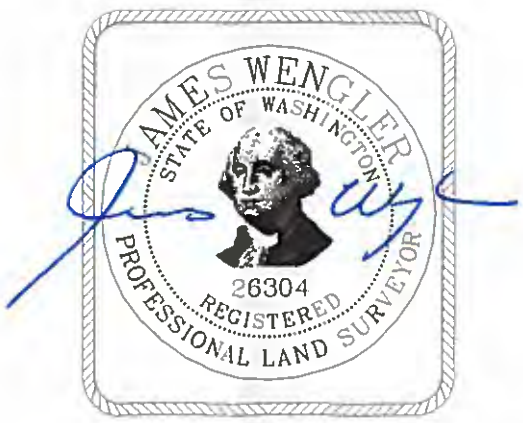
Station	Physical Characteristics
1-2	Found: ½ inch rebar set by HDR
3	Set: 5/8 inch rebar with a red plastic cap stamped "GPS CONTROL PLS 26304"
4 THROUGH 6	Set: 5/8 inch rebar with a red plastic cap stamped "CONTROL POINT PLS 26304"

All coordinate values exceed the relative accuracy requirement as specified in the contract and were constrained to the following NGS control points with published values relative to the North American datum of 1983, 2011 adjustment,(Epoch 2010) and the North American Vertical Datum of 1988 (NAVD88).

NGS Station & (PID)	Latitude (N)	Longitude (W)	Orthometric Elev. (NAVD 88 meters)
N 469 (TS0058)	48-11-52.34640	124-07-08.35317	4.813
944 4090 A TIDAL (TR2551)	48-07-25.14828	123-27-04.01731	4.069
FORKS RESET (SD0880)	47-56-12.19221	124-23-44.16562	87.95

Sincerely,

James Wengler, PLS, CFedS



DATE: 10-28-2013

SV OBSTRUCTION DIAGRAM

BY: JW

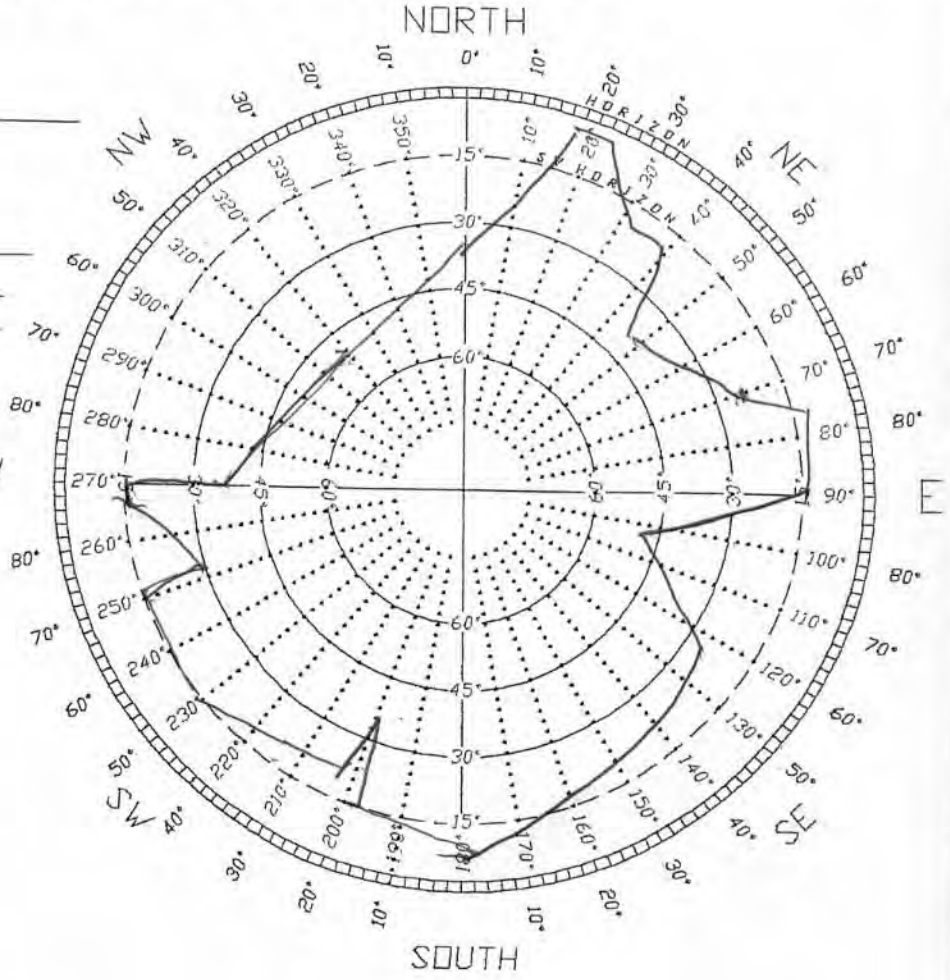
DATE: 10-9-2013

PROJECT: PACR

POINT: 2887 SKYLINE

DESCRIPTION: SEE CITY OF DA RECONFIG SHEET

SKETCH/MAP



N18E	3	W	15
N22E	8	W	35
N32E	22	N46W	52
N38E	22	N	35
N46E	38		
N72E	25		
N76E	7		
E	15		
S78E	47		
S56E	27		
S	8		
S20	33	POLE	
S34W	24		
S50W	15	S68W	15
S72W	28		
S86W	15		

HOW TO GET HERE (INCLUDE TIME TO WALK TO MONUMENT FROM VEHICLE)

SV OBSTRUCTION DIAGRAM

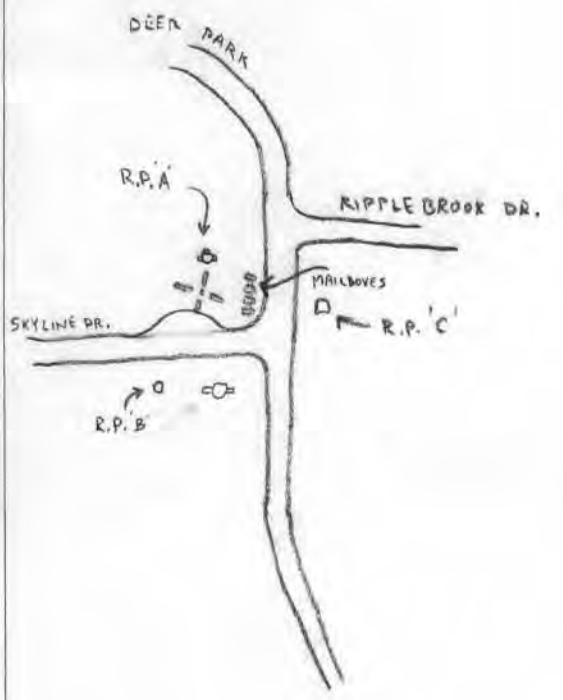
48° 03' 04"
123° 20' 16"

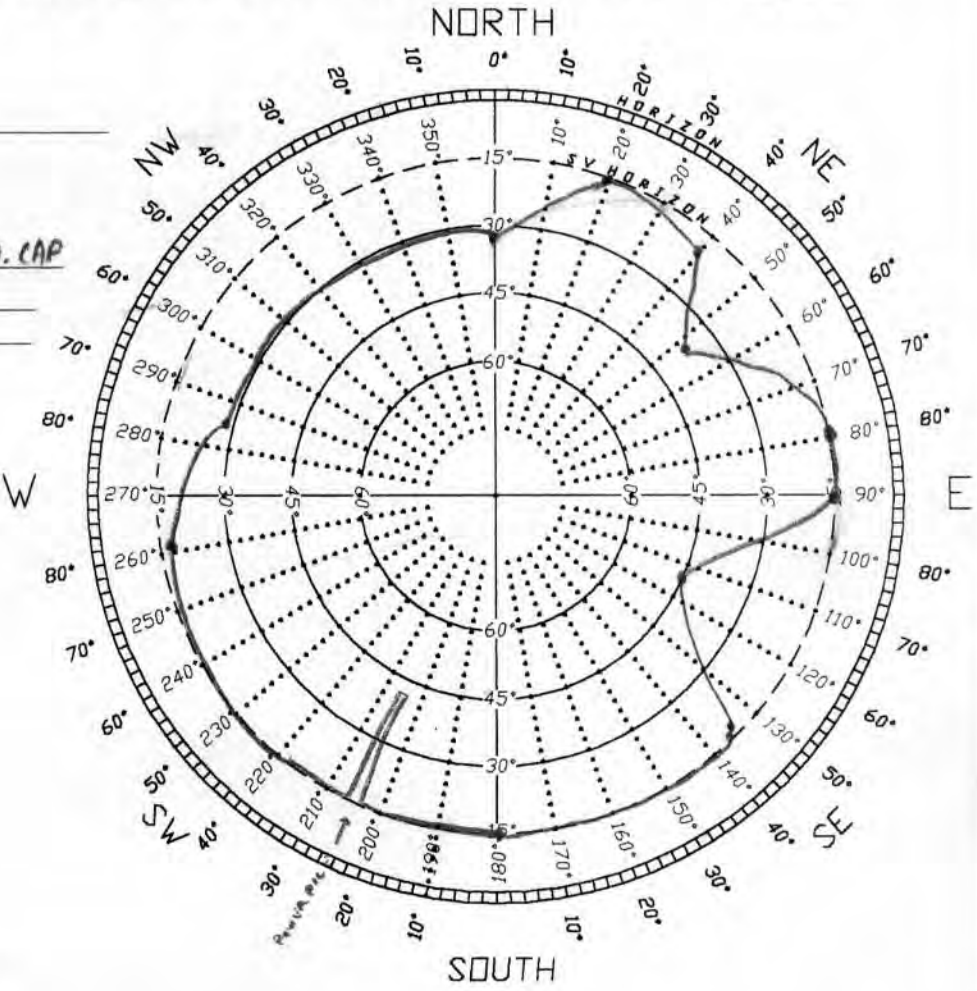
BY: R. BAIN / A. NEWMAN
DATE: NOV. 9, 2000

PROJECT: CITY PA 2000
2887
POINT: SKYLINE 05303361

DESCRIPTION: SET: FENO SPIK/2" ALUM. CAP STAMPED "CITY OF PORT ANGELES CONTROL POINT 2000 05303361"
DOWN 0.3' BELOW PANELS

SKETCH/MAP





R.P. 'A' TOP CENTER OF FIRE PLUG
FROM MONUMENT N 25° E 16.75'

R.P. 'B' TOP CENTER OF TELEPHONE RISER
FROM MONUMENT S 38° W 52.40'

R.P. 'C' TOP CENTER OF LARGE TELEPHONE RISER
FROM MONUMENT S 85° E 47'

HOW TO GET HERE (INCLUDE TIME TO WALK TO MONUMENT FROM VEHICLE)

FROM HWY 101 TO DEER PARK RD S 4.01 MI TO INTL SKYLINE DR.

SKYPILOT OK JW 10-11-2013

SV OBSTRUCTION DIAGRAM

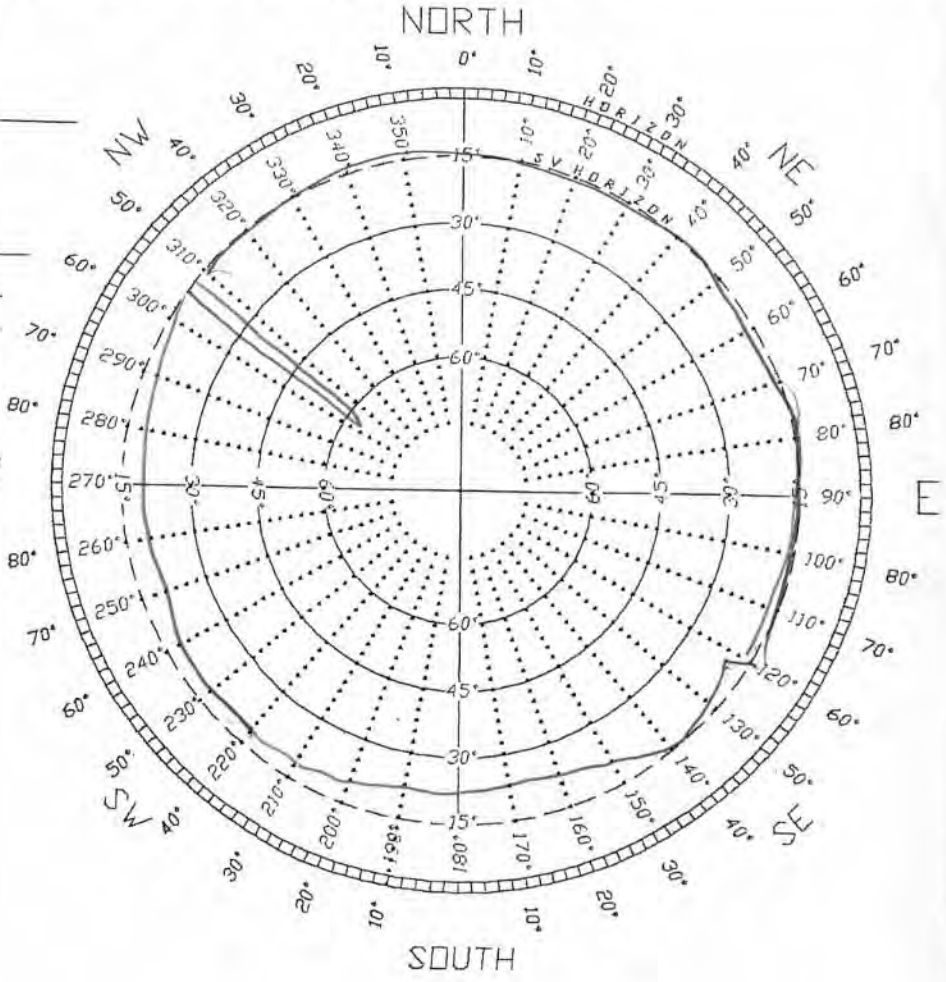
BY: JW
DATE: 10-19-2013

PROJECT: PACR

POINT: 2886 SCHREINER

DESCRIPTION: SEE CITY OF PA RECORD SHEET

SKETCH/MAP



S60 E 15
S60 E 20
S64 E 19
S60 E 13
S38 E 15
S30 E 23
S 42 W 19
N54 W 70 POLE

HOW TO GET HERE (INCLUDE TIME TO WALK TO MONUMENT FROM VEHICLE)

SV OBSTRUCTION DIAGRAM

48°01'51"N
123°20'25"W

BY: J. DUGAN / R. BAIN
DATE: 30 OCT. 00

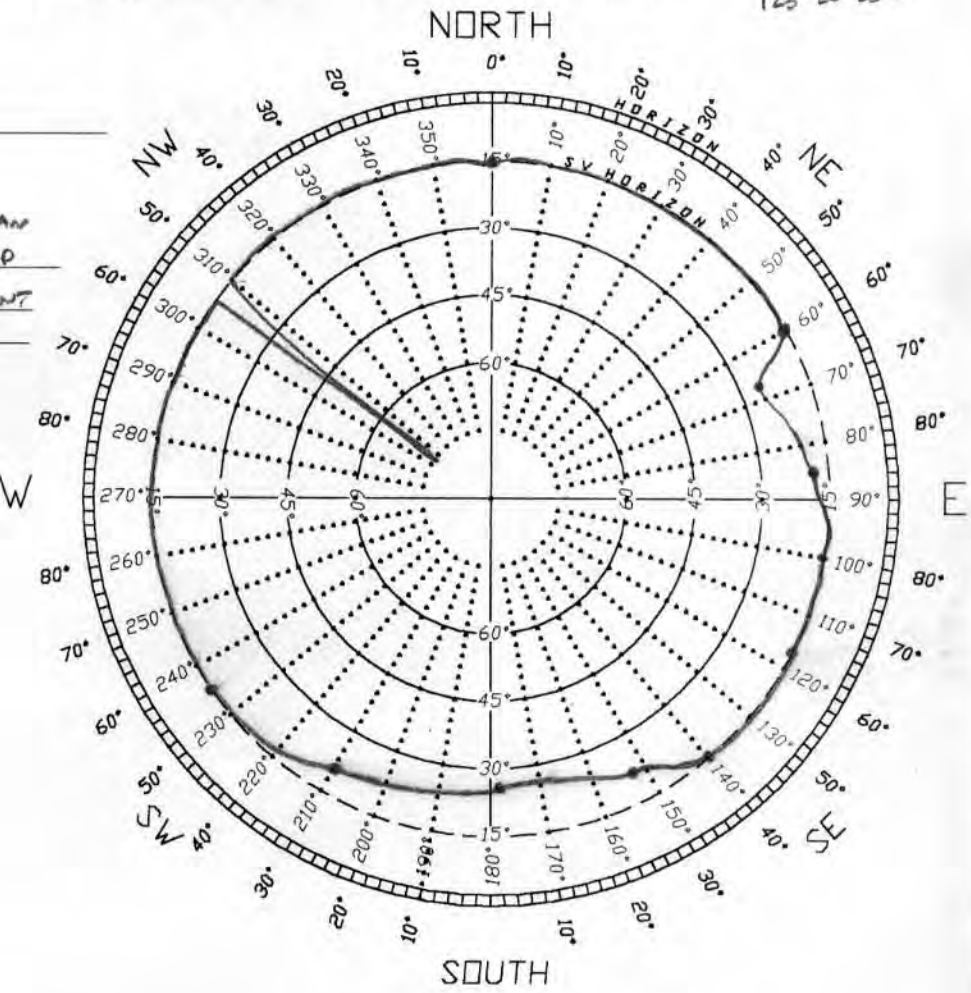
PROJECT: CITY OF PA 2000
2886

POINT: SCHREINER 05290580

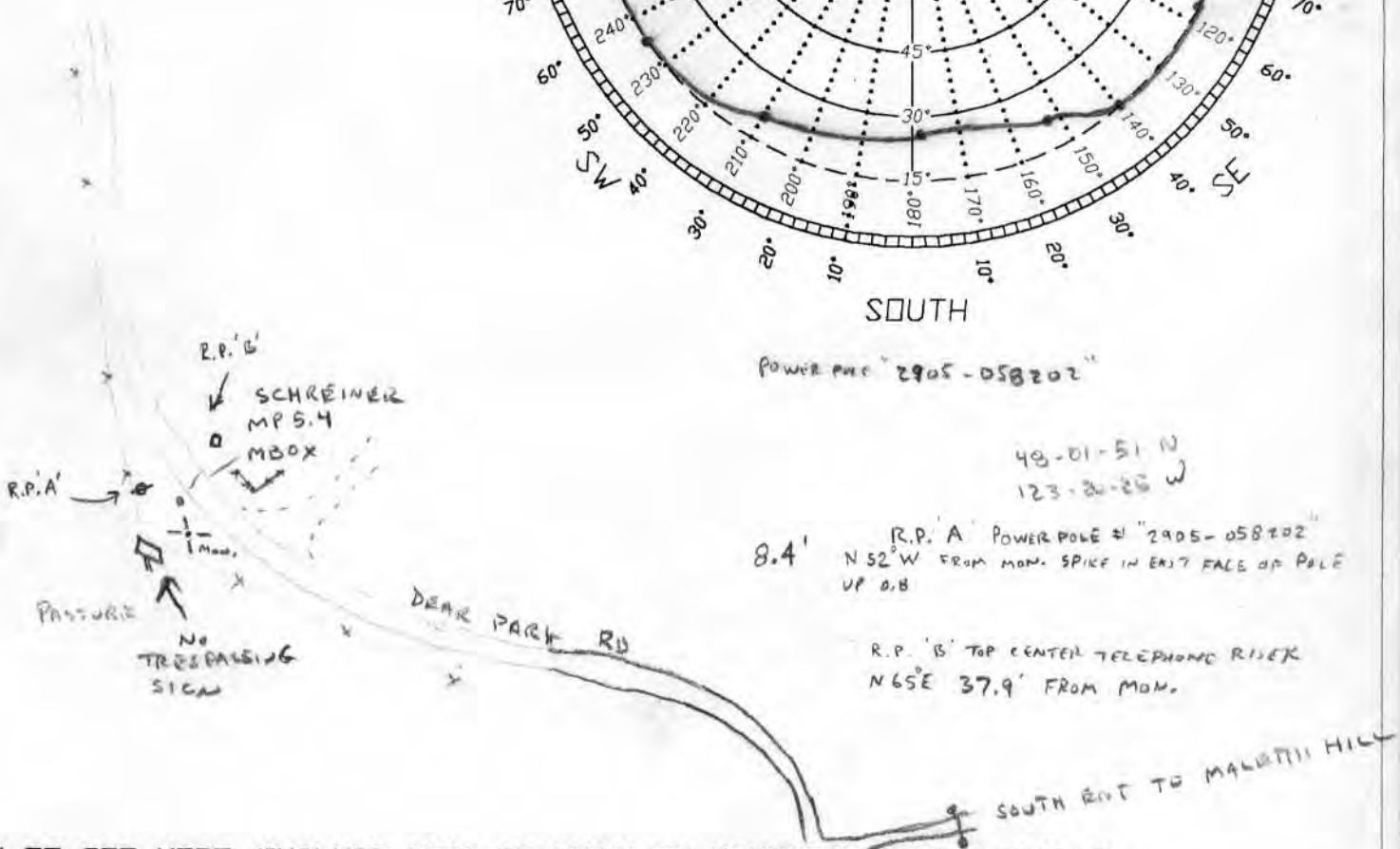
NOV. 8, 2000 R. BAIN / A. NEWMAN

DESCRIPTION: SET: FEND SPK / 2" ALUM CAP STAMPED "CITY OF PORT ANGELES CONTROL POINT 2000 05290580"
DOWN 0.15 IN GRASS SHOULDER
10.8 FEET WEST OF FOG LINE

SKETCH/MAP



POWER POLE "2905-058202"



48-01-51 N
123-20-25 W

8.4' R.P. 'A' POWER POLE # "2905-058202" N 52° W FROM MON. SPIKE IN EAST FACE OF POLE UP 0.8

R.P. 'B' TOP CENTER TELEPHONE RISER N 65° E 37.9' FROM MON.

HOW TO GET HERE (INCLUDE TIME TO WALK TO MONUMENT FROM VEHICLE)

FROM HWY 101 DRIVE APPROX. 5.4 mi UP DEER PARK TO CURVE IN ROAD AND BEGINNING OF STOP AND PARK AT DRIVEWAY @ ADDRESS # 5455 ON EAST SIDE OF DEER PARK ROAD. MONUMENT IS ON WEST SIDE OF ROAD IN GRASS OPPOSITE FENCE CORNER

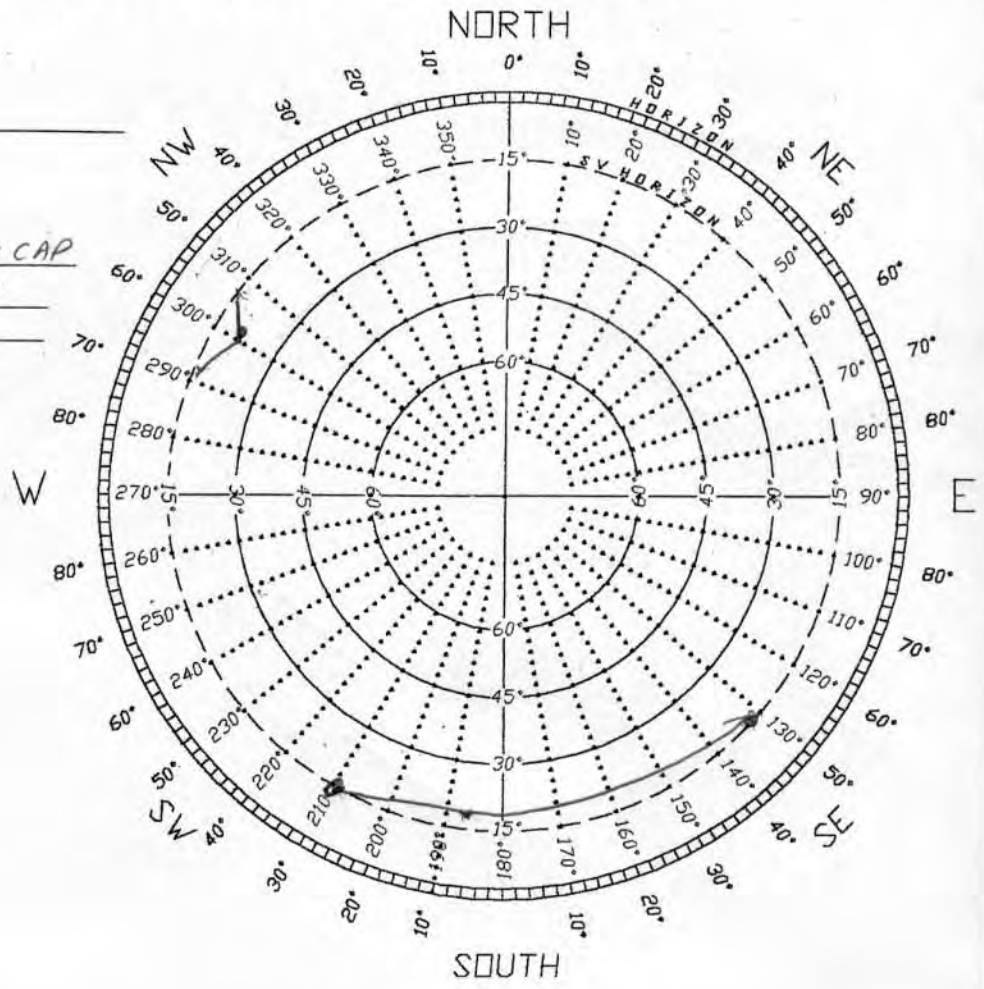
SV OBSTRUCTION DIAGRAM

BY: JW
DATE: 10-23-2013

PROJECT: HDR

POINT: PACR CP-1

DESCRIPTION: 1/2" REBAR /NC CAP SET IN FIELD NORTH OF CP-2



SKETCH/MAP

N68W	15
N58W	20 TREE
N52W	15
S48E	15
S45E	20
S6W	20
S30W	15

48-01-51
123-20-26

GPS GOOD ACC DAY FRIDAY

HOW TO GET HERE (INCLUDE TIME TO WALK TO MONUMENT FROM VEHICLE)

NORTH OF PACR CP-2

SV OBSTRUCTION DIAGRAM

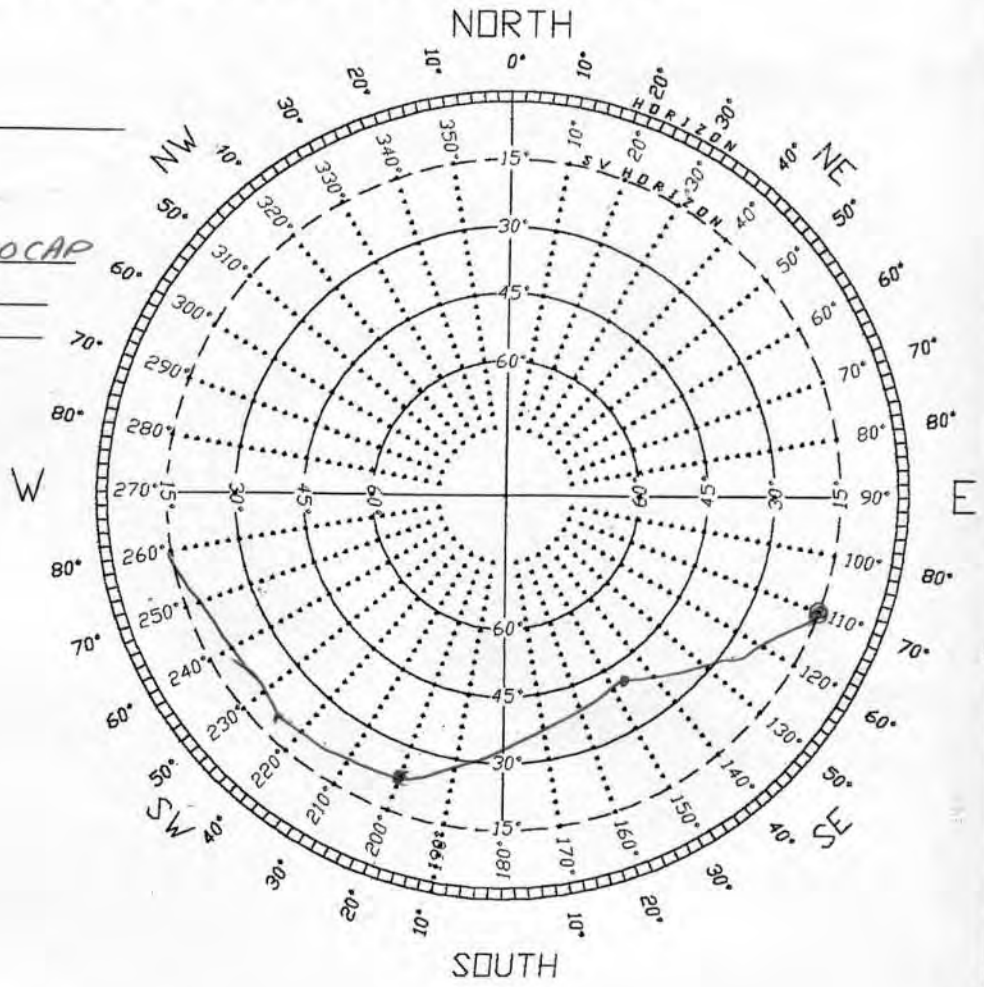
BY: JW
DATE: 10-23-2013

PROJECT: HDR

POINT: PACR GP-2

DESCRIPTION: 1/2 "REBAR / NOCAP SET IN FIELD S60W FROM SCHRIEVER 2886

SKETCH/MAP



S70E 15
S56E 27
S26E 40
S20W 25
S45W 20
S80W 15

LAT 48-01-50 N
LONG 123-20-26 W

FROM GOOGLE EARTH

8:18 - 8:52 :34
9:02 - 13:54 4:52
14:00 - 17:00 3:00

HOW TO GET HERE (INCLUDE TIME TO WALK TO MONUMENT FROM VEHICLE)

SOUTH OF PACR CP-1

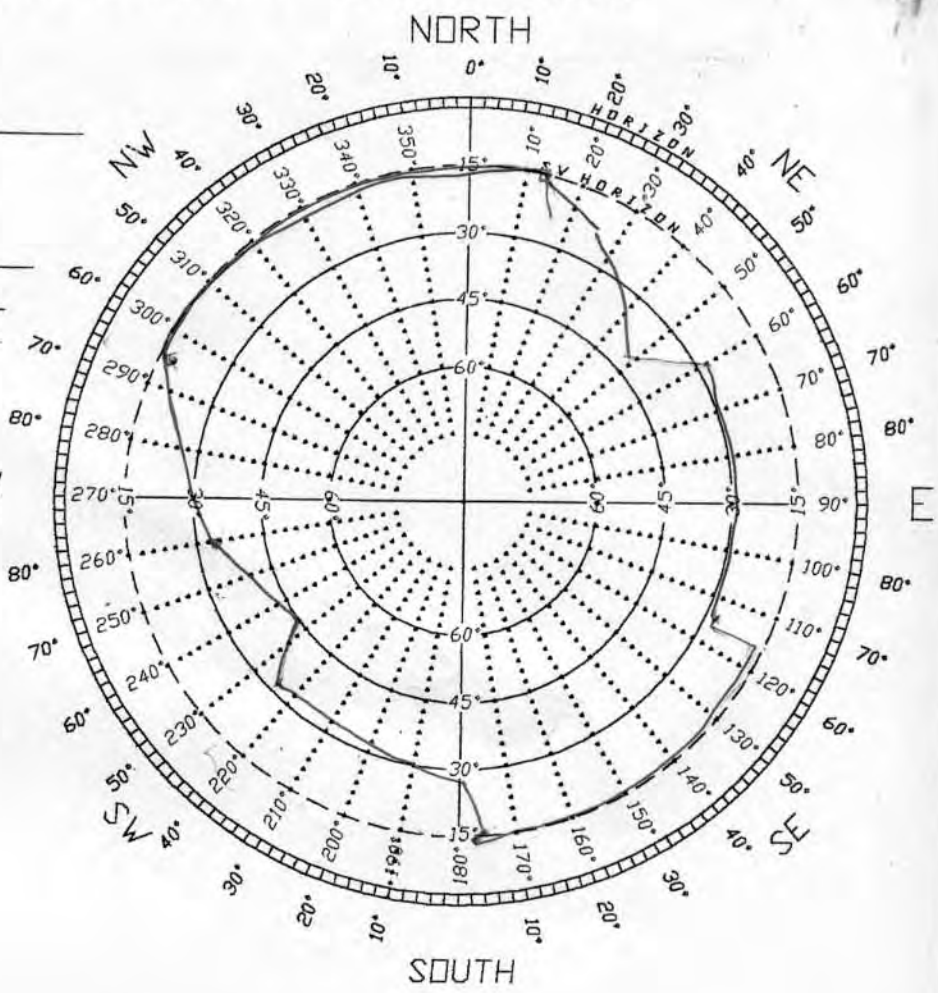
SV OBSTRUCTION DIAGRAM

BY: JW
DATE: 10-23-2013

PROJECT: HDR

POINT: PACK CP-3

DESCRIPTION: SET 5/8" R/C
GPS CONTROL "PLS 26304"



SKETCH/MAP

N68W	13
N12E	15
N16E	24
N24E	21
N48E	40
N60E	28
S66E	28
S66E	15
S6E	15
S8E	26
S45W	33
S52W	48
N30W	33

48-01-49.0
123-20-33.8

N 117601
E 312891

8:18 - 10:28	2:10
10:48 - 13:02	2:14
14:16 - 17:00	2:44

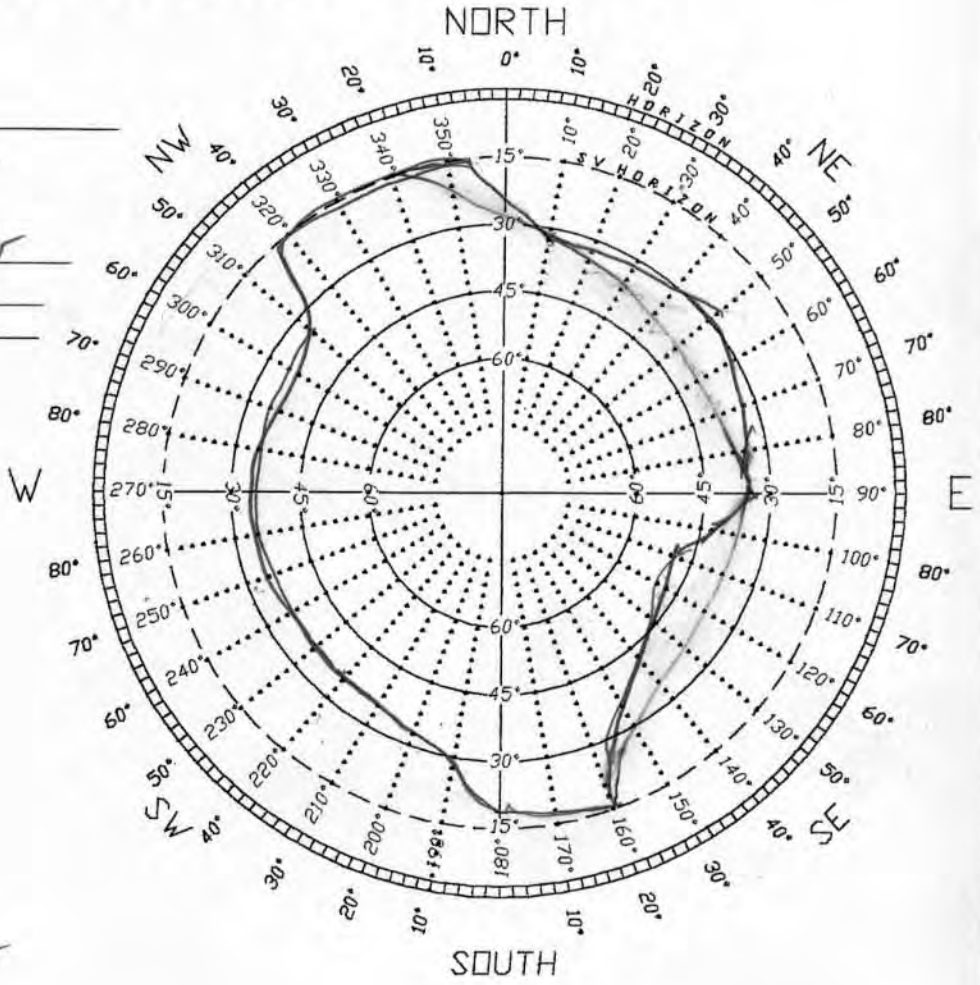
HOW TO GET HERE (INCLUDE TIME TO WALK TO MONUMENT FROM VEHICLE)

111 WESTERLY MEADOW

SV OBSTRUCTION DIAGRAM

BY: JW
DATE: 10-19-2013
PROJECT: PACR
POINT: MT PLEASANT 2155
DESCRIPTION: SEE CCGF SHEET

SKETCH/MAP



N8W 15
N20W - 0
N8E 33
E 37
S26E 28
S20E 15
S72E 50
S 19
S10W 29
S42W 40
N40W 32
N45W 16

N50E 25

HOW TO GET HERE (INCLUDE TIME TO WALK TO MONUMENT FROM VEHICLE)

GEODETIC CONTROL STATION REPORT

CLALLAM COUNTY GEODETIC CONTROL NETWORK

Agency:	Location:	Date set/ recovered:
Clallam County, Road Dept./ G.I.S. 223 East Fourth St. Port Angeles, Wa. 98362 (360) 417-2000	Clallam County Washington	DEC. 17, 1996
		Map of Record/ Project: C.C.G.F. ROS AUDIT. F.N.: 1998-1003283

Index No.:	I.D. No.:	P.I.D. No.:	Name:	Origin:
2155	05303180	N/A	MT PLEASANT	C.C.G.F.

Horizontal Datum:	Method (Hor.):	Accuracy (H):	Vertical Datum:	Method (Vert.):	Accuracy (V):
NAD 83(91)	GPS	1ST	NAVD 88	GPS	GPS HEIGHT

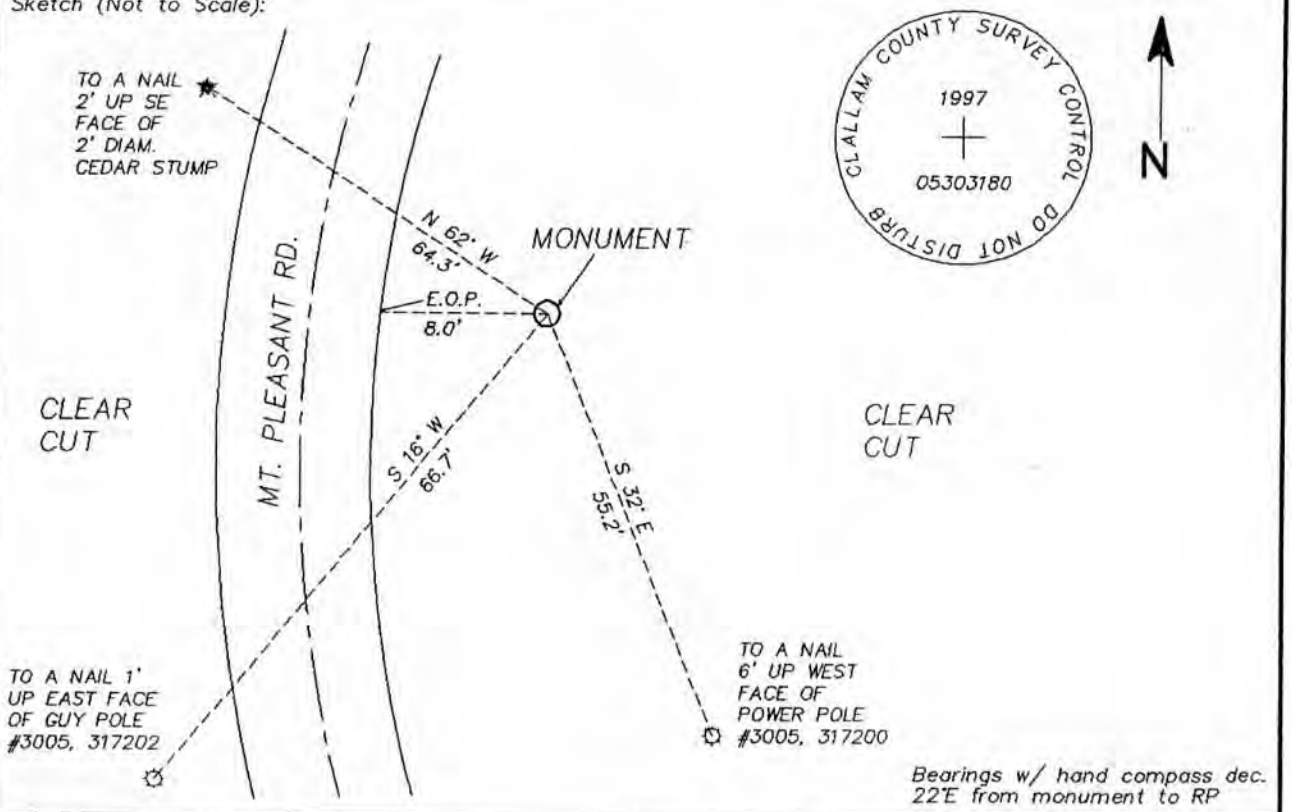
Latitude:	Longitude:	Washington Coordinate System (North), US feet:
48°02'46.50017" N	123°21'50.16260" W	N 391 816.815 E 1 021 542.017

Orthometric Elevation (US feet):	Ellipsoid Height:	Scale:	Convergence Angle:	Geoid Model:
1301.1	1235.40 US FEET 376.55 M	0.99994303	-1°53'02.7"	96

Monument Description:

3" DIAM. BRASS CAP ON 2 1/2" DIAM. X 30" STAINLESS STEEL PIPE IN CONCRETE BASE AS PER CLALLAM COUNTY GEOMETRIC FRAMEWORK PROJECT SPECIFICATIONS, SET FLUSH WITH SURROUNDING SOIL. CAP IS MARKED AS SHOWN. SET ORANGE CARSONITE WITNESS POST NEAR MONUMENT.

Sketch (Not to Scale):



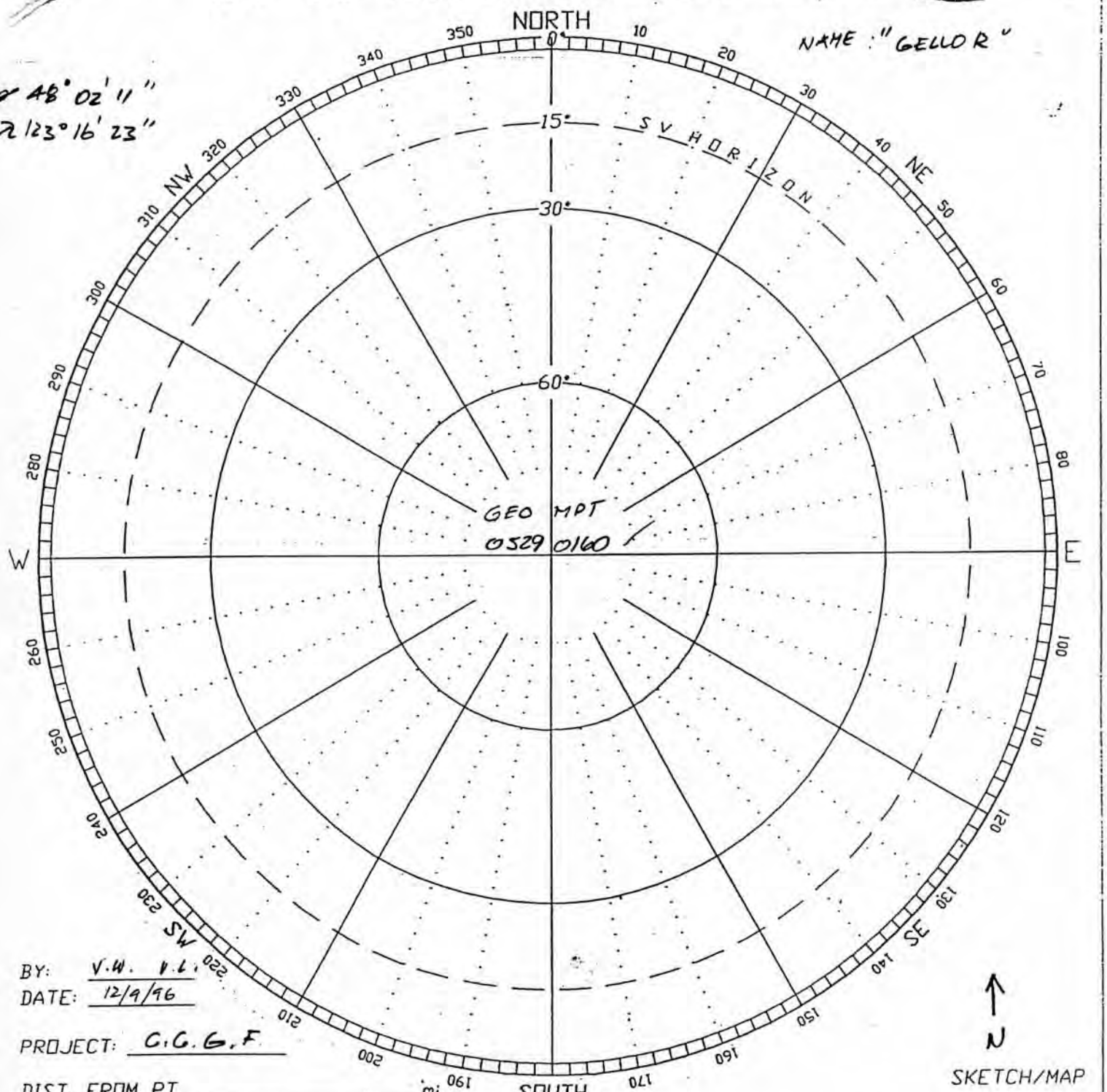
Bearings w/ hand compass dec. 22°E from monument to RP

Directions:

FROM THE INTERSECTION OF S.R. 101 AND MT. PLEASANT RD. GO SOUTH ON MT. PLEASANT RD. 4.35 MILES. MONUMENT IS ON EAST SIDE OF MT. PLEASANT RD. AND 0.25 MILES SOUTH FROM DIETZ RD. INTERSECTION.

PG. 35

SV OBSTRUCTION DIAGRAM NEW



NAME: "GELLOR"

ϕ 48° 02' 11"
λ 123° 16' 23"

BY: V.W. P.L.
DATE: 12/9/96

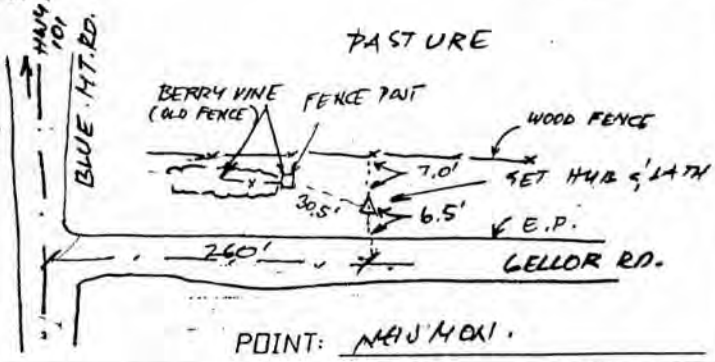
PROJECT: C.G.G.F.

DIST. FROM PT. _____, ___mi.
TRAVEL TIME _____min.

HOW TO GET HERE: FROM HWY 101 XT "R CORNER STORE" SOUTH ON BLUE MT. RD. 4 MI TO GELLOR RD.) EAST ON GELLOR RD. 260' TO THE POINT ON NORTH SIDE OF THE RD.

DESCRIPTION: NEW MON. NAME: "GELLOR"

SKETCH/MAP



POINT: MAIN MON.

GEODETIC CONTROL STATION REPORT

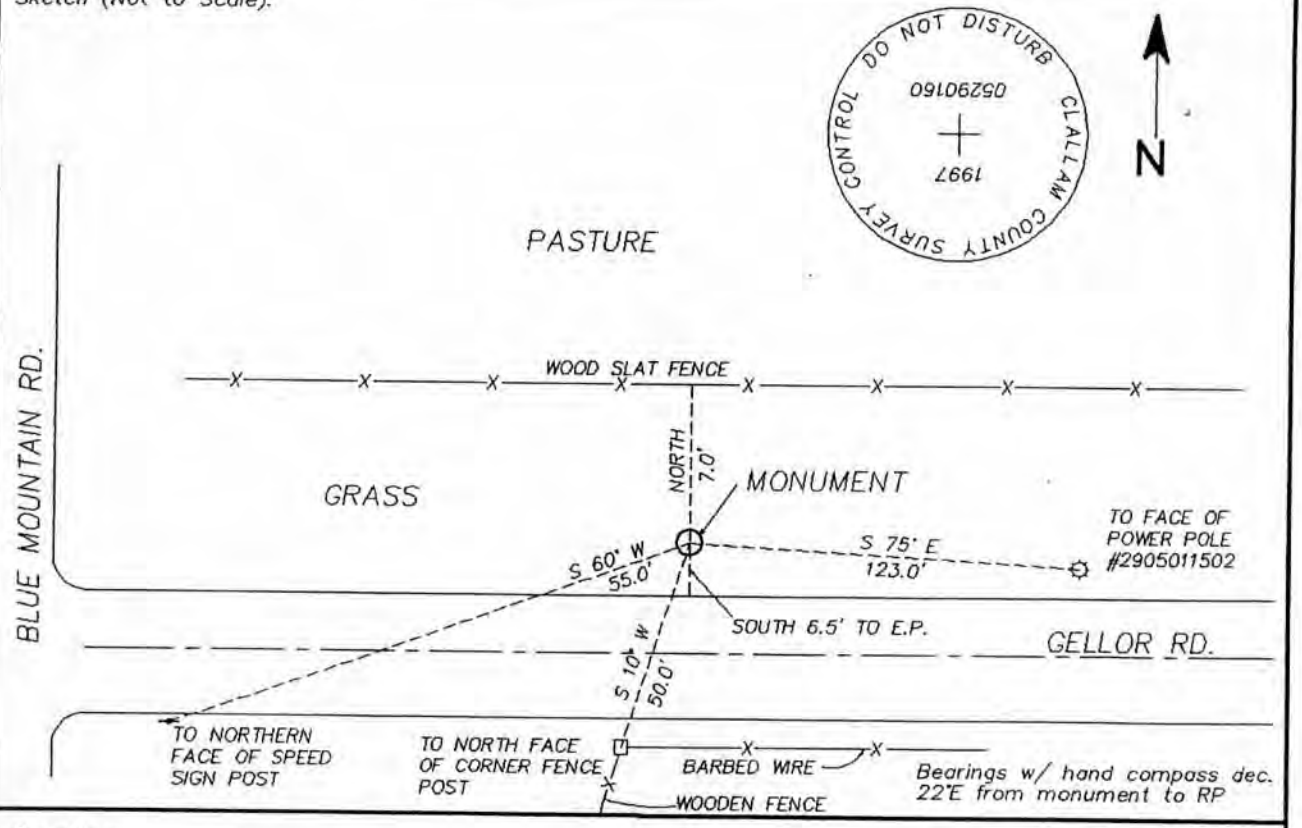
CLALLAM COUNTY GEODETIC CONTROL NETWORK

Agency: Clallam County, Road Dept./ G.I.S. 223 East Fourth St. Port Angeles, Wa. 98362 (360) 417-2000		Location: Clallam County Washington	Date set/ recovered: DEC. 17, 1996	
			Map of Record/ Project: C.C.G.F. ROS AUDIT. F.N.: 1998-1003283	
Index No.: 2158	I.D. No.: 05290160	P.I.D. No.: N/A	Name: GELLOR	Origin: C.C.G.F.
Horizontal Datum: NAD 83(91)	Method (Hor.): GPS	Accuracy (H): 1ST	Vertical Datum: NAVD 88	Method (Vert.): GPS	Accuracy (V): GPS HEIGHT
Latitude: 48°02'10.69071" N	Longitude: 123°16'27.17864" W	Washington Coordinate System (North), US feet: N 387 481.446	E 1 043 360.512	
Orthometric Elevation (US feet): 1120.6	Ellipsoid Height: 1054.23 US FEET 321.33 M	Scale: 0.99994326	Convergence Angle: -1°49'02.2"	Geoid Model: 96

Monument Description:

3" DIAM. BRASS CAP ON 2 1/2" DIAM. X 30" STAINLESS STEEL PIPE IN CONCRETE BASE AS PER CLALLAM COUNTY GEOMETRIC FRAMEWORK PROJECT SPECIFICATIONS, SET FLUSH WITH SURROUNDING SOIL. CAP IS MARKED AS SHOWN. SET ORANGE CARSONITE WITNESS POST NEAR MONUMENT.

Sketch (Not to Scale):



Directions:

FROM THE INTERSECTION OF S.R. 101 AND BLUE MOUNTAIN RD. GO SOUTH ON BLUE MOUNTAIN RD. TO INTERSECTION OF BLUE MOUNTAIN RD. AND GELLOR RD. GO EAST ON GELLOR RD. APPROXIMATELY 260'± TO THE STATION ON THE NORTH SIDE OF GELLOR RD.

PG. 37

WENGLER SURVEYING & MAPPING
GPS SITE LOG

Unit Number 0220083375

PROJECT	HDR
DATE	10-25-2013
JULIAN DAY	298
OBSERVER	WENGLER

10-26-2007
CHECKED IN 10-25-2013

Station #	File Name UNIT# + Jul Day	Session #	Occupation Times Planned	Occupation Times Actual	Ant. Ht. Meters	Ant. Ht. Feet
MT PLEASANT 2155	3375 298	0	8:36	8:13	1.633 ✓ 1.633 ✓	5.355 ✓ 5.355 ✓ 5.36 (2ND)
			9:36	9:36		
GELLOR 2158	3375 298	1	ASAP	9:59	1.541 ✓	5.055 -
			10:28	10:28	1.541 ✓	5.055 -
MT. PLEASANT 2155	3375 298	2	11:08	10:58	1.605 ✓	5.265 -
			12:24	12:24	1.606 ✓	5.270 -
GELLOR 2158	3375 298	3	1:00	12:54	1.601 ✓	5.255 -
			1:54	1:54	1.601 ✓	5.255 -

Comments: 2ND MEAS WITH SECOND TAPE, MT PLEASANT MON. "FOUND MON AS DESCRIBED"
FAST FLASH SAT 8:14 LOGGING DATA @ 8:15, 8:36 ALL GOOD
8:45 - DOUBLE YELLOW BLINK,
GELLOR START 9:59 - LOG DAT @ 10:00, GELLOR MON FOUND AS DESCRIBED, 10:20 - DOUBLE YELLOW BLINK, MT. PLEASANT - 10:59 START LOGGING DATA, GELLOR STMT 12:54 LOGGING DATA, 1:20 DOUBLE BLINK YELLOW
MT PLEASANT TO GELLOR 21 MIN. MINIMUM, 1/2 HR BETTER

WENGLER SURVEYING & MAPPING
GPS SITE LOG

Page 1 of 1
Unit Number 0220068742

PROJECT	HDR
DATE	10-25-2013
JULIAN DAY	298
OBSERVER	VERNON

CHECKED IN 10-25-2013

Station #	File Name UNIT# + Jul Day	Session #	Occupation Times Planned	Occupation Times Actual	Ant. Ht. Meters	Ant. Ht. Feet
SKYLINE 2887	8742+298	0	8:36 9:30	8:35 9:30	1.795 ✓ 1.795	5.89 ✓ 5.89
SCHREINER 2886	8742 298	1	9:48 10:28	9:47 10:28	1.736 ✓ 1.736	5.70 ✓ 5.70
SKYLINE 2887	8742 298	2	11:08 12:02	11:07 12:02	1.769 ✓ 1.769	5.80 ✓ 5.80
SCHREINER 2886	8742 298	3	12:22 1:02	12:21 12:51	1.685 ✓ 1.685	5.53 ✓ 5.525
2886	8742 298	4		1:00 1:02	"	"

Comments:

WENGLER SURVEYING & MAPPING
GPS SITE LOG

Page 1 of 1
Unit Number 02200 68745

PROJECT	HDR
DATE	10-25-2013
JULIAN DAY	298
OBSERVER	HEISTAND

CHECKED IN 10-25-2013

Station #	File Name UNIT# + Jul Day	Session #	Occupation Times Planned	Occupation Times Actual	Ant. Ht. Meters	Ant. Ht. Feet
PACR CP-1	8745 298	0	8:36	8:25 AM	1.610 ✓	5.28 ✓
			1:54	12:52	1.610 ✓	5.28
CP-1	8745 298	1		1:00	"	"
				1:54		
CP-1						

Comments: When breaking down set up found OPTICAL optical Plummet was sighting 0.04 ~~East~~ NE of the center of the rebar.

WENGLER SURVEYING & MAPPING
GPS SITE LOG

Page 1 of 1
Unit Number 0220083823

PROJECT	HDR
DATE	10-25-2013
JULIAN DAY	298
OBSERVER	VERNON

CHECKED IN 10-25-2013

Station #	File Name UNIT# + Jul Day	Session #	Occupation Times Planned	Occupation Times Actual	Ant. Ht. Meters	Ant. Ht. Feet
PACR			8:36	8:28	1.730 ✓	5.675 ✓
CP-2	3823 298	0	1:54	12:54	1.731	5.68
CP-2	3823 298	1		1:00	"	"
				1:54		

Comments: ERROR LOG C

WENGLER SURVEYING & MAPPING
GPS SITE LOG

Page 1 of 1

Unit Number 02200838 22

PROJECT	HDR
DATE	10-25-2013
JULIAN DAY	298
OBSERVER	HEISTAND

CHECKED IN 10-25-2013

3.280833

Station #	File Name UNIT# + Jul Day	Session #	Occupation Times Planned	Occupation Times Actual	Ant. Ht. Meters	Ant. Ht. Feet
PACR CP-3	3822 298	0	8:36	8:33	1.694 ✓	5.56 ✓
			1:54	12:51	1.694	5.56
CP-3	3822 298	1	12:57	12:57	"	"
				12:58		
CP-3	3822 298	2		1:03	"	"
				1:54		

Comments: Around 1:00 The satalite and Data log lights changed from slowly blinking to fast rapid blinking for a short period of time, guessing to be under a minute, then went back to normal blinking speed.

SG2W (KEEPER COMPASS BEARING BETWEEN 2886 & 2)

PT	& PT	SD	24	177	DESC
			SCHREINER		
	⊼ @	2886	BS 2	HI: 5.31	FND 2" AC
PACIF CP #				5.26	
(DV) 2	- 0 -	151.033	92-11-47	~~5.27~~	FND ½"
PACIF CP #				5.08	
(M) 1	41-03-10	125.745	95-51-38	~~5.09~~	FND ½"
	⊼ @	2	BS 2886	HI: 5.41	FND ½ RD
SCHREINER					
(DV) 2886	- 0 -	151.020	87-55-15	5.16	FND 2" AC
PACIF CP #					
(M) 1	304-33-42	100.000	93-56-31	5.40	FND ½"
(T) 20	142-15-01	303.429	90-34-31	5.19	SET SPK
	⊼ @	2	BS 20	HI: 5.41	FND ½" RD
(M) 2886	217-45-06	151.023	87-55-08	5.16	FND 2" AC
	⊼ @	20	BS 2	HI: 5.34	FND SPK
(T) 21	229-56-52	184.522	91-23-04	5.28	SET SPK
	⊼ @	20	BS 21	HI: 5.34	FND SPK
(M) 2	130-03-23	303.429	89-29-58	5.26	FND

HDR GPS MON TIES

24 OCT 2013

B. VERNON

J. HEISTAND

"05290580" CCGF #, ≈ 10' W'LY OF WEEP DEER PARK RD

≈ 15' SW'LY OF MB # 5955 "SCHREINER"

REBAR NO CAP (S'LY) * < HT = 5.26 > *

REBAR NO CAP (N'LY) * < HT = 5.08 > *

28.1" / 46 °F

PPM 10

PSM = -28mm

ACF = 1.0

SUNNY

CM S. SIDE OF DRIVE

Case 3:23-cv-00303-WQH-KSC Document 1-2 Filed 02/22/23 PageID.1058 Page 19 of 29
Delivery Order 0006

PT	ANT	SD	ZA	HT	DESC
	↑ @ 21 BS 20			HI: 5.43	FND SPK
PACIR CP # 3 (T) 3	246-19-00	317.795	94-43-38	5.16	FND 5/8"
	↑ @ 21 BS 3			HI: 5.43	FND SPK
(M) 20	113-41-08	184.514	88-42-57	5.19	FND SPK
	↑ @ 3 BS 21			HI: 5.32	FND 5/8" REBAR
PACIR CP # (M) 4	96-17-11	178.662	88-01-58	5.37	FND 5/8" REBAR
(T) 22	177-34-36	662.944	91-46-02	5.25	SET SPK
	↑ @ 3 BS 22			HI: 5.32	FRC 5/8"
(M) 21	182-25-26	317.770	85-19-45	5.28	FND SPK
PACIR CP # (M) 4	278-42-38	178.649	88-07-21	5.07	FRC 5/8"

HDR CONTD

24 OCT 2013
B. VERNON
J. HEISTAND

REBAR & CAP "GPS CONTROL PLS 26304

& CAP

& CAP "GPS CONTROL PLS 26304"

PT	RT	SD	ZA	HT	DESC	HDR CONTD
						24OCT2013
						B. VERNON
						J. HEISTAND
	⊼ @ 22	BS	3	HI: 5.40	FND SPK	
PACK CP #						
(M) 6	52-45-38	130.580	87-54-28	5.41	FND 5/8"	REBAR & CAP "GPS CONTROL PLS 26304"
PACK CP #						
(M) 5	284-11-35	348.052	90-53-19	5.56	FND 5/8"	REBAR & CAP "GPS CONTROL PLS 26304"
(T) 23	338-54-22	298.343	89-21-42	5.19	SET SPK	
	⊼ @ 22	BS	23	HI: 5.40	FND SPK	
PACK CP #						
(M) 5	305-17-10	348.058	90-56-49	5.26	FRC 5/8"	
PACK CP #						
(M) 6	73-51-13	130.577	88-00-18	5.19	FRC 5/8"	
	⊼ @ 23	BS	22	HI: 5.34	FND SPK	
PACK CP #						
(M) 3	216-42-02	379.356	87-37-17	5.16	FRC 5/8"	
(T) 24	143-09-01	251.970	88-04-23	5.07	SET SPK	
	⊼ @ 23	BS	24	HI: 5.34	FND SPK	
(M) 22	216-50-50	298.349	90-42-21	5.25	FND SPK	

PT	∡RT	SD	ZA	HT	DESC
	⊼ @ 24	BS 23	HI	5.22	FND SPK
(M) 2886	213-29-19	619.019	85-39-11	5.30	FND 2" AC
-MISS-	S23-15-59W HD 0.052 VD 0.065				
	⊼ @ 24	BS 2886	HI	5.22	FND SPK
(M) 23	146-30-37	251.978	92-00-17	5.19	FND SPK
	⊼ @ 2886	BS 24	HI	5.45	FND 2" AC
CL4 2	308-22-17	151.054	92-24-25	4.86	FND ½" RB
REC	S62-00-00W HD 150.922				
MEAS	S 62-00-25W HD 150.921				
∡ERR	25 SEC.				

Contract No.: W9128F-10-D-0058
Delivery Order 0006

UPLOAD/5-29-5/HDR-1, RAW

HDR CONT'D

24 OCT 2013

B. VERNON

J. HEISTAND

Project:	HDR
Supervisor:	WENGLER
Date Created:	10/19/2013 15:39
Date Last Accessed:	10/25/2013 20:28
Project Directory:	C:\GPSURVEY\projects\HDR
Antenna Type:	4600LS Internal
Antenna Measurement Method:	Reading from hook using 4600LS tape
Antenna Group:	GPSurvey
Receiver Type:	4600LS
Coordinate System:	Geographic
Zone:	WGS84
Linear Unit:	Meter
Timezone:	Pacific Day USA : -7:00
Number of Stations:	7
Number of Baselines:	25
No. of Continuous Kinematic Solns:	0

		**** Reference Coordinates ****			
Station Short Name	Station ID	Latitude	Longitude	Height	Station Quality
2158	2158	48°02'10.69610" N	123°16'27.17350" W	321.17000	Network Adjustment
3	3	48°01'48.99312" N	123°20'33.48972" W	289.86755	Baseline Solutions
2	2	48°01'49.89197" N	123°20'26.10346" W	299.96173	Baseline Solutions
1	1	48°01'50.87197" N	123°20'25.96030" W	297.86799	Baseline Solutions
2155	2155	48°02'46.50570" N	123°21'50.15700" W	376.38000	Network Adjustment
2887	2887	48°03'03.05485" N	123°20'21.47710" W	235.33000	Network Adjustment
2886	2886	48°01'50.61290" N	123°20'24.16120" W	301.70000	Network Adjustment

From Station Short Name	To Station Short Name	Solution Type	Slope	Ratio	Reference Variance	Entered Ant. Ht. (From)	Entered Ant. Ht. (To)
1	2	L1 fixed	30.488	45.5	0.871	1.610	1.730
1	3	L1 fixed	166.622	15.5	0.793	1.610	1.694
2	3	L1 fixed	155.848	4.6	3.484	1.730	1.694
2155	1	L1 fixed	2449.728	26.8	2.506	1.633	1.610
2155	1	L1 fixed	2449.723	32.4	4.596	1.605	1.610
2155	2	L1 fixed	2468.903	30.5	2.463	1.633	1.730
2155	2	L1 fixed	2468.902	21.8	3.476	1.605	1.730
2155	3	L1 fixed	2384.443	27.9	2.459	1.633	1.694
2155	3	L1 fixed	2384.441	38.1	3.830	1.605	1.694
2158	1	L1 fixed	4984.712	3.7	2.904	1.541	1.610
2158	1	L1 fixed	4984.711	7.7	2.914	1.601	1.610
2158	2	L1 fixed	4991.468	4.3	2.749	1.541	1.730
2158	2	L1 fixed	4991.465	8.3	2.512	1.601	1.730
2158	3	L1 fixed	5146.854	4.6	1.964	1.541	1.694
2886	1	L1 fixed	38.321	8.6	2.960	1.736	1.610
2886	1	L1 fixed	38.319	14.4	2.343	1.685	1.610
2886	2	L1 fixed	46.033	8.6	4.237	1.736	1.730
2886	2	L1 fixed	46.032	4.3	4.538	1.685	1.730
2886	3	L1 fixed	199.986	4.6	3.564	1.736	1.694

2887	1	L1 fixed	2232.392	19.8	2.605	1.795	1.610
2887	1	L1 fixed	2232.390	19.0	3.514	1.769	1.610
2887	2	L1 fixed	2262.807	19.2	2.918	1.795	1.730
2887	2	L1 fixed	2262.808	31.8	2.156	1.769	1.730
2887	3	L1 fixed	2301.739	21.4	2.513	1.795	1.694
2887	3	L1 fixed	2301.738	27.6	2.521	1.769	1.694

**** SSF/SSK Solution Output Files For Selected Baselines ****

.ssf/.ssk Solution Output File	From Station Short Name	To Station Short Name	Solution Type	Slope	Ratio	Reference Variance
00006596.ssf	1	2	L1 fixed	30.488	45.5	0.871
00006672.ssf	1	3	L1 fixed	166.622	15.5	0.793
00006636.ssf	2	3	L1 fixed	155.848	4.6	3.484
00006584.ssf	2155	1	L1 fixed	2449.728	26.8	2.506
00006640.ssf	2155	1	L1 fixed	2449.723	32.4	4.596
00006588.ssf	2155	2	L1 fixed	2468.903	30.5	2.463
00006644.ssf	2155	2	L1 fixed	2468.902	21.8	3.476
00006592.ssf	2155	3	L1 fixed	2384.443	27.9	2.459
00006648.ssf	2155	3	L1 fixed	2384.441	38.1	3.830
00006624.ssf	2158	1	L1 fixed	4984.712	3.7	2.904
00006676.ssf	2158	1	L1 fixed	4984.711	7.7	2.914
00006628.ssf	2158	2	L1 fixed	4991.468	4.3	2.749
00006680.ssf	2158	2	L1 fixed	4991.465	8.3	2.512
00006632.ssf	2158	3	L1 fixed	5146.854	4.6	1.964
00006612.ssf	2886	1	L1 fixed	38.321	8.6	2.960
00006664.ssf	2886	1	L1 fixed	38.319	14.4	2.343
00006616.ssf	2886	2	L1 fixed	46.033	8.6	4.237
00006668.ssf	2886	2	L1 fixed	46.032	4.3	4.538
00006620.ssf	2886	3	L1 fixed	199.986	4.6	3.564
00006600.ssf	2887	1	L1 fixed	2232.392	19.8	2.605
00006652.ssf	2887	1	L1 fixed	2232.390	19.0	3.514
00006604.ssf	2887	2	L1 fixed	2262.807	19.2	2.918
00006656.ssf	2887	2	L1 fixed	2262.808	31.8	2.156
00006608.ssf	2887	3	L1 fixed	2301.739	21.4	2.513
00006660.ssf	2887	3	L1 fixed	2301.738	27.6	2.521

Project Name:	HDR			
Processed:	Friday, October 25, 2013 16:29			
	WAVE 2.35			
Solution Output File (SSF):	00006596.SSF			
From Station:	1			
Data file:	87452980.DAT			
Antenna Height (meters):	1.672 True Vertical	1.610 Uncorrected		
Position Quality:	Fixed Baseline Solution			
WGS 84 Position:	48° 01' 50.871482" S		X	-2348705.365
	123° 20' 25.960176" S		Y	-3570054.254
	297.843		Z	4719388.470
To Station:	2			
Data file:	38232980.DAT			
Antenna Height (meters):	1.792 True Vertical	1.730 Uncorrected		
WGS 84 Position:	48° 01' 49.891447" S		X	-2348720.983
	123° 20' 26.103428" S		Y	-3570072.593
	299.934		Z	4719369.781
Start Time:	10/26/07 17:28:00.00 GPS	(1450 494880.00)		
Stop Time:	10/26/07 18:08:00.00 GPS	(1450 497280.00)		
Occupation Time Meas. Interval (seconds):	00:40:00.00	15.00		
Solution Type:	L1 fixed double difference			
Solution Acceptability:	Passed ratio test			
Ephemeris:	Broadcast			
Met Data:	Standard			
Baseline Slope Distance Std. Dev. (meters):	30.488	0.000476		

	Forward	Backward
Normal Section Azimuth:	185° 35' 58.545709"	5° 35' 58.439221"
Vertical Angle:	3° 55' 54.870702"	-3° 55' 55.855408"

Baseline Components (meters):	dx	-15.618	dy	-18.339	dz	-18.689
Standard Deviations (meters):		0.000411		0.000543		0.000565
	dn	-30.271	de	-2.968	du	2.091
		0.000471		0.000265		0.000701
					dh	2.091
						0.000701

Aposteriori Covariance Matrix:

1.687983E-007		
1.492217E-007	2.953846E-007	
-9.163936E-008	-1.071050E-007	3.196525E-007

Variance Ratio Cutoff:	45.5	1.5

Reference Variance:			0.871			
Observable	Count/Rejected	RMS:	L1 phase	904/0		0.003
Project Name:			HDR			
Processed:			Friday, October 25, 2013 20:02			
			WAVE 2.35			
Solution Output File (SSF):			00006672.SSF			
From Station:			1			
Data file:			87452980.DAT			
Antenna Height (meters):			1.672 True Vertical	1.610 Uncorrected		
Position Quality:			Fixed Baseline Solution			
WGS 84 Position:			48° 01' 50.871625" S		X	-2348705.377
			123° 20' 25.960576" S		Y	-3570054.257
			297.862		Z	4719388.487
To Station:			3			
Data file:			38222980.DAT			
Antenna Height (meters):			1.756 True Vertical	1.694 Uncorrected		
WGS 84 Position:			48° 01' 48.993120" S		X	-2348856.464
			123° 20' 33.489721" S		Y	-3570000.095
			289.868		Z	4719343.741
Start Time:			10/26/07 17:22:00.00 GPS	(1450 494520.00)		
Stop Time:			10/26/07 18:02:00.00 GPS	(1450 496920.00)		
Occupation Time	Meas. Interval (seconds):		00:40:00.00	15.00		
Solution Type:			L1 fixed double difference			
Solution Acceptability:			Passed ratio test			
Ephemeris:			Broadcast			
Met Data:			Standard			
Baseline Slope Distance	Std. Dev. (meters):		166.622	0.001036		

	Forward	Backward
Normal Section Azimuth:	249° 35' 49.813377"	69° 35' 44.215194"
Vertical Angle:	-2° 45' 03.392086"	2° 44' 58.018078"

Baseline Components (meters):	dx	-151.087	dy	54.163	dz	-44.746
Standard Deviations (meters):		0.000607		0.000973		0.003605
	dn	-58.021	de	-155.989	du	-7.997
		0.001853		0.000460		0.003266
					dh	-7.995
						0.003266

Aposteriori Covariance Matrix: 3.683640E-007

	3.612191E-007	9.472127E-007
	-1.134482E-006	-2.852145E-006 1.299586E-005

Variance Ratio Cutoff:	15.5	1.5	
Reference Variance:	0.793		
Observable Count/Rejected RMS:	L1 phase	482/0	0.003
Project Name:	HDR		
Processed:	Friday, October 25, 2013 19:12		
	WAVE 2.35		
Solution Output File (SSF):	00006636.SSF		
From Station:	2		
Data file:	38232980.DAT		
Antenna Height (meters):	1.792 True Vertical	1.730 Uncorrected	
Position Quality:	Fixed Baseline Solution		
WGS 84 Position:	48° 01' 49.891836" S	X	-2348720.987
	123° 20' 26.103574" S	Y	-3570072.595
	299.953	Z	4719369.803
To Station:	3		
Data file:	38222980.DAT		
Antenna Height (meters):	1.756 True Vertical	1.694 Uncorrected	
WGS 84 Position:	48° 01' 48.993399" S	X	-2348856.467
	123° 20' 33.489711" S	Y	-3570000.100
	289.886	Z	4719343.761
Start Time:	10/26/07 16:30:00.00 GPS	(1450 491400.00)	
Stop Time:	10/26/07 16:48:00.00 GPS	(1450 492480.00)	
Occupation Time Meas. Interval (seconds):	00:18:00.00	15.00	
Solution Type:	L1 fixed double difference		
Solution Acceptability:	Passed ratio test		
Ephemeris:	Broadcast		
Met Data:	Standard		
Baseline Slope Distance Std. Dev. (meters):	155.848	0.000944	

	Forward	Backward
Normal Section Azimuth:	259° 43' 19.529805"	79° 43' 14.038042"
Vertical Angle:	-3° 42' 15.048065"	3° 42' 10.027644"

Baseline Components (meters):	dx	-135.480	dy	72.495	dz	-26.042
Standard Deviations (meters):		0.001263		0.001497		0.002803
	dn	-27.749	de	-153.027	du	-10.069
		0.001351		0.000904		0.003008

				dh	-10.067
					0.003008

Aposteriori Covariance Matrix:

1.595347E-006		
1.059431E-006	2.240891E-006	
-2.011408E-006	-2.716767E-006	7.855054E-006

Variance Ratio	Cutoff:	4.6	1.5		
Reference Variance:		3.484			
Observable	Count/Rejected	RMS:	L1 phase	358/0	0.007
Project Name:			HDR		
Processed:			Friday, October 25, 2013 16:00		
			WAVE 2.35		
Solution Output File (SSF):			00006584.SSF		
From Station:			2155		
Data file:			33752980.DAT		
Antenna Height (meters):			1.695 True Vertical	1.633 Uncorrected	
Position Quality:			Network Adjustment		
WGS 84 Position:			48° 02' 46.505700" S	X	-2349488.595
			123° 21' 50.157000" S	Y	-3568071.853
			376.380	Z	4720595.866
To Station:			1		
Data file:			87452980.DAT		
Antenna Height (meters):			1.672 True Vertical	1.610 Uncorrected	
WGS 84 Position:			48° 01' 50.871482" S	X	-2348705.365
			123° 20' 25.960176" S	Y	-3570054.254
			297.843	Z	4719388.470
Start Time:			10/26/07 15:27:00.00 GPS	(1450 487620.00)	
Stop Time:			10/26/07 16:36:15.00 GPS	(1450 491775.00)	
Occupation Time	Meas. Interval (seconds):		01:09:15.00	15.00	
Solution Type:			L1 fixed double difference		
Solution Acceptability:			Passed ratio test		
Ephemeris:			Broadcast		
Met Data:			Standard		
Baseline Slope Distance	Std. Dev. (meters):		2449.728	0.000471	

	Forward	Backward
Normal Section Azimuth:	134° 33' 57.870877"	314° 35' 00.482997"
Vertical Angle:	-1° 50' 53.455482"	1° 49' 34.307155"

Baseline Components (meters):	dx	783.230	dy	-1982.401	dz	-1207.396
Standard Deviations (meters):		0.000816		0.001169		0.001384

	dn	-1718.157	de	1744.380	du	-79.007
		0.000536		0.000454		0.001859
					dh	-78.537
						0.001859

Aposteriori Covariance Matrix:

6.659973E-007		
7.306201E-007	1.366001E-006	
-8.184703E-007	-1.361676E-006	1.916518E-006

Variance Ratio Cutoff:	26.8	1.5
Reference Variance:	2.506	

Observable	Count/Rejected	RMS:	
L1 phase	1067/0	0.006	

Project Name:	HDR
Processed:	Friday, October 25, 2013 19:21
	WAVE 2.35
Solution Output File (SSF):	00006640.SSF

From Station:	2155			
Data file:	33752982.DAT			
Antenna Height (meters):	1.667 True Vertical	1.605	Uncorrected	
Position Quality:	Network Adjustment			
WGS 84 Position:	48° 02' 46.505700" S		X	-2349488.595
	123° 21' 50.157000" S		Y	-3568071.853
	376.380		Z	4720595.866

To Station:	1			
Data file:	87452980.DAT			
Antenna Height (meters):	1.672 True Vertical	1.610	Uncorrected	
WGS 84 Position:	48° 01' 50.871446" S		X	-2348705.377
	123° 20' 25.960513" S		Y	-3570054.259
	297.858		Z	4719388.480

Start Time:	10/26/07 17:59:30.00 GPS	(1450 496770.00)
Stop Time:	10/26/07 19:24:30.00 GPS	(1450 501870.00)
Occupation Time Meas. Interval (seconds):	01:25:00.00	15.00

Solution Type:	L1 fixed double difference
Solution Acceptability:	Passed ratio test

Ephemeris:	Broadcast	
Met Data:	Standard	
Baseline Slope Distance Std. Dev. (meters):	2449.723	0.000598

	Forward	Backward
Normal Section Azimuth:	134° 33' 58.350263"	314° 35' 00.962132"

Vertical Angle:		-1° 50' 52.185099"			1° 49' 33.036907"	
Baseline Components (meters):	dx	783.218	dy	-1982.406	dz	-1207.386
Standard Deviations (meters):		0.000680		0.001204		0.001339
	dn	-1718.158	de	1744.373	du	-78.992
		0.000707		0.000580		0.001693
					dh	-78.522
						0.001693

Aposteriori Covariance Matrix:

4.627292E-007		
4.620954E-007	1.449222E-006	
-3.460717E-007	-1.183421E-006	1.792813E-006

Variance Ratio Cutoff:	32.4	1.5		
Reference Variance:	4.596			
Observable Count/Rejected RMS:	L1 phase	1651/0		0.007
Project Name:	HDR			
Processed:	Friday, October 25, 2013 16:03			
	WAVE 2.35			
Solution Output File (SSF):	00006588.SSF			
From Station:	2155			
Data file:	33752980.DAT			
Antenna Height (meters):	1.695 True Vertical	1.633 Uncorrected		
Position Quality:	Network Adjustment			
WGS 84 Position:	48° 02' 46.505700" S		X	-2349488.595
	123° 21' 50.157000" S		Y	-3568071.853
	376.380		Z	4720595.866
To Station:	2			
Data file:	38232980.DAT			
Antenna Height (meters):	1.792 True Vertical	1.730 Uncorrected		
WGS 84 Position:	48° 01' 49.891476" S		X	-2348720.978
	123° 20' 26.103303" S		Y	-3570072.592
	299.929		Z	4719369.778
Start Time:	10/26/07 15:28:00.00 GPS	(1450 487680.00)		
Stop Time:	10/26/07 16:36:15.00 GPS	(1450 491775.00)		
Occupation Time Meas. Interval (seconds):	01:08:15.00	15.00		
Solution Type:	L1 fixed double difference			
Solution Acceptability:	Passed ratio test			
Ephemeris:	Broadcast			
Met Data:	Standard			

Baseline Slope Distance	Std. Dev. (meters):	2468.903		0.000501		
			Forward			Backward
Normal Section Azimuth:			135° 06' 53.936373"			315° 07' 56.441831"
Vertical Angle:			-1° 47' 08.006899"			1° 45' 48.234019"
Baseline Components (meters):		dx	767.616	dy -2000.738	dz	-1226.088
Standard Deviations (meters):			0.000845	0.001228		0.001616
		dn	-1748.428	de 1741.425	du	-76.928
			0.000579	0.000454		0.002072
					dh	-76.451
						0.002072

Aposteriori Covariance Matrix:

7.144975E-007		
8.146853E-007	1.507630E-006	
-1.008337E-006	-1.681346E-006	2.612237E-006

Variance Ratio	Cutoff:	30.5	1.5		
Reference Variance:		2.463			
Observable	Count/Rejected RMS:	L1 phase	994/0		0.006
Project Name:		HDR			
Processed:		Friday, October 25, 2013 19:25			
		WAVE 2.35			
Solution Output File (SSF):		00006644.SSF			
From Station:		2155			
Data file:		33752982.DAT			
Antenna Height (meters):		1.667 True Vertical	1.605 Uncorrected		
Position Quality:		Network Adjustment			
WGS 84 Position:		48° 02' 46.505700" S		X	-2349488.595
		123° 21' 50.157000" S		Y	-3568071.853
		376.380		Z	4720595.866
To Station:		2			
Data file:		38232980.DAT			
Antenna Height (meters):		1.792 True Vertical	1.730 Uncorrected		
WGS 84 Position:		48° 01' 49.891255" S		X	-2348720.990
		123° 20' 26.103694" S		Y	-3570072.594
		299.934		Z	4719369.777
Start Time:		10/26/07 17:59:30.00 GPS	(1450 496770.00)		
Stop Time:		10/26/07 19:24:30.00 GPS	(1450 501870.00)		
Occupation Time	Meas. Interval (seconds):	01:25:00.00	15.00		
Solution Type:		L1 fixed double difference			

Solution Acceptability:	Passed ratio test					
Ephemeris:	Broadcast					
Met Data:	Standard					
Baseline Slope Distance Std. Dev. (meters):	2468.902	0.000710				
		Forward			Backward	
Normal Section Azimuth:		135° 06' 54.818521"			315° 07' 57.323688"	
Vertical Angle:		-1° 47' 07.603170"			1° 45' 47.830317"	
Baseline Components (meters):	dx	767.605	dy	-2000.741	dz	-1226.089
Standard Deviations (meters):		0.000503		0.000998		0.001565
	dn	-1748.435	de	1741.417	du	-76.923
		0.000826		0.000508		0.001661
					dh	-76.446
						0.001661
Aposteriori Covariance Matrix:	2.529122E-007					
	2.389937E-007	9.954701E-007				
	-3.257271E-007	-9.420300E-007	2.449641E-006			
Variance Ratio Cutoff:	21.8	1.5				
Reference Variance:	3.476					
Observable Count/Rejected RMS:	L1 phase	1514/38	0.006			
Project Name:	HDR					
Processed:	Friday, October 25, 2013 16:07					
	WAVE 2.35					
Solution Output File (SSF):	00006592.SSF					
From Station:	2155					
Data file:	33752980.DAT					
Antenna Height (meters):	1.695 True Vertical	1.633 Uncorrected				
Position Quality:	Network Adjustment					
WGS 84 Position:	48° 02' 46.505700" S				X	-2349488.595
	123° 21' 50.157000" S				Y	-3568071.853
	376.380				Z	4720595.866
To Station:	3					
Data file:	38222980.DAT					
Antenna Height (meters):	1.756 True Vertical	1.694 Uncorrected				
WGS 84 Position:	48° 01' 48.993062" S				X	-2348856.446
	123° 20' 33.489192" S				Y	-3570000.088
	289.843				Z	4719343.722
Start Time:	10/26/07 15:35:45.00 GPS	(1450 488145.00)				

Stop Time:		10/26/07 16:36:15.00 GPS		(1450 491775.00)		
Occupation Time	Meas. Interval (seconds):	01:00:30.00		15.00		
Solution Type:		L1 fixed double difference				
Solution Acceptability:		Passed ratio test				
Ephemeris:		Broadcast				
Met Data:		Standard				
Baseline Slope Distance	Std. Dev. (meters):	2384.443		0.000507		

	Forward	Backward
Normal Section Azimuth:	138° 11' 41.594377"	318° 12' 38.608092"
Vertical Angle:	-2° 05' 25.959255"	2° 04' 08.916694"

Baseline Components (meters):	dx	632.148	dy	-1928.235	dz	-1252.144
Standard Deviations (meters):		0.000869		0.001295		0.001522
	dn	-1776.220	de	1588.409	du	-86.982
		0.000560		0.000486		0.002049
					dh	-86.537
						0.002049

Aposteriori Covariance Matrix:

7.548394E-007		
8.687782E-007	1.677986E-006	
-9.809087E-007	-1.686693E-006	2.316445E-006

Variance Ratio	Cutoff:	27.9	1.5			
Reference Variance:		2.459				
Observable	Count/Rejected	RMS:	L1 phase	949/0		0.006
Project Name:			HDR			
Processed:			Friday, October 25, 2013 19:29			
			WAVE 2.35			
Solution Output File (SSF):			00006648.SSF			
From Station:			2155			
Data file:			33752982.DAT			
Antenna Height (meters):			1.667 True Vertical	1.605 Uncorrected		
Position Quality:			Network Adjustment			
WGS 84 Position:			48° 02' 46.505700" S		X	-2349488.595
			123° 21' 50.157000" S		Y	-3568071.853
			376.380		Z	4720595.866
To Station:			3			
Data file:			38222980.DAT			
Antenna Height (meters):			1.756 True Vertical	1.694 Uncorrected		
WGS 84 Position:			48° 01' 48.992922" S		X	-2348856.460

	123° 20' 33.489537" S			Y	-3570000.096
	289.860			Z	4719343.731
Start Time:	10/26/07 17:59:30.00 GPS		(1450 496770.00)		
Stop Time:	10/26/07 19:24:30.00 GPS		(1450 501870.00)		
Occupation Time Meas. Interval (seconds):	01:25:00.00		15.00		
Solution Type:	L1 fixed double difference				
Solution Acceptability:	Passed ratio test				
Ephemeris:	Broadcast				
Met Data:	Standard				
Baseline Slope Distance Std. Dev. (meters):	2384.441		0.000556		

	Forward	Backward
Normal Section Azimuth:	138° 11' 42.305942"	318° 12' 39.319400"
Vertical Angle:	-2° 05' 24.554419"	2° 04' 07.511907"

Baseline Components (meters):	dx	632.134	dy -1928.243	dz	-1252.135
Standard Deviations (meters):		0.000660	0.001104		0.001207
	dn	-1776.224	de 1588.402	du	-86.965
		0.000667	0.000524		0.001547
				dh	-86.520
					0.001547

Aposteriori Covariance Matrix:

4.357330E-007		
4.338894E-007	1.219746E-006	
-3.069318E-007	-9.655254E-007	1.456899E-006

Variance Ratio Cutoff:	38.1	1.5		
Reference Variance:	3.830			
Observable Count/Rejected RMS:	L1 phase	1618/1		0.006
Project Name:	HDR			
Processed:	Friday, October 25, 2013 18:53			
	WAVE 2.35			
Solution Output File (SSF):	00006624.SSF			
From Station:	2158			
Data file:	33752981.DAT			
Antenna Height (meters):	1.603 True Vertical		1.541 Uncorrected	
Position Quality:	Network Adjustment			
WGS 84 Position:	48° 02' 10.696100" S		X	-2344329.606
	123° 16' 27.173500" S		Y	-3572403.276
	321.170		Z	4719815.284
To Station:	1			

Data file:	87452980.DAT				
Antenna Height (meters):	1.672 True Vertical		1.610 Uncorrected		
WGS 84 Position:	48° 01' 50.871767" S			X	-2348705.370
	123° 20' 25.960315" S			Y	-3570054.257
	297.861			Z	4719388.489
Start Time:	10/26/07 17:00:45.00 GPS		(1450 493245.00)		
Stop Time:	10/26/07 17:28:15.00 GPS		(1450 494895.00)		
Occupation Time Meas. Interval (seconds):	00:27:30.00		15.00		
Solution Type:	L1 fixed double difference				
Solution Acceptability:	Passed ratio test				
Ephemeris:	Broadcast				
Met Data:	Standard				
Baseline Slope Distance Std. Dev. (meters):	4984.712		0.000715		

	Forward	Backward
Normal Section Azimuth:	262° 58' 06.369008"	82° 55' 08.822004"
Vertical Angle:	-0° 17' 24.989037"	0° 14' 44.087501"

Baseline Components (meters):	dx	-4375.764	dy 2349.019	dz	-426.795
Standard Deviations (meters):		0.000986	0.001232		0.001325
	dn	-610.201	de -4947.158	du	-25.254
		0.000903	0.000696		0.001717
				dh	-23.309
					0.001717

Aposteriori Covariance Matrix:

9.726658E-007		
7.117435E-007	1.518560E-006	
-5.155583E-007	-9.605255E-007	1.755638E-006

Variance Ratio Cutoff:	3.7	1.5		
Reference Variance:	2.904			
Observable Count/Rejected RMS:	L1 phase	549/0		0.007
Project Name:	HDR			
Processed:	Friday, October 25, 2013 20:11			
	WAVE 2.35			
Solution Output File (SSF):	00006676.SSF			
From Station:	2158			
Data file:	33752983.DAT			
Antenna Height (meters):	1.663 True Vertical		1.601 Uncorrected	
Position Quality:	Network Adjustment			
WGS 84 Position:	48° 02' 10.696100" S		X	-2344329.606

	123° 16' 27.173500" S	Y	-3572403.276
	321.170	Z	4719815.284
To Station:	1		
Data file:	87452981.DAT		
Antenna Height (meters):	1.672 True Vertical	1.610 Uncorrected	
WGS 84 Position:	48° 01' 50.871967" S	X	-2348705.370
	123° 20' 25.960297" S	Y	-3570054.257
	297.868	Z	4719388.498
Start Time:	10/26/07 20:00:15.00 GPS	(1450 504015.00)	
Stop Time:	10/26/07 20:54:15.00 GPS	(1450 507255.00)	
Occupation Time Meas. Interval (seconds):	00:54:00.00	15.00	
Solution Type:	L1 fixed double difference		
Solution Acceptability:	Passed ratio test		
Ephemeris:	Broadcast		
Met Data:	Standard		
Baseline Slope Distance Std. Dev. (meters):	4984.711	0.000714	

	Forward	Backward
Normal Section Azimuth:	262° 58' 06.620039"	82° 55' 09.073048"
Vertical Angle:	-0° 17' 24.679418"	0° 14' 43.777917"

Baseline Components (meters):	dx	-4375.764	dy	2349.019	dz	-426.785
Standard Deviations (meters):		0.001239		0.001749		0.001533
	dn	-610.195	de	-4947.157	du	-25.246
		0.001113		0.000773		0.002261
					dh	-23.302
						0.002261

Aposteriori Covariance Matrix:

1.536016E-006		
1.522966E-006	3.059611E-006	
-1.507194E-006	-1.444479E-006	2.350601E-006

Variance Ratio Cutoff:	7.7	1.5	
Reference Variance:	2.914		
Observable Count/Rejected RMS:	L1 phase	651/0	0.005
Project Name:	HDR		
Processed:	Friday, October 25, 2013 18:57		
	WAVE 2.35		
Solution Output File (SSF):	00006628.SSF		
From Station:	2158		
Data file:	33752981.DAT		

Antenna Height (meters):	1.603 True Vertical	1.541 Uncorrected	
Position Quality:	Network Adjustment		
WGS 84 Position:	48° 02' 10.696100" S	X	-2344329.606
	123° 16' 27.173500" S	Y	-3572403.276
	321.170	Z	4719815.284
To Station:	2		
Data file:	38232980.DAT		
Antenna Height (meters):	1.792 True Vertical	1.730 Uncorrected	
WGS 84 Position:	48° 01' 49.891836" S	X	-2348720.987
	123° 20' 26.103574" S	Y	-3570072.595
	299.953	Z	4719369.803
Start Time:	10/26/07 17:00:45.00 GPS	(1450 493245.00)	
Stop Time:	10/26/07 17:28:15.00 GPS	(1450 494895.00)	
Occupation Time Meas. Interval (seconds):	00:27:30.00	15.00	
Solution Type:	L1 fixed double difference		
Solution Acceptability:	Passed ratio test		
Ephemeris:	Broadcast		
Met Data:	Standard		
Baseline Slope Distance Std. Dev. (meters):	4991.468	0.000762	

	Forward	Backward
Normal Section Azimuth:	262° 37' 40.230772"	82° 34' 42.577641"
Vertical Angle:	-0° 15' 57.326769"	0° 13' 16.206148"

Baseline Components (meters):	dx	-4391.381	dy	2330.681	dz	-445.480
Standard Deviations (meters):		0.001119		0.001233		0.001457
	dn	-640.467	de	-4950.154	du	-23.167
		0.000879		0.000750		0.001888
					dh	-21.217
						0.001888

Aposteriori Covariance Matrix:

1.252333E-006		
8.406709E-007	1.521029E-006	
-8.798101E-007	-1.106401E-006	2.124160E-006

Variance Ratio Cutoff:	4.3	1.5	
Reference Variance:	2.749		
Observable Count/Rejected RMS:	L1 phase	500/0	0.006
Project Name:	HDR		
Processed:	Friday, October 25, 2013 20:15		
	WAVE 2.35		

Solution Output File (SSF):	00006680.SSF				
From Station:	2158				
Data file:	33752983.DAT				
Antenna Height (meters):	1.663 True Vertical		1.601 Uncorrected		
Position Quality:	Network Adjustment				
WGS 84 Position:	48° 02' 10.696100" S			X	-2344329.606
	123° 16' 27.173500" S			Y	-3572403.276
	321.170			Z	4719815.284
To Station:	2				
Data file:	38232981.DAT				
Antenna Height (meters):	1.792 True Vertical		1.730 Uncorrected		
WGS 84 Position:	48° 01' 49.891966" S			X	-2348720.987
	123° 20' 26.103461" S			Y	-3570072.599
	299.962			Z	4719369.813
Start Time:	10/26/07 20:00:15.00 GPS		(1450 504015.00)		
Stop Time:	10/26/07 20:54:15.00 GPS		(1450 507255.00)		
Occupation Time Meas. Interval (seconds):	00:54:00.00		15.00		
Solution Type:	L1 fixed double difference				
Solution Acceptability:	Passed ratio test				
Ephemeris:	Broadcast				
Met Data:	Standard				
Baseline Slope Distance Std. Dev. (meters):	4991.465		0.000663		

	Forward	Backward
Normal Section Azimuth:	262° 37' 40.382623"	82° 34' 42.729577"
Vertical Angle:	-0° 15' 56.962783"	0° 13' 15.842254"

Baseline Components (meters):	dx	-4391.381	dy 2330.677	dz	-445.471
Standard Deviations (meters):		0.001151	0.001628		0.001428
	dn	-640.463	de -4950.151	du	-23.158
		0.001038	0.000721		0.002102
				dh	-21.208
					0.002102

Aposteriori Covariance Matrix:

1.324301E-006		
1.312466E-006	2.650028E-006	
-1.302049E-006	-1.244604E-006	2.040521E-006

Variance Ratio Cutoff:	8.3	1.5		
Reference Variance:	2.512			
Observable Count/Rejected RMS:	L1 phase	647/0		0.005

Project Name:	HDR			
Processed:	Friday, October 25, 2013 19:02			
	WAVE 2.35			
Solution Output File (SSF):	00006632.SSF			
From Station:	2158			
Data file:	33752981.DAT			
Antenna Height (meters):	1.603 True Vertical	1.541 Uncorrected		
Position Quality:	Network Adjustment			
WGS 84 Position:	48° 02' 10.696100" S		X	-2344329.606
	123° 16' 27.173500" S		Y	-3572403.276
	321.170		Z	4719815.284
To Station:	3			
Data file:	38222980.DAT			
Antenna Height (meters):	1.756 True Vertical	1.694 Uncorrected		
WGS 84 Position:	48° 01' 48.993385" S		X	-2348856.466
	123° 20' 33.489938" S		Y	-3570000.090
	289.873		Z	4719343.751
Start Time:	10/26/07 17:00:45.00 GPS	(1450 493245.00)		
Stop Time:	10/26/07 17:28:15.00 GPS	(1450 494895.00)		
Occupation Time Meas. Interval (seconds):	00:27:30.00	15.00		
Solution Type:	L1 fixed double difference			
Solution Acceptability:	Passed ratio test			
Ephemeris:	Broadcast			
Met Data:	Standard			
Baseline Slope Distance Std. Dev. (meters):	5146.854	0.000878		

	Forward	Backward
Normal Section Azimuth:	262° 32' 29.638415"	82° 29' 26.493494"
Vertical Angle:	-0° 22' 17.327914"	0° 19' 31.192804"

Baseline Components (meters):	dx	-4526.860	dy	2403.186	dz	-471.533
Standard Deviations (meters):		0.001428		0.001158		0.001705
	dn	-668.083	de	-5103.201	du	-33.370
		0.000744		0.000885		0.002225
					dh	-31.297
						0.002225

Aposteriori Covariance Matrix:

2.038773E-006		
1.140274E-006	1.341758E-006	
-1.888456E-006	-1.385088E-006	2.906174E-006

Variance Ratio Cutoff:	4.6	1.5	
Reference Variance:	1.964		
Observable Count/Rejected RMS:	L1 phase	444/0	0.005
Project Name:	HDR		
Processed:	Friday, October 25, 2013 16:47		
	WAVE 2.35		
Solution Output File (SSF):	00006612.SSF		
From Station:	2886		
Data file:	87422981.DAT		
Antenna Height (meters):	1.798 True Vertical	1.736 Uncorrected	
Position Quality:	Network Adjustment		
WGS 84 Position:	48° 01' 50.612900" S	X	-2348678.909
	123° 20' 24.161200" S	Y	-3570081.854
	301.700	Z	4719385.996
To Station:	1		
Data file:	87452980.DAT		
Antenna Height (meters):	1.672 True Vertical	1.610 Uncorrected	
WGS 84 Position:	48° 01' 50.871689" S	X	-2348705.372
	123° 20' 25.960605" S	Y	-3570054.249
	297.851	Z	4719388.480
Start Time:	10/26/07 16:47:45.00 GPS	(1450 492465.00)	
Stop Time:	10/26/07 17:28:15.00 GPS	(1450 494895.00)	
Occupation Time Meas. Interval (seconds):	00:40:30.00	15.00	
Solution Type:	L1 fixed double difference		
Solution Acceptability:	Passed ratio test		
Ephemeris:	Broadcast		
Met Data:	Standard		
Baseline Slope Distance Std. Dev. (meters):	38.321	0.000630	

	Forward	Backward
Normal Section Azimuth:	282° 06' 07.537757"	102° 06' 06.199969"
Vertical Angle:	-5° 45' 54.680474"	5° 45' 53.449643"

Baseline Components (meters):	dx	-26.463	dy	27.605	dz	2.483
Standard Deviations (meters):		0.000834		0.000958		0.001385
	dn	7.994	de	-37.280	du	-3.849
		0.000753		0.000622		0.001606
					dh	-3.849
						0.001606

Aposteriori Covariance Matrix:	6.951397E-007		
	4.091866E-007	9.175381E-007	
	-6.436293E-007	-7.436242E-007	1.918638E-006
Variance Ratio Cutoff:	8.6	1.5	
Reference Variance:	2.960		
Observable Count/Rejected RMS:	L1 phase	745/0	0.008
Project Name:	HDR		
Processed:	Friday, October 25, 2013 19:51		
	WAVE 2.35		
Solution Output File (SSF):	00006664.SSF		
From Station:	2886		
Data file:	87422983.DAT		
Antenna Height (meters):	1.747 True Vertical	1.685 Uncorrected	
Position Quality:	Network Adjustment		
WGS 84 Position:	48° 01' 50.612900" S	X	-2348678.909
	123° 20' 24.161200" S	Y	-3570081.854
	301.700	Z	4719385.996
To Station:	1		
Data file:	87452980.DAT		
Antenna Height (meters):	1.672 True Vertical	1.610 Uncorrected	
WGS 84 Position:	48° 01' 50.871625" S	X	-2348705.377
	123° 20' 25.960576" S	Y	-3570054.257
	297.862	Z	4719388.487
Start Time:	10/26/07 19:22:30.00 GPS	(1450 501750.00)	
Stop Time:	10/26/07 19:51:45.00 GPS	(1450 503505.00)	
Occupation Time Meas. Interval (seconds):	00:29:15.00	15.00	
Solution Type:	L1 fixed double difference		
Solution Acceptability:	Passed ratio test		
Ephemeris:	Broadcast		
Met Data:	Standard		
Baseline Slope Distance Std. Dev. (meters):	38.319	0.001291	

	Forward	Backward
Normal Section Azimuth:	282° 05' 57.765848"	102° 05' 56.428082"
Vertical Angle:	-5° 44' 52.809406"	5° 44' 51.578606"

Baseline Components (meters):	dx	-26.468	dy	27.597	dz	2.491
Standard Deviations (meters):		0.000669		0.001867		0.001686
	dn	7.992	de	-37.279	du	-3.838
		0.000709		0.001100		0.002250

				dh	-3.838
					0.002250

Aposteriori Covariance Matrix:

4.470594E-007		
1.675790E-007	3.485728E-006	
-3.705317E-007	-2.493315E-006	2.843949E-006

Variance Ratio	Cutoff:	14.4	1.5		
Reference Variance:		2.343			
Observable	Count/Rejected	RMS:	L1 phase	583/0	0.006
Project Name:		HDR			
Processed:		Friday, October 25, 2013 16:49			
		WAVE 2.35			
Solution Output File (SSF):		00006616.SSF			
From Station:		2886			
Data file:		87422981.DAT			
Antenna Height (meters):		1.798 True Vertical	1.736 Uncorrected		
Position Quality:		Network Adjustment			
WGS 84 Position:		48° 01' 50.612900" S		X	-2348678.909
		123° 20' 24.161200" S		Y	-3570081.854
		301.700		Z	4719385.996
To Station:		2			
Data file:		38232980.DAT			
Antenna Height (meters):		1.792 True Vertical	1.730 Uncorrected		
WGS 84 Position:		48° 01' 49.891737" S		X	-2348720.988
		123° 20' 26.103769" S		Y	-3570072.589
		299.943		Z	4719369.794
Start Time:		10/26/07 16:47:45.00 GPS	(1450 492465.00)		
Stop Time:		10/26/07 17:28:15.00 GPS	(1450 494895.00)		
Occupation Time	Meas. Interval (seconds):	00:40:30.00	15.00		
Solution Type:		L1 fixed double difference			
Solution Acceptability:		Passed ratio test			
Ephemeris:		Broadcast			
Met Data:		Standard			
Baseline Slope Distance	Std. Dev. (meters):	46.033	0.000710		

	Forward	Backward
Normal Section Azimuth:	241° 02' 12.568778"	61° 02' 11.124401"
Vertical Angle:	-2° 11' 16.762861"	2° 11' 15.277051"

Baseline Components (meters):	dx	-42.079	dy	9.266	dz	-16.203

Standard Deviations (meters):		0.000855		0.001070	0.001395
	dn	-22.275	de	-40.246	du -1.757
		0.000875		0.000642	0.001626
					dh -1.757
					0.001626

Aposteriori Covariance Matrix:

7.302524E-007		
4.831838E-007	1.145307E-006	
-5.050169E-007	-7.681684E-007	1.945032E-006

Variance Ratio Cutoff:	8.6	1.5		
Reference Variance:	4.237			
Observable Count/Rejected RMS:	L1 phase		856/0	0.009
Project Name:	HDR			
Processed:	Friday, October 25, 2013 19:57			
	WAVE 2.35			
Solution Output File (SSF):	00006668.SSF			
From Station:	2886			
Data file:	87422983.DAT			
Antenna Height (meters):	1.747 True Vertical		1.685 Uncorrected	
Position Quality:	Network Adjustment			
WGS 84 Position:	48° 01' 50.612900" S		X	-2348678.909
	123° 20' 24.161200" S		Y	-3570081.854
	301.700		Z	4719385.996
To Station:	2			
Data file:	38232980.DAT			
Antenna Height (meters):	1.792 True Vertical		1.730 Uncorrected	
WGS 84 Position:	48° 01' 49.891536" S		X	-2348720.992
	123° 20' 26.103579" S		Y	-3570072.602
	299.956		Z	4719369.799
Start Time:	10/26/07 19:22:30.00 GPS		(1450 501750.00)	
Stop Time:	10/26/07 19:51:30.00 GPS		(1450 503490.00)	
Occupation Time Meas. Interval (seconds):	00:29:00.00		15.00	
Solution Type:	L1 fixed double difference			
Solution Acceptability:	Passed ratio test			
Ephemeris:	Broadcast			
Met Data:	Standard			
Baseline Slope Distance Std. Dev. (meters):	46.032		0.000706	

	Forward	Backward

Normal Section Azimuth:			241° 01' 39.635742"			61° 01' 38.191507"
Vertical Angle:			-2° 10' 18.697882"			2° 10' 17.212086"
Baseline Components (meters):		dx	-42.083	dy	9.252	dz	-16.197
Standard Deviations (meters):			0.000940		0.001177		0.002072
		dn	-22.281	de	-40.242	du	-1.744
			0.001368		0.000783		0.002019
						dh	-1.744
							0.002019

Aposteriori Covariance Matrix:

```
 8.843926E-007
 4.594458E-007   1.384598E-006
-1.117793E-006  -4.241115E-007   4.291777E-006
```

Variance Ratio Cutoff:		4.3	1.5		
Reference Variance:		4.538			
Observable	Count/Rejected RMS:	L1 phase	675/0		0.008
Project Name:		HDR			
Processed:		Friday, October 25, 2013 17:05			
		WAVE 2.35			
Solution Output File (SSF):		00006620.SSF			
From Station:		2886			
Data file:		87422981.DAT			
Antenna Height (meters):		1.798 True Vertical	1.736 Uncorrected		
Position Quality:		Network Adjustment			
WGS 84 Position:		48° 01' 50.612900" S		X	-2348678.909
		123° 20' 24.161200" S		Y	-3570081.854
		301.700		Z	4719385.996
To Station:		3			
Data file:		38222980.DAT			
Antenna Height (meters):		1.756 True Vertical	1.694 Uncorrected		
WGS 84 Position:		48° 01' 48.993351" S		X	-2348856.453
		123° 20' 33.489591" S		Y	-3570000.084
		289.853		Z	4719343.735
Start Time:		10/26/07 16:47:45.00 GPS	(1450 492465.00)		
Stop Time:		10/26/07 17:28:15.00 GPS	(1450 494895.00)		
Occupation Time	Meas. Interval (seconds):	00:40:30.00	15.00		
Solution Type:		L1 fixed double difference			
Solution Acceptability:		Passed ratio test			
Ephemeris:		Broadcast			

Met Data:			Standard				
Baseline Slope Distance	Std. Dev. (meters):		199.986		0.000933		
				Forward			Backward
Normal Section Azimuth:				255° 29' 21.045317"			75° 29' 14.109370"
Vertical Angle:				-3° 23' 49.081417"			3° 23' 42.636395"
Baseline Components (meters):		dx	-177.544	dy	81.771	dz	-42.261
Standard Deviations (meters):			0.001646		0.001278		0.002012
		dn	-50.021	de	-193.266	du	-11.850
			0.000842		0.001011		0.002581
						dh	-11.847
							0.002581

Aposteriori Covariance Matrix:

2.709172E-006		
1.483648E-006	1.632348E-006	
-2.562751E-006	-1.849549E-006	4.047505E-006

Variance Ratio	Cutoff:	4.6	1.5		
Reference Variance:		3.564			
Observable	Count/Rejected RMS:	L1 phase	648/0		0.009
Project Name:		HDR			
Processed:		Friday, October 25, 2013 16:34			
		WAVE 2.35			
Solution Output File (SSF):		00006600.SSF			
From Station:		2887			
Data file:		87422980.DAT			
Antenna Height (meters):		1.857 True Vertical	1.795 Uncorrected		
Position Quality:		Network Adjustment			
WGS 84 Position:		48° 03' 03.054850" S		X	-2347693.590
		123° 20' 21.477100" S		Y	-3568685.270
		235.330		Z	4720832.683
To Station:		1			
Data file:		87452980.DAT			
Antenna Height (meters):		1.672 True Vertical	1.610 Uncorrected		
WGS 84 Position:		48° 01' 50.871364" S		X	-2348705.370
		123° 20' 25.960090" S		Y	-3570054.266
		297.859		Z	4719388.479
Start Time:		10/26/07 15:36:30.00 GPS	(1450 488190.00)		
Stop Time:		10/26/07 16:30:15.00 GPS	(1450 491415.00)		
Occupation Time	Meas. Interval (seconds):	00:53:45.00	15.00		

Solution Type:	L1 fixed double difference					
Solution Acceptability:	Passed ratio test					
Ephemeris:	Broadcast					
Met Data:	Standard					
Baseline Slope Distance Std. Dev. (meters):	2232.392	0.000623				
		Forward			Backward	
Normal Section Azimuth:		182° 23' 07.401615"			2° 23' 04.068220"	
Vertical Angle:		1° 35' 42.048795"			-1° 36' 54.294484"	
Baseline Components (meters):	dx	-1011.781	dy	-1368.995	dz	-1444.204
Standard Deviations (meters):		0.000968		0.001415		0.001616
	dn	-2229.593	de	-92.878	du	62.138
		0.000608		0.000532		0.002214
					dh	62.529
						0.002214

Aposteriori Covariance Matrix:

9.372200E-007		
1.063322E-006	2.002380E-006	
-1.166384E-006	-1.962887E-006	2.612415E-006

Variance Ratio Cutoff:	19.8	1.5		
Reference Variance:	2.605			
Observable Count/Rejected RMS:	L1 phase	844/3		0.006
Project Name:	HDR			
Processed:	Friday, October 25, 2013 19:34			
	WAVE 2.35			
Solution Output File (SSF):	00006652.SSF			
From Station:	2887			
Data file:	87422982.DAT			
Antenna Height (meters):	1.831 True Vertical	1.769 Uncorrected		
Position Quality:	Network Adjustment			
WGS 84 Position:	48° 03' 03.054850" S		X	-2347693.590
	123° 20' 21.477100" S		Y	-3568685.270
	235.330		Z	4720832.683
To Station:	1			
Data file:	87452980.DAT			
Antenna Height (meters):	1.672 True Vertical	1.610 Uncorrected		
WGS 84 Position:	48° 01' 50.871410" S		X	-2348705.367
	123° 20' 25.960103" S		Y	-3570054.259
	297.849		Z	4719388.473

Start Time:	10/26/07 18:07:45.00 GPS	(1450 497265.00)	
Stop Time:	10/26/07 19:02:15.00 GPS	(1450 500535.00)	
Occupation Time Meas. Interval (seconds):	00:54:30.00	15.00	
Solution Type:	L1 fixed double difference		
Solution Acceptability:	Passed ratio test		
Ephemeris:	Broadcast		
Met Data:	Standard		
Baseline Slope Distance Std. Dev. (meters):	2232.390	0.000861	

	Forward	Backward
Normal Section Azimuth:	182° 23' 07.433199"	2° 23' 04.099794"
Vertical Angle:	1° 35' 41.158830"	-1° 36' 53.404473"

Baseline Components (meters):	dx	-1011.777	dy	-1368.989	dz	-1444.210
Standard Deviations (meters):		0.000784		0.001275		0.001475
	dn	-2229.592	de	-92.878	du	62.128
		0.000857		0.000585		0.001827
					dh	62.519
						0.001827

Aposteriori Covariance Matrix:

6.139794E-007		
6.286949E-007	1.626338E-006	
-4.111784E-007	-1.278333E-006	2.174452E-006

Variance Ratio Cutoff:	19.0	1.5	
Reference Variance:	3.514		
Observable Count/Rejected RMS:	L1 phase	1060/1	0.006
Project Name:	HDR		
Processed:	Friday, October 25, 2013 16:36		
	WAVE 2.35		
Solution Output File (SSF):	00006604.SSF		
From Station:	2887		
Data file:	87422980.DAT		
Antenna Height (meters):	1.857 True Vertical	1.795 Uncorrected	
Position Quality:	Network Adjustment		
WGS 84 Position:	48° 03' 03.054850" S	X	-2347693.590
	123° 20' 21.477100" S	Y	-3568685.270
	235.330	Z	4720832.683
To Station:	2		
Data file:	38232980.DAT		
Antenna Height (meters):	1.792 True Vertical	1.730 Uncorrected	

WGS 84 Position:	48° 01' 49.891346" S	X	-2348720.983
	123° 20' 26.103208" S	Y	-3570072.603
	299.943	Z	4719369.786

Start Time:	10/26/07 15:36:30.00 GPS	(1450 488190.00)
Stop Time:	10/26/07 16:30:15.00 GPS	(1450 491415.00)
Occupation Time Meas. Interval (seconds):	00:53:45.00	15.00

Solution Type:	L1 fixed double difference
Solution Acceptability:	Passed ratio test

Ephemeris:	Broadcast	
Met Data:	Standard	
Baseline Slope Distance Std. Dev. (meters):	2262.807	0.000700

	Forward	Backward
Normal Section Azimuth:	182° 25' 42.714129"	2° 25' 39.274330"
Vertical Angle:	1° 37' 33.928966"	-1° 38' 47.157820"

Baseline Components (meters):	dx	-1027.394	dy	-1387.332	dz	-1462.897
Standard Deviations (meters):		0.001067		0.001585		0.002068
	dn	-2259.864	de	-95.844	du	64.211
		0.000699		0.000557		0.002670
					dh	64.613
						0.002670

Aposteriori Covariance Matrix:

1.139218E-006		
1.353617E-006	2.511761E-006	
-1.680501E-006	-2.831252E-006	4.277597E-006

Variance Ratio Cutoff:	19.2	1.5	
Reference Variance:	2.918		
Observable Count/Rejected RMS:	L1 phase	790/2	0.006

Project Name:	HDR
Processed:	Friday, October 25, 2013 19:39
	WAVE 2.35
Solution Output File (SSF):	00006656.SSF
From Station:	2887
Data file:	87422982.DAT
Antenna Height (meters):	1.831 True Vertical 1.769 Uncorrected
Position Quality:	Network Adjustment

WGS 84 Position:	48° 03' 03.054850" S	X	-2347693.590
	123° 20' 21.477100" S	Y	-3568685.270
	235.330	Z	4720832.683

To Station:	2				
Data file:	38232980.DAT				
Antenna Height (meters):	1.792 True Vertical		1.730 Uncorrected		
WGS 84 Position:	48° 01' 49.891322" S			X	-2348720.984
	123° 20' 26.103282" S			Y	-3570072.601
	299.940			Z	4719369.783
Start Time:	10/26/07 18:07:45.00 GPS		(1450 497265.00)		
Stop Time:	10/26/07 19:02:15.00 GPS		(1450 500535.00)		
Occupation Time Meas. Interval (seconds):	00:54:30.00		15.00		
Solution Type:	L1 fixed double difference				
Solution Acceptability:	Passed ratio test				
Ephemeris:	Broadcast				
Met Data:	Standard				
Baseline Slope Distance Std. Dev. (meters):	2262.808		0.000968		

	Forward	Backward
Normal Section Azimuth:	182° 25' 42.850892"	2° 25' 39.411037"
Vertical Angle:	1° 37' 33.698661"	-1° 38' 46.927541"

Baseline Components (meters):	dx	-1027.394	dy	-1387.331	dz	-1462.899
Standard Deviations (meters):		0.000622		0.001009		0.001713
	dn	-2259.865	de	-95.845	du	64.209
		0.000989		0.000460		0.001774
					dh	64.610
						0.001774

Aposteriori Covariance Matrix:

3.869673E-007		
3.980003E-007	1.017712E-006	
-4.063544E-007	-9.272591E-007	2.933723E-006

Variance Ratio Cutoff:	31.8	1.5			
Reference Variance:	2.156				
Observable Count/Rejected RMS:	L1 phase		876/0		0.005
Project Name:	HDR				
Processed:	Friday, October 25, 2013 16:40				
	WAVE 2.35				
Solution Output File (SSF):	00006608.SSF				
From Station:	2887				
Data file:	87422980.DAT				
Antenna Height (meters):	1.857 True Vertical		1.795 Uncorrected		
Position Quality:	Network Adjustment				

WGS 84 Position:	48° 03' 03.054850" S	X	-2347693.590
	123° 20' 21.477100" S	Y	-3568685.270
	235.330	Z	4720832.683

To Station:	3	
Data file:	38222980.DAT	
Antenna Height (meters):	1.756 True Vertical	1.694 Uncorrected

WGS 84 Position:	48° 01' 48.992934" S	X	-2348856.452
	123° 20' 33.489106" S	Y	-3570000.100
	289.858	Z	4719343.730

Start Time:	10/26/07 15:36:30.00 GPS	(1450 488190.00)
Stop Time:	10/26/07 16:30:15.00 GPS	(1450 491415.00)
Occupation Time Meas. Interval (seconds):	00:53:45.00	15.00

Solution Type:	L1 fixed double difference
Solution Acceptability:	Passed ratio test

Ephemeris:	Broadcast
Met Data:	Standard
Baseline Slope Distance Std. Dev. (meters):	2301.739 0.000613

	Forward	Backward
Normal Section Azimuth:	186° 12' 31.374353"	6° 12' 22.442575"
Vertical Angle:	1° 20' 49.569909"	-1° 22' 04.066004"

Baseline Components (meters):	dx	-1162.862	dy	-1314.829	dz	-1488.953
Standard Deviations (meters):		0.000957		0.001400		0.001636
	dn	-2287.606	de	-248.866	du	54.112
		0.000600		0.000520		0.002218
					dh	54.528
						0.002218

Aposteriori Covariance Matrix:

9.149934E-007		
1.045518E-006	1.959009E-006	
-1.172006E-006	-1.969559E-006	2.678008E-006

Variance Ratio Cutoff:	21.4	1.5
Reference Variance:	2.513	

Observable Count/Rejected RMS:	L1 phase	838/2	0.005

Project Name:	HDR
Processed:	Friday, October 25, 2013 19:45
	WAVE 2.35
Solution Output File (SSF):	00006660.SSF

From Station:	2887

Data file:	87422982.DAT			
Antenna Height (meters):	1.831 True Vertical	1.769 Uncorrected		
Position Quality:	Network Adjustment			
WGS 84 Position:	48° 03' 03.054850" S		X	-2347693.590
	123° 20' 21.477100" S		Y	-3568685.270
	235.330		Z	4720832.683
To Station:	3			
Data file:	38222980.DAT			
Antenna Height (meters):	1.756 True Vertical	1.694 Uncorrected		
WGS 84 Position:	48° 01' 48.992969" S		X	-2348856.451
	123° 20' 33.489108" S		Y	-3570000.098
	289.856		Z	4719343.729
Start Time:	10/26/07 18:07:45.00 GPS	(1450 497265.00)		
Stop Time:	10/26/07 19:02:15.00 GPS	(1450 500535.00)		
Occupation Time Meas. Interval (seconds):	00:54:30.00	15.00		
Solution Type:	L1 fixed double difference			
Solution Acceptability:	Passed ratio test			
Ephemeris:	Broadcast			
Met Data:	Standard			
Baseline Slope Distance Std. Dev. (meters):	2301.738	0.001051		

	Forward	Backward
Normal Section Azimuth:	186° 12' 31.388251"	6° 12' 22.456472"
Vertical Angle:	1° 20' 49.393909"	-1° 22' 03.889969"

Baseline Components (meters):	dx	-1162.861	dy	-1314.827	dz	-1488.953
Standard Deviations (meters):		0.000706		0.001123		0.001919
	dn	-2287.605	de	-248.866	du	54.110
		0.001075		0.000515		0.002005
					dh	54.526
						0.002005

Aposteriori Covariance Matrix:

4.989892E-007		
5.047324E-007	1.261031E-006	
-5.679604E-007	-1.211459E-006	3.682507E-006

Variance Ratio Cutoff:	27.6	1.5		
Reference Variance:	2.521			
Observable Count/Rejected RMS:	L1 phase	843/0		0.005

***** End of Report *****


PACR CP-5
PACR CP-6
PACR CP-1
SCHREINER
PACR CP-2
PACR CP-3
PACR CP-4
Deer Park Dr

STAR*NET-PRO Version 6.0.36
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Run Date: Sat Oct 26 2013 11:57:05

Summary of Files Used and Option Settings

Project Folder and Data Files

Project Name PACR 2013
Project Folder \\SERVER\WORKFILES\...\PROJECTS\HDR\PACR 2013
Data File List
1. PACR 2013.dat
2. CCGF1 READJUST 2013.gps
3. P2KGPS.gps
4. HDR.gps
5. HDR-1.dat

Project Option Settings

STAR*NET Run Mode	Adjust with Error Propagation
Type of Adjustment	3D
Project Units	Meters; DMS
Coordinate System	Lambert NAD83; WA North 4601
Geoid Height Model	WASH12A.GHT
Vertical Deflection Model	WASH12A.VDF
Longitude Sign Convention	Positive West
Input/Output Coordinate Order	North-East
Angle Data Station Order	At-From-To
Distance/Vertical Data Type	Slope/Zenith
Convergence Limit; Max Iterations	0.010000; 10
Default Coefficient of Refraction	0.070000
Create Coordinate File	Yes
Create Geodetic Position File	Yes
Create Ground Scale Coordinate File	No
Create Dump File	No
GPS Vector Standard Error Factors	4.5000 (Horiz), 4.5000 (Vert)
GPS Vector Centering (Meters)	0.00300 (Horiz), 0.00300 (Vert)
GPS Vector Transformations	Solve for Scale and Rotations

Instrument Standard Error Settings

Project Default Instrument

Distances (Constant)	:	0.002000 Meters
Distances (PPM)	:	2.000000
Angles	:	5.000000 Seconds
Directions	:	5.000000 Seconds
Azimuths & Bearings	:	1.000000 Seconds
Zeniths	:	10.000000 Seconds
Elevation Differences (Constant)	:	0.003048 Meters
Elevation Differences (PPM)	:	50.000000
Differential Levels	:	0.001524 Meters / Turn
Centering Error Instrument	:	0.001524 Meters
Centering Error Target	:	0.001524 Meters
Centering Error Vertical	:	0.001524 Meters

Listing of Input Data
==========

```
[File: \\SERVER\workfiles\STARNET PROJECTS\PROJECTS\HDR\PACR 2013\PACR 2013.dat]
# THE PURPOSE OF THIS ADJUSTMENT IS TO PROVIDE WASHINGTON STATE PLANE COORDINATE VALUES
#(NORTH ZONE), NORTH AMERICAN DATUM OF 1983, 2011 ADJUSTMENT, (EPOCH 2010) IN METERS FOR STATIONS
# 1-6 (PACR CP-1 THROUGH PACR CP-6) TO HDR, INC.

# TO ACCOMPLISH THIS, A READJUSTMENT OF VECTORS MEASURED FOR THE CLALLAM COUNTY GEOMETRIC FRAMEWORK
# PERFORMED IN 1997 WITH ADDITIONAL VECTORS MEASURED FOR THE CITY OF PORT ANGELES PERFORMED IN
# 2000, ALONG WITH NEW MEASUREMENTS MADE FOR HDR INC. IN 2013 WERE UTILIZED.


# FOR ADDITIONAL INFORMATION ABOUT THE ORIGINAL MEASUREMENTS SEE VOLUME 38 OF SURVEYS,
# PAGE 84, CLALLAM COUNTY AUDITOR'S FILE NUMBERS 1998-1003283, 1998-1003284 (SUMMARY REPORT),
# AND 1998-1003306 (GEODETIC CONTROL STATION REPORT), RECORDS OF CLALLAM COUNTY, WASHINGTON.


# NGS STATIONS WITH NAD83/2011 (EPOCH 2010) COORDINATE VALUES HELD FIXED PER NGS DATA SHEETS
# ARE LISTED BELOW. ORTHOMETRIC ELEVATIONS ARE IN METERS.

P 1638 48-11-52.34640   124-07-08.35317     4.813  !     !      !     'N 469 (TS0058)
P 1885 48-07-25.14828   123-27-04.01731     4.069  !     !      !     '944 4090 A TIDAL (TR2551)
P 2137 47-56-22.82051   124-33-40.80378    57.80   !     !      *     'QUILLAYUTE RESET (SD0799)
P 2156 48-07-30.75981   123-30-08.01501    71.99   !     !      *     'CBL150 (AC5475)
P 8597 47-56-12.19221   124-23-44.16562    87.95   !     !      !     'FORKS RESET (SD0880)
P 8894 48-04-50.32901   123-06-14.70421    56.70   !     !      *     'WEGENEST (AI2209)

# NGS STATIONS WITH NAD83/2011 (EPOCH 2010) COORDINATE VALUES WITH STANDARD DEVIATIONS PER NGS DATA
# SHEETS ARE LISTED BELOW. ORTHOMETRIC ELEVATIONS ARE IN METERS.

P 1487 47-49-27.05641   122-52-31.62393    12.73   .0356 .0358  .03   'SCHOOL(SY5641)
P 1779 48-22-00.75024   124-37-15.66179     5.675  .0044 .0032  .02   '944 3090 A TIDAL (TS0340)
P 1927 48-08-30.27149   123-25-32.18311     4.4    .0194 .0195  *     'EAST BASE AZ MK (TR2552)
P 8207 48-03-16.40631   122-48-33.66371    32.398  .0178 .0133  .01   'JCIA(TR2696)
P 8472 47-32-24.68604   124-19-55.02649    12.56   .0213 .0189  .03   'QUIN (SD0881)


# ADDITIONAL STATE OF WASHINGTON DEPARTMENT OF TRANSPORTATION GPS STATIONS WITH
# PUBLISHED NAD83/2011 VALUES (EPOCH UNKNOWN) WITH ALL VALUES UNCONSTRAINED.
# ORTHOMETRIC ELEVATIONS ARE IN METERS.

P 2098 48-13-45.580811  124-15-14.852121   18.035  *     *      *     'GP05112-29
P 2111 48-04-18.909498  123-46-27.262665  180.035  *     *      *     'GP05101-11
P 2130 48-07-09.579497  123-40-11.738719   76.129  *     *      *     'GP05112-8
P 2136 48-02-24.424428  123-09-09.753912  139.429  *     *      *     'PETE

# STATIONS ESTABLISHED IN 1997 WITH ELEVATIONS MEASURED BY DIFFERENTIAL LEVELING FROM
# NGS BENCH MARKS IN METERS

E 2141                                    88.6634             *    'LAPUSH
E 2142                                    49.6093             *    'GOODMAN
E 2146                                   109.2375             *    'BEDROCK
E 2148                                   150.9403             *    'BEAVER FALLS
E 2149                                     4.3404             *    'RAYS
E 2150                                    87.5662             *    'S2500
E 2151                                   114.0503             *    'CRESCENT HS
E 2160                                    14.7615             *    'CASINO
E 2161                                     2.8316             *    'GARDINER

# STATIONS ESTABLISHED IN 1997 WITH ELEVATION ESTABLISHED BY TRIG LEVELING FROM
# NGS BENCH MARK IN METERS

E 2144                                   71.6617              *    'UNDIE RD.

# EXISTING NGS STATIONS WITH ELEVATIONS MEASURED BY DIFFERENTIAL LEVELING FROM
```

```
# NGS BENCH MARKS IN METERS

E 1823                                  76.0600              !     'SAWMILL 2 (TR2398)

# EXISTING NGS BENCH MARKS

E 2133                                  52.1280              .01   'CARLSBORG (TR0834)
E 8275                                   3                   *     'QUARINTINE 2 (TR1746)
E 8870                                   2.61                *     'SAND (TR2365)

# OTHER EXISTING STATIONS

C 2100                                                               'K473 RESET
C 2165                                                               'ELWHA CONTROL NO.1

# STATIONS ESTABLISHED DURING THE CCGF PROJECT (1997)

C 2141                                                               'LAPUSH
C 2142                                                               'GOODMAN
C 2143                                                               'WENTWORTH
C 2144                                                               'UNDIE RD.
C 2145                                                               'FS29 PIT
C 2146                                                               'BEDROCK
C 2147                                                               'SCALES
C 2148                                                               'BEAVER FALLS
C 2149                                                               'RAYS
C 2150                                                               'S2500
C 2151                                                               'CRESCENT HS
C 2152                                                               'CEMETERY
C 2153                                                               'DOT ELWHA PIT
C 2154                                                               'LITTLE RIVER
C 2155                                                               'MT. PLEASANT
C 2157                                                               'LOST MOUNTAIN
C 2158                                                               'GELLOR
C 2159                                                               'FINN HALL
C 2160                                                               'CASINO
C 2161                                                               'GARDINER
C 2162                                                               'CLINE SPIT
C 2163                                                               'SERPENTINE
C 2164                                                               'BURNT HILL

# POINTS ESTABLISHED FOR THE CITY OF PORT ANGELES (2000)
# FOR ADDITIONAL INFORMATION SEE VOLUME 46 OF SURVEYS, PAGE 14, RECORDS OF CLALLAM COUNTY,
# WASHINGTON.

C 2886                                                               'SCHREINER
C 2887                                                               'SKYLINE
```

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[File: \\SERVER\workfiles\STARNET PROJECTS\PROJECTS\HDR\PACR 2013\CCGF1 READJUST 2013.gps]
.GPS WEIGHT COVARIANCE

G0 'V1 Day083(A) 14:30 00000509.SSF
G1 1487-2161 7911.399508 17765.671513 17322.879512
G2  1.71117241435213E-006  6.19535009889729E-006  5.05540567077052E-006
G3  1.42112669905343E-006 -1.13276257206851E-006 -3.13367707468567E-006

G0 'V2 Day083(A) 14:29 00000513.SSF
G1 1487-2160 312.978708 19218.809824 14718.292942
G2  1.75177714343785E-006  6.42822194220416E-006  5.24505229446543E-006
G3  1.50366366842805E-006 -1.16826285954309E-006 -3.24837272917886E-006

G0 'V3 Day083(A) 14:25 00000517.SSF
G1 8870-2160 -1499.613427 -2254.301005 -2418.406533
G2  2.81636874150897E-007  1.00977261210746E-006  8.38271067348081E-007
G3  2.40605934557793E-007 -1.92871309922887E-007 -5.26015365292048E-007

G0 'V4 Day083(A) 14:22 00000521.SSF
G1 8207-8870 -12643.450076 8184.155524 -37.509840
G2  4.34488398306595E-007  1.57983478853094E-006  1.29790220685711E-006
G3  3.80930921897663E-007 -3.08230227936812E-007 -8.31827077271741E-007

G0 'V5 Day083(B) 15:33 00000525.SSF
G1 2161-2160 -7598.409774 1453.129334 -2604.576784
G2  3.29335052183094E-006  4.78220066331298E-006  8.80651559451951E-006
G3  2.04971718669147E-006 -4.70496637184824E-008 -2.94623482120697E-006

G0 'V6 Day083(0) 15:33 00000529.SSF
G1 1487-2160 312.977464 19218.798299 14718.313163
G2  4.45110977615634E-006  6.45295173187211E-006  1.18383665753185E-005
G3  2.76658257495281E-006 -7.73664170163146E-008 -3.98394335164940E-006

G0 'V7 Day083(B) 15:33 00000533.SSF
G1 8207-2161 -6544.645999 4476.726275 148.654201
G2  2.25355768112744E-006  3.29979460948423E-006  5.97006197033816E-006
G3  1.41517035218409E-006 -4.18535392811161E-008 -2.01078740938319E-006

G0 'V8 Day083(C) 16:12 00000541.SSF
G1 1487-2160 312.975572 19218.794267 14718.306122
G2  2.09562784173866E-006  3.97855461369247E-006  6.07594322952382E-006
G3  1.82900817431932E-006 -1.89305980019836E-006 -2.77484163600067E-006

G0 'V9 Day083(C) 16:12 00000537.SSF
G1 1487-8275 9594.485358 20430.542394 20152.831624
G2  2.51404696058806E-006  3.06882463472160E-006  2.95874826276257E-006
G3  2.25685031550242E-006 -1.55697091740145E-006 -1.87003597029820E-006

G0 'V10 Day083(C) 16:11 00000545.SSF
G1 8207-8275 -4861.541315 7141.615396 2978.594863
G2  8.79271579489709E-007  1.26083289509851E-006  1.45363113453573E-006
G3  7.91276642741034E-007 -6.13092087705185E-007 -7.99553934753500E-007

G0 'V11 Day083(C) 16:11 00000549.SSF
G1 8207-2161 -6544.646060 4476.725619 148.660409
G2  1.23598897343756E-006  2.33350655021553E-006  3.50691948303474E-006
G3  1.07819188472778E-006 -1.10777940878801E-006 -1.61115978629791E-006

G0 'V12 Day083(D) 17:13 00000553.SSF
G1 2161-8275 1683.106715 2664.890458 2829.931047
G2  3.16234495652972E-007  6.55666849836355E-007  6.03846934717264E-007
G3  2.89388494658526E-007 -2.41646455592445E-007 -2.99970027395258E-007
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G0 'V13 Day083(F) 18:10 00000565.SSF
G1 8894-8275 12404.683110 -6604.737486 1021.456020
G2  6.27184821845484E-007  1.18568826158061E-006  1.52304325147933E-006
G3  3.27151453323171E-007 -2.13667731671283E-007 -8.75044025317640E-007

G0 'V14 Day083(E) 17:43 00000557.SSF
G1 8870-2161 6098.796277 -3707.443818 186.192445
G2  5.21301559224976E-006  5.68249561695485E-006  2.51782977767310E-005
G3  2.81988573039801E-006 -5.54336519227300E-006 -3.47736962655645E-006

G0 'V15 Day083(E) 17:44 00000561.SSF
G1 8870-8275 7781.902212 -1042.559607 3016.126257
G2  3.04564750733546E-006  3.47181106300412E-006  1.54770458799244E-005
G3  1.67102780937447E-006 -3.24369811048024E-006 -2.24510285888959E-006

G0 'V16 Day083(F) 18:08 00000573.SSF
G1 8894-2164 -1544.264755 -4719.779560 -3781.084290
G2  9.47116565014586E-007  1.78834856460907E-006  2.40826690433094E-006
G3  4.89842484192456E-007 -3.17774105407054E-007 -1.34410496870878E-006

G0 'V17 Day083(G) 19:12 00000577.SSF
G1 2136-8894 4897.692451 872.979677 2950.094085
G2  7.69756945385465E-007  1.59147417214636E-006  3.27919361886346E-006
G3  5.14341045281915E-007 -4.76309510494934E-007 -1.30667732977847E-006

G0 'V18 Day083(G) 19:14 00000581.SSF
G1 8894-8870 4622.760106 -5562.182206 -1994.662858
G2  7.71318559857598E-007  1.53215134511794E-006  3.22104446351260E-006
G3  5.08640609457027E-007 -4.86524011280012E-007 -1.27237847164967E-006

G0 'V19 Day083(G) 19:12 00000585.SSF
G1 2136-2164 3353.429104 -3846.796438 -830.993348
G2  9.70788642524395E-007  1.98035141352721E-006  3.90924856045231E-006
G3  6.65009498359098E-007 -5.94148843924788E-007 -1.59547817956897E-006

G0 'V20 Day083(H) 20:14 00000589.SSF
G1 8894-2164 -1544.266836 -4719.784385 -3781.070567
G2  1.31561869970444E-006  1.77647026154022E-006  2.21031863158153E-006
G3  9.62617996774216E-007 -8.88067080465659E-007 -1.04218953449436E-006

G0 'V21 Day083(H) 20:13 00000593.SSF
G1 2160-2164 -4667.444232 3096.720266 632.001141
G2  2.34262970047102E-006  3.20555832315852E-006  4.02129439202082E-006
G3  1.70678871432892E-006 -1.59408500423501E-006 -1.87624685512986E-006

G0 'V22 Day083(I) 21:13 00000601.SSF
G1 2133-2163 7089.753137 -1412.427520 2347.861811
G2  5.58411070447526E-006  7.28873477326064E-006  6.39316050833263E-006
G3  5.15008977904309E-006 -3.17768268780990E-006 -4.75992703691645E-006

G0 'V23 Day083(I) 21:14 00000605.SSF
G1 2133-2164 2138.478002 -8374.560311 -4715.204113
G2  3.13436983419727E-006  4.29725189384280E-006  3.90727104906667E-006
G3  2.90230651164053E-006 -1.73465236891974E-006 -2.86063927626074E-006

G0 'V24 Day083(I) 21:15 00000597.SSF
G1 8894-2163 3407.007107 2242.341446 3281.990305
G2  6.25764230308576E-006  8.42574585777557E-006  7.64158956662014E-006
G3  5.76826851981480E-006 -3.44056787624336E-006 -5.53710525345779E-006

G0 'V25 Day083(I) 21:15 00000609.SSF
G1 2160-2164 -4667.437433 3096.712000 631.994585
G2  4.78169156483370E-006  6.46528130036046E-006  6.03780571696465E-006
G3  4.38760847025185E-006 -2.60053652049308E-006 -4.30081903726001E-006
```

```
G0 'V26 Day083(J) 22:17 00000613.SSF
G1 2133-8894 3682.756644 -3654.759697 -934.143118
G2  7.47623186851705E-007  1.35024445933259E-006  3.48565653935252E-006
G3  6.46462515329927E-007 -9.67734040287696E-007 -1.61478327601108E-006

G0 'V27 Day083(J) 22:16 00000617.SSF
G1 2133-2163 7089.766577 -1412.423528 2347.858529
G2  2.50542533896801E-006  4.44496284924359E-006  1.15079307702239E-005
G3  2.14872960719384E-006 -3.22801412032932E-006 -5.30905036177443E-006

G0 'V28 Day083(J) 22:16 00000621.SSF
G1 2133-2164 2138.489514 -8374.539607 -4715.224472
G2  7.44286431026518E-007  1.41470054989024E-006  3.50964316959491E-006
G3  6.69019123422686E-007 -9.89930029398289E-007 -1.68521126371237E-006

G0 'V29 Day083(K) 23:40 00000625.SSF
G1 8275-2163 -8997.669278 8847.072028 2260.553135
G2  5.02270150748535E-006  7.03812400537170E-006  5.93334537671454E-006
G3  3.77667022180361E-006 -2.73046230988341E-006 -3.05680425416207E-006

G0 'V30 Day083(K) 23:36 00000629.SSF
G1 8894-8275 12404.678770 -6604.737136 1021.453450
G2  9.63997204315199E-007  1.35699123397796E-006  1.22949299219915E-006
G3  7.11042254384324E-007 -5.61220961388235E-007 -6.03464691023184E-007

G0 'V31 Day083(K) 23:47 00000633.SSF
G1 2136-8894 4897.695244 872.994869 2950.074961
G2  1.17047327710459E-006  1.76667232478960E-006  1.56512797278217E-006
G3  8.88733142848417E-007 -6.24321110535956E-007 -7.38921834144243E-007

G0 'V32 Day083(K) 23:47 00000637.SSF
G1 2136-2133 1214.944323 4527.758930 3884.212046
G2  1.14977761483690E-006  1.70631917780436E-006  1.61952701172363E-006
G3  8.49400893243590E-007 -6.61808236597674E-007 -7.04441368889828E-007

G0 'V33 Day084(L) 00:56 00000641.SSF
G1 2136-2133 1214.945514 4527.752131 3884.213373
G2  1.03168908793477E-006  1.27321665660219E-006  3.04832170665850E-006
G3  6.39599051219984E-007 -9.14308587495915E-007 -1.19922909035147E-006

G0 'V34 Day084(L) 01:06 00000645.SSF
G1 2133-2162 3924.582138 3254.957354 4301.272679
G2  7.04494366769533E-007  9.08806302834723E-007  1.88296055061301E-006
G3  4.71048492134780E-007 -6.59192441440742E-007 -8.32256525750890E-007

G0 'V35 Day084(L) 01:06 00000649.SSF
G1 2162-2163 3165.183122 -4667.373592 -1953.414326
G2  4.24093586362911E-006  4.15999531216452E-006  9.41625527024399E-006
G3  2.67944904824623E-006 -3.70675828274107E-006 -3.96929479861782E-006

G0 'V36 Day084(M) 02:28 00000653.SSF
G1 2133-2162 3924.578364 3254.952819 4301.274288
G2  8.23950453768009E-007  1.23169953281420E-006  1.74252479485553E-006
G3  4.66354183612271E-007 -7.26168633208765E-007 -8.23620293844330E-007

G0 'V37 Day084(M) 02:30 00000657.SSF
G1 2162-2159 -7999.814351 1320.765547 -2880.123337
G2  2.64995455266355E-006  4.01902068225408E-006  5.55416360195609E-006
G3  1.51130243080125E-006 -2.26576462334261E-006 -2.70185990198596E-006

G0 'V38 Day084(M) 02:30 00000661.SSF
G1 2159-2157 -2430.934222 -8331.640883 -6960.898950
G2  2.68191974423910E-006  4.06217076378437E-006  5.64832115531235E-006
G3  1.53516174278307E-006 -2.30571874213383E-006 -2.73317733287120E-006
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G0 'V39 Day084(M) 02:03 00000665.SSF
G1 2136-2157 -5291.233753 771.818671 -1655.513621
G2  9.47545101929737E-007  1.81356645835850E-006  2.05035754949646E-006
G3  6.07219557646151E-007 -8.53244721740576E-007 -1.05777275472261E-006

G0 'V40 Day084(A) 14:30 00000669.SSF
G1 2133-2159 -4075.226038 4575.720142 1421.153051
G2  1.72823771909271E-006  5.34937332172992E-006  4.98902584152502E-006
G3  1.28562176939657E-006 -1.06181085708955E-006 -2.69024624197249E-006

G0 'V41 Day084(A) 14:30 00000673.SSF
G1 2159-2157 -2430.938673 -8331.625456 -6960.888324
G2  1.56373796075414E-006  4.91041901872702E-006  4.56709572705736E-006
G3  1.17655633465681E-006 -9.71625082990818E-007 -2.47849138199612E-006

G0 'V42 Day084(A) 14:30 00000677.SSF
G1 1823-2159 6109.732264 -3186.579848 576.081325
G2  1.36069467080252E-006  4.21976214198831E-006  3.97693988711787E-006
G3  1.01480685479793E-006 -8.45200297363719E-007 -2.13331145318530E-006

G0 'V43 Day084(A) 14:23 00000681.SSF
G1 2157-2158 -2536.375814 3814.370698 1522.500797
G2  2.48249831240385E-007  8.28699936169505E-007  7.28807454997753E-007
G3  2.01058515928906E-007 -1.61928219144333E-007 -4.31671932932018E-007

G0 'V44 Day084(B) 15:33 00000685.SSF
G1 1823-2158 1142.422040 -7703.832626 -4862.307949
G2  7.44205863460393E-007  1.20340418138676E-006  2.23302173646171E-006
G3  5.46701333826852E-007 -2.11123950986032E-007 -7.69096613877043E-007

G0 'V45 Day084(B) 15:34 00000689.SSF
G1 1823-2159 6109.738666 -3186.574499 576.093685
G2  2.53599424630147E-006  4.13174022986731E-006  7.19066280679855E-006
G3  1.87266676679849E-006 -7.92505420616197E-007 -2.63351507100234E-006

G0 'V46 Day084(B) 15:34 00000693.SSF
G1 2133-2159 -4075.228036 4575.725937 1421.167795
G2  3.80950200110998E-006  6.21400227667070E-006  1.07329572912363E-005
G3  2.81541416535949E-006 -1.19987619779933E-006 -3.95191661078842E-006

G0 'V47 Day084(C) 16:34 00000697.SSF
G1 2133-2158 -9042.543332 58.469602 -4017.243461
G2  8.63118766771883E-007  1.73966053452391E-006  2.20981476523598E-006
G3  7.56392592047152E-007 -8.05857325391654E-007 -1.05415753988917E-006

G0 'V48 Day084(C) 16:34 00000701.SSF
G1 2159-2158 -4967.315157 -4517.250003 -5438.401847
G2  2.04256061667391E-006  4.08491979468219E-006  5.10843781346479E-006
G3  1.80379241574053E-006 -1.88411481369016E-006 -2.47011552881427E-006

G0 'V49 Day084(E) 18:35 00000717.SSF
G1 2155-2154 -8052.623583 6672.078206 892.878995
G2  1.33083949768358E-006  2.64048517773260E-006  3.37404931158452E-006
G3  9.25283555108226E-007 -4.14435373983823E-007 -1.89242066471315E-006

G0 'V50 Day084(C) 16:34 00000705.SSF
G1 2158-2155 -5158.993823 4331.421939 780.591798
G2  1.92611086416951E-006  3.10268393740035E-006  2.46737436222705E-006
G3  1.97634289020912E-006 -1.39892050941244E-006 -1.74812475267473E-006

G0 'V51 Day084(C) 16:33 00000709.SSF
G1 1823-2155 -4016.588042 -3372.418943 -4081.720032
G2  1.29631881989869E-006  2.04107702192661E-006  1.65332670634397E-006
G3  1.31690772686637E-006 -9.36247274867173E-007 -1.14887892443297E-006
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G0 'V52 Day084(D) 17:35 00000713.SSF
G1 1823-2155 -4016.578080 -3372.424449 -4081.715007
G2  7.68129650248290E-007  1.20720723871437E-006  2.75511963015652E-006
G3  4.16544486519565E-007 -4.74053957580252E-007 -9.88500478504247E-007

G0 'V53 Day084(E) 18:35 00000721.SSF
G1 2155-2156 -4879.303185 11310.269287 5623.579913
G2  1.49306984790552E-006  3.19012648471158E-006  4.34615697149736E-006
G3  9.70763852613138E-007 -5.08445810527982E-007 -2.42192911656173E-006

G0 'V54 Day084(E) 18:36 00000725.SSF
G1 1823-2156 -8895.885724 7937.850596 1541.857073
G2  1.10991917614486E-006  2.26538529048157E-006  2.94385199975730E-006
G3  7.36644080628749E-007 -3.57264281665696E-007 -1.67397432313972E-006

G0 'V55 Day084(E) 18:36 00000729.SSF
G1 1823-1927 -3358.615999 5972.738580 2718.315203
G2  9.80085245833056E-007  1.83497477785749E-006  2.33758841198358E-006
G3  6.60101987611210E-007 -3.32077581009600E-007 -1.34673755159430E-006

G0 'V56 Day084(F) 19:37 00000733.SSF
G1 2156-1927 5537.271114 -1965.105089 1176.458190
G2  2.32183223931280E-006  3.65288103688988E-006  8.69739944524757E-006
G3  1.35871686658315E-006 -1.56509154847549E-006 -3.01506599463695E-006

G0 'V57 Day084(F) 19:37 00000737.SSF
G1 2156-2154 -3173.315687 -4638.170313 -4730.702837
G2  3.84305014754758E-006  5.73849497220967E-006  1.31769896586774E-005
G3  2.25920205585412E-006 -2.38275124564419E-006 -4.61227997723600E-006

G0 'V58 Day084(F) 19:37 00000741.SSF
G1 2155-2154 -8052.618641 6672.071834 892.871094
G2  3.20147164623222E-006  5.06418192257327E-006  1.18658131597681E-005
G3  1.88125815186662E-006 -2.12157741553121E-006 -4.13550719490438E-006

G0 'V59 Day084(G) 20:20 00000745.SSF
G1 2156-1927 5537.278610 -1965.107059 1176.459022
G2  2.86184499390902E-006  3.82138662280762E-006  4.01876013105606E-006
G3  2.31389155510755E-006 -2.00972621174539E-006 -2.09548387408246E-006

G0 'V60 Day084(I) 22:19 00000765.SSF
G1 2154-2153 -5335.554966 4193.113839 230.080354
G2  1.13960646727512E-006  1.88670245693829E-006  5.28446391842223E-006
G3  9.03904931054583E-007 -1.39930163741922E-006 -2.24621727219285E-006

G0 'V61 Day084(G) 20:20 00000749.SSF
G1 1885-1927 2409.692776 203.517874 1342.722506
G2  4.38395257043660E-006  4.68649209400746E-006  3.17147321213947E-006
G3  3.83408495646962E-006 -2.41502588277830E-006 -2.68279008218969E-006

G0 'V62 Day084(G) 20:19 00000753.SSF
G1 1885-2154 -6300.899130 -2469.553500 -4564.446388
G2  1.51102144163222E-005  1.59648732477328E-005  1.12758734098317E-005
G3  1.30686398489044E-005 -8.38230612282085E-006 -9.20801343615819E-006

G0 'V63 Day084(G) 20:17 00000757.SSF
G1 1885-2155 1751.711534 -9141.624024 -5457.327983
G2  1.93753854400084E-005  2.01906775259261E-005  1.44443320698724E-005
G3  1.65401572218495E-005 -1.05169277407808E-005 -1.16249577473342E-005

G0 'V64 Day084(H) 21:18 00000761.SSF
G1 2154-2156 3173.321252 4638.187889 4730.703987
G2  2.10855558284053E-006  8.97209716533734E-006  4.64583991660418E-006
G3  3.44694838270409E-006 -2.18768753520657E-006 -5.62682133573342E-006
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G0 'V65 Day084(I) 22:17 00000769.SSF
G1 2130-2153 2163.114061 -6943.564262 -4067.136363
G2  1.36814343005161E-006  2.32239348016891E-006  6.34218702147809E-006
G3  1.09937121307875E-006 -1.67674963752268E-006 -2.73942289397475E-006

G0 'V66 Day084(I) 22:18 00000773.SSF
G1 2130-2165 7578.683029 -2350.446074 1909.557336
G2  6.18858823542841E-007  1.03418622208748E-006  2.81682016866574E-006
G3  4.98854193164479E-007 -7.64167781677804E-007 -1.22699576997309E-006

G0 'V67 Day084(I) 22:19 00000777.SSF
G1 2165-2156 3093.301626 -4148.046196 -1476.072691
G2  7.16322638168357E-007  1.15083499950717E-006  3.21073433779713E-006
G3  5.68220340948611E-007 -8.80416099775578E-007 -1.37865475902565E-006

G0 'V68 Day084(J) 23:21 00000781.SSF
G1 2153-2156 8508.867752 445.061599 4500.631697
G2  2.31689797480692E-006  2.60538159017588E-006  2.80857357114733E-006
G3  1.59929846867306E-006 -1.53025134878815E-006 -1.35314858156796E-006

G0 'V69 Day084(J) 23:22 00000785.SSF
G1 2130-2156 10671.980169 -6498.496038 433.488468
G2  1.97373034845382E-006  2.17886380272185E-006  2.12957306959562E-006
G3  1.35093798799725E-006 -1.28264666413091E-006 -1.09334789610529E-006

G0 'V70 Day084(J) 23:22 00000789.SSF
G1 2156-2165 -3093.301917 4148.042355 1476.074313
G2  1.38819281349590E-006  1.55673391432844E-006  1.54531707595485E-006
G3  9.47667888418463E-007 -9.20827222986751E-007 -7.90257335641401E-007

G0 'V71 Day085(K) 00:21 00000793.SSF
G1 2156-2153 -8508.868000 -445.070308 -4500.625427
G2  9.09848142835247E-007  1.39430292297845E-006  3.74035708194689E-006
G3  4.93101306410806E-007 -4.79145892105252E-007 -1.34815996803847E-006

G0 'V72 Day085(K) 00:22 00000801.SSF
G1 2111-2130 8679.326615 -992.761165 3443.507162
G2  4.00521489139743E-006  2.85910246424967E-006  9.36369576990336E-006
G3  2.02248591466370E-006 -2.15893191684511E-006 -2.87253746215346E-006

G0 'V73 Day085(K) 00:21 00000797.SSF
G1 2111-2153 10842.430390 -7936.339157 -623.621589
G2  6.30753052798737E-006  4.70243285898311E-006  1.37859756472106E-005
G3  3.24852118596272E-006 -2.75221455935482E-006 -4.45979154241751E-006

G0 'V74 Day085(K) 00:22 00000805.SSF
G1 2130-2165 7578.677373 -2350.457269 1909.565770
G2  5.62354660356233E-007  8.61069161728694E-007  2.34519262412680E-006
G3  3.02304286373802E-007 -2.96004160381858E-007 -8.46565330813895E-007

G0 'V75 Day085(L) 01:23 00000809.SSF
G1 2111-2153 10842.434123 -7936.329495 -623.618366
G2  4.90509522330214E-006  5.61395005283602E-006  7.80377771396071E-006
G3  3.45184117784174E-006 -3.99873210572953E-006 -4.05850987733672E-006

G0 'V76 Day085(L) 01:22 00000813.SSF
G1 2130-2153 2163.110277 -6943.565471 -4067.137577
G2  1.45956713052018E-006  2.30788021590560E-006  3.24233558760101E-006
G3  1.04615191670716E-006 -1.40155221660413E-006 -1.61542756941214E-006

G0 'V77 Day085(M) 02:23 00000817.SSF
G1 2153-2151 -6120.809446 11261.075863 5368.669177
G2  2.93700056458351E-006  4.23716924512912E-006  6.84744209458186E-006
G3  1.59828685352689E-006 -2.82494571397564E-006 -2.85644724111585E-006
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G0 'V78 Day085(M) 02:22 00000821.SSF
G1 2151-2152 3227.553070 213.484815 1617.724027
G2  6.14885494343338E-007  8.99739040361343E-007  1.76871006945746E-006
G3  3.35789517247546E-007 -6.53203038495591E-007 -6.26659224267380E-007

G0 'V79 Day085(M) 02:24 00000825.SSF
G1 2130-2111 -8679.320555 992.765301 -3443.513079
G2  3.72118403460844E-006  3.86778769524942E-006  6.13569747662207E-006
G3  1.98756692021807E-006 -3.21485666096914E-006 -2.88527661656569E-006

G0 'V80 Day085(M) 02:23 00000829.SSF
G1 2130-2152 -730.150884 4530.989095 2919.268693
G2  2.02397594837131E-006  2.59843123012886E-006  5.76266749565819E-006
G3  1.07791761871893E-006 -2.17148553162851E-006 -1.95439867854083E-006

G0 'V81 Day085(A) 14:37 00000833.SSF
G1 2130-2152 -730.157634 4530.958407 2919.284887
G2  2.45872634090448E-006  8.44122301258783E-006  7.37725799991626E-006
G3  1.99818117941382E-006 -1.58591861637912E-006 -3.64363793368633E-006

G0 'V82 Day085(A) 14:37 00000837.SSF
G1 2152-2151 -3227.559667 -213.489596 -1617.713438
G2  5.17006076276267E-007  2.05014469539550E-006  1.49820515639398E-006
G3  4.81377682933225E-007 -3.34634939238877E-007 -8.05928762365105E-007

G0 'V83 Day085(B) 15:12 00000841.SSF
G1 2111-2151 4721.607154 3324.748646 4745.086537
G2  1.37501793361166E-005  2.85040600191310E-006  6.08745761620485E-006
G3  3.96899201833926E-006 -4.81771652263501E-006 -2.31425804399424E-006

G0 'V84 Day085(B) 15:13 00000845.SSF
G1 2111-2152 7949.169497 3538.235702 6362.796399
G2  7.83889586903309E-006  1.55114846720511E-006  6.81104002516716E-006
G3  2.21492677435802E-006 -3.88708574569360E-006 -1.64286217255549E-006

G0 'V85 Day085(D) 18:13 00000865.SSF
G1 2150-2151 6906.395724 -5574.203524 -671.286954
G2  1.03499561652220E-006  2.02574849053595E-006  2.54373142157699E-006
G3  5.78572535747412E-007 -3.20657490816903E-007 -1.49312722442059E-006

G0 'V86 Day085(C) 16:12 00000849.SSF
G1 2111-2144 -43922.153079 11194.218492 -13958.930439
G2  3.36101946783753E-006  2.00140329691561E-006  2.72469056576032E-006
G3  1.95494493199783E-006 -1.85347260482451E-006 -1.29195989805472E-006

G0 'V87 Day085(C) 16:11 00000853.SSF
G1 2144-2150 41737.357577 -2295.262135 19375.270755
G2  7.77694573984221E-007  1.29452584715051E-006  2.08172235048507E-006
G3  6.00987989565920E-007 -6.46270907244677E-007 -8.05971880558044E-007

G0 'V88 Day085(D) 18:13 00000869.SSF
G1 2111-2150 -2184.789365 8898.954781 5416.358548
G2  8.81859407284667E-006  4.05800786432511E-006  3.78639738753234E-006
G3  4.87821613242237E-006 -3.96676894902590E-006 -3.13475626881342E-006

G0 'V89 Day085(C) 16:12 00000861.SSF
G1 2150-2151 6906.391526 -5574.209736 -671.268133
G2  4.66534044524401E-007  8.14882028221057E-007  1.24976932888519E-006
G3  3.66653727886568E-007 -3.87630890266014E-007 -5.01295016547981E-007

G0 'V90 Day085(C) 17:03 00000857.SSF
G1 1638-2150 13211.816599 -14179.771952 -3799.657613
G2  1.76229898331058E-006  2.63222199256524E-006  4.71493594984409E-006
G3  1.21322728399105E-006 -1.37943815649525E-006 -1.44270423075387E-006
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G0 'V91 Day085(D) 18:14 00000873.SSF
G1 2150-2144 -41737.360933 2295.271322 -19375.276928
G2  6.50344730029430E-007  1.20773410484478E-006  1.94058790497519E-006
G3  3.90013169534999E-007 -2.93023580011032E-007 -9.28794220149613E-007

G0 'V92 Day085(D) 18:14 00000877.SSF
G1 1638-2144 -28525.536074 -11884.507404 -23174.938221
G2  1.32821012726902E-006  2.43575504998166E-006  3.87944555350053E-006
G3  8.05261213309122E-007 -5.91184500250502E-007 -1.86170416343055E-006

G0 'V93 Day085(E) 20:16 00000881.SSF
G1 1638-2150 13211.812204 -14179.790751 -3799.656910
G2  4.60552529041934E-006  6.12322356695141E-006  6.08044460266760E-006
G3  3.79063402827631E-006 -3.12507692429282E-006 -3.40802657093068E-006

G0 'V94 Day085(E) 20:19 00000885.SSF
G1 1638-2098 -6847.329553 7793.103098 2340.367186
G2  8.67930912754087E-006  1.07201952379501E-005  1.73731594812341E-005
G3  6.35928197976771E-006 -4.25214921951555E-006 -7.11859127617358E-006

G0 'V95 Day085(E) 20:19 00000889.SSF
G1 2098-2147 -5855.749777 -12653.236782 -12092.558707
G2  7.16860657489271E-006  8.76475053623648E-006  1.47728853427645E-005
G3  5.16988698591007E-006 -3.32771882247622E-006 -5.87997757670833E-006

G0 'V96 Day085(E) 20:15 00000893.SSF
G1 2144-2147 15822.463008 7024.393209 13422.719954
G2  4.44540008537587E-006  5.58992357266994E-006  5.53371497670124E-006
G3  3.61934417218555E-006 -2.90693492634271E-006 -3.18024372223644E-006

G0 'V97 Day085(F) 21:19 00000897.SSF
G1 1638-2098 -6847.322732 7793.119476 2340.342644
G2  6.43693960013582E-006  1.00390239931655E-005  1.03152004233886E-005
G3  6.20036867500303E-006 -4.35756101188178E-006 -7.50500125908883E-006

G0 'V98 Day085(F) 21:19 00000901.SSF
G1 1638-2147 -12703.071827 -4860.120829 -9752.209419
G2  4.76611287541226E-006  7.38038776790928E-006  7.56845967362938E-006
G3  4.58023876217111E-006 -3.24861788202154E-006 -5.53145160041280E-006

G0 'V99 Day085(F) 21:16 00000905.SSF
G1 2147-2144 -15822.466924 -7024.388611 -13422.722033
G2  3.38053063848967E-006  5.03013387810207E-006  5.08792093282982E-006
G3  3.20679131515706E-006 -2.23206651184296E-006 -3.71407395448628E-006

G0 'V100 Day085(F) 21:15 00000909.SSF
G1 2150-2147 -25914.893186 9319.654756 -5952.551721
G2  2.74795462651070E-006  4.07152873079350E-006  4.17518813485665E-006
G3  2.60024553241834E-006 -1.80002358296223E-006 -3.00815900290768E-006

G0 'V101 Day085(G) 22:17 00000913.SSF
G1 2098-2147 -5855.747135 -12653.247296 -12092.558279
G2  2.80262806638341E-006  7.10089185636858E-006  1.00318248228098E-005
G3  3.55805614653379E-006 -4.17466155650815E-006 -7.29742441536059E-006

G0 'V102 Day085(G) 22:17 00000917.SSF
G1 1638-2147 -12703.074622 -4860.115546 -9752.217551
G2  3.91146278419436E-006  9.54869625219644E-006  1.32450231789281E-005
G3  4.93600480283428E-006 -5.73584472041060E-006 -9.76967923386299E-006

G0 'V103 Day085(H) 23:18 00000921.SSF
G1 2147-2145 -9314.310999 -3364.292370 -7312.512431
G2  2.15321341951878E-006  2.80011243744511E-006  2.60141042084315E-006
G3  1.38511726538483E-006 -1.48476490560229E-006 -8.66753274746757E-007
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G0 'V104 Day085(H) 23:17 00000925.SSF
G1 2100-2145 -13775.058577 -20025.420297 -21676.496357
G2  5.30176891303072E-006  7.55675467185817E-006  7.04792252344012E-006
G3  3.49417348370474E-006 -3.74293940155717E-006 -2.27872430540295E-006

G0 'V105 Day085(H) 23:17 00000929.SSF
G1 2098-2100 -1394.993694 4007.883505 2271.429015
G2  1.51310887779736E-006  2.48432153859209E-006  2.74219475878177E-006
G3  7.61169366405901E-007 -1.40059252121241E-006 -4.32254504891579E-007

G0 'V106 Day086(I) 00:17 00000933.SSF
G1 2098-2145 -15170.053413 -16017.545438 -19405.093589
G2  5.07836744658931E-006  1.08138297439788E-005  1.90518467322898E-005
G3  3.79498362246490E-006 -4.03519506552893E-006 -9.02090471678527E-006

G0 'V107 Day086(J) 01:01 00000945.SSF
G1 2098-2149 -7158.243084 12559.843430 5630.099904
G2  2.34469333142872E-006  3.27344204754793E-006  5.57383104589629E-006
G3  1.88311045152086E-006 -2.28566868675543E-006 -3.30427395257512E-006

G0 'V108 Day086(I) 00:18 00000937.SSF
G1 2098-2100 -1394.984453 4007.891618 2271.413780
G2  1.17503027674550E-006  2.62466332003064E-006  4.60853948125162E-006
G3  8.56051002771500E-007 -9.25280304938500E-007 -2.20124058600168E-006

G0 'V109 Day086(J) 00:58 00000949.SSF
G1 2098-2148 -7163.955420 -9261.199517 -10287.124913
G2  4.16060806384380E-006  5.55896291999942E-006  9.83747085881612E-006
G3  3.27627356379205E-006 -4.02064468360579E-006 -5.70602456613134E-006

G0 'V110 Day086(A) 15:00 00000973.SSF
G1 1779-2149 8829.938625 -12258.659837 -4535.498455
G2  2.61347903471355E-006  4.33014944946106E-006  9.20909945649728E-006
G3  1.49453064348681E-006 -5.68196828847506E-007 -2.98583998568291E-006

G0 'V111 Day086(J) 00:59 00000957.SSF
G1 2148-2145 -8006.104127 -6756.349285 -9117.945321
G2  6.33695696611136E-006  6.05640134328945E-006  1.12096693160150E-005
G3  4.65550537574914E-006 -5.91583436624359E-006 -5.83715905332910E-006

G0 'V112 Day086(K) 02:01 00000961.SSF
G1 2100-2149 -5763.241365 8551.967522 3358.668930
G2  4.62121456330792E-006  1.20304826379427E-005  1.11079793925039E-005
G3  3.64923173192305E-006 -4.29402203892013E-006 -4.79630240840311E-006

G0 'V113 Day086(J) 00:59 00000953.SSF
G1 2100-2148 -5768.962512 -13269.081851 -12558.564286
G2  7.47524385182860E-006  7.82201135859702E-006  1.41901670620123E-005
G3  5.66913599184487E-006 -7.11937366366005E-006 -7.60923018404842E-006

G0 'V114 Day086(K) 02:00 00000965.SSF
G1 2149-2148 -5.716245 -21821.035724 -15917.240771
G2  3.38195320978979E-006  5.18102548854046E-006  6.36677132180487E-006
G3  2.28384830570843E-006 -3.04539363134869E-006 -2.75508376363221E-006

G0 'V115 Day086(K) 02:00 00000969.SSF
G1 2098-2148 -7163.954260 -9261.165909 -10287.140202
G2  6.25893038128992E-006  1.00351067605115E-005  1.09547805071403E-005
G3  4.02782744773053E-006 -5.13991684908251E-006 -5.24434195641061E-006

G0 'V116 Day086(A) 14:49 00000977.SSF
G1 1779-2143 -13297.852745 -31841.488183 -30161.931576
G2  2.01799780261835E-006  3.71004759393904E-006  6.16135251762990E-006
G3  1.23050643534955E-006 -7.49397767152228E-007 -2.28832417448892E-006
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G0 'V117 Day086(A) 14:49 00000981.SSF
G1 1779-2146 -274.392738 -32466.820428 -23921.425250
G2  2.62055890426170E-006  4.88338661618579E-006  8.11348155611139E-006
G3  1.61006109246701E-006 -9.67651255707673E-007 -3.04074176732020E-006

G0 'V118 Day086(B) 16:15 00000989.SSF
G1 1779-2149 8829.947166 -12258.651754 -4535.506333
G2  1.66535036131441E-006  3.30018364949930E-006  4.57223857705125E-006
G3  1.45367874611733E-006 -1.59553153393849E-006 -2.15651332982437E-006

G0 'V119 Day086(A) 14:56 00000985.SSF
G1 1779-2148 8824.221264 -34079.703203 -20452.721091
G2  7.03503899366537E-006  3.47591746452934E-006  5.48576143324772E-006
G3  2.52564526931525E-006 -1.03530146391943E-006 -1.98454134513170E-006

G0 'V120 Day086(B) 16:04 00000993.SSF
G1 1779-2143 -13297.837910 -31841.471755 -30161.953951
G2  2.15881670026405E-006  4.16720856423059E-006  5.68604693028727E-006
G3  1.89431879542807E-006 -1.96734047376154E-006 -2.69970767220927E-006

G0 'V121 Day086(B) 16:15 00000997.SSF
G1 2143-2146 13023.452872 -625.339294 6240.515770
G2  1.56284398758294E-006  3.08260407071196E-006  4.16719242374200E-006
G3  1.37933108326007E-006 -1.48282979805696E-006 -2.00976218054313E-006

G0 'V122 Day086(B) 16:16 00001001.SSF
G1 2146-2147 10406.825641 -5004.939477 1663.265371
G2  1.85568097609391E-006  3.65622654623320E-006  5.04172562691318E-006
G3  1.62231544515058E-006 -1.77899846521311E-006 -2.39785539434789E-006

G0 'V123 Day086(C) 17:17 00001005.SSF
G1 2143-2146 13023.457682 -625.339918 6240.515363
G2  1.91438175754427E-006  2.59567132386284E-006  4.66022465383382E-006
G3  1.17841470814777E-006 -1.25570975803411E-006 -1.58139353659398E-006

G0 'V124 Day086(C) 17:17 00001009.SSF
G1 2143-2147 23430.277796 -5630.273219 7903.778609
G2  1.00691601511148E-006  1.37800692531379E-006  2.61935964893289E-006
G3  6.18232290274032E-007 -6.96441506272008E-007 -8.41461331886657E-007

G0 'V125 Day086(D) 18:18 00001013.SSF
G1 2148-2147 1308.226572 -3392.041387 -1805.445254
G2  2.15305177519034E-006  2.06836178319784E-006  1.79850395178435E-006
G3  1.49633624867246E-006 -7.21015980005788E-007 -1.29894227647207E-006

G0 'V126 Day086(D) 18:18 00001017.SSF
G1 2148-2146 -9098.599924 1612.898015 -3468.711928
G2  8.72166623151500E-006  7.46884963053869E-006  6.60549890201110E-006
G3  5.96147466856745E-006 -3.38721620963873E-006 -4.93322964998082E-006

G0 'V127 Day086(E) 19:19 00001021.SSF
G1 2145-2146 -1092.503282 8369.227100 5649.239432
G2  2.87122885554358E-006  4.44552706058492E-006  8.65691907426032E-006
G3  1.82239049597961E-006 -1.68335705234668E-006 -3.30238138819930E-006

G0 'V128 Day086(E) 19:19 00001025.SSF
G1 8597-2146 6120.022304 6439.610460 7929.169834
G2  1.61058408969254E-006  2.70230183905381E-006  6.00142726027230E-006
G3  9.70506888765169E-007 -1.11212175287981E-006 -2.14710416337605E-006

G0 'V129 Day086(F) 20:22 00001029.SSF
G1 8597-2146 6120.014225 6439.611098 7929.178431
G2  6.92581584677923E-006  8.09549730551547E-006  6.28089526916571E-006
G3  6.10600848061841E-006 -4.15685344186324E-006 -4.59914539248865E-006
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G0 'V130 Day086(F) 20:22 00001033.SSF
G1 8597-2142 -6095.606768 3334.601506 -681.756337
G2  3.74083540735642E-006  4.35030959858818E-006  3.33716290447359E-006
G3  3.30702673421367E-006 -2.24762530949163E-006 -2.46931023623854E-006

G0 'V131 Day086(F) 20:25 00001037.SSF
G1 8597-2145 7212.529238 -1929.612799 2279.936940
G2  7.84266765491787E-006  8.36247703859372E-006  5.41405429925021E-006
G3  7.18114586836356E-006 -4.65610764408010E-006 -4.80490455197387E-006

G0 'V132 Day086(F) 20:25 00001041.SSF
G1 2145-2144 -6508.150385 -3660.098409 -6110.212346
G2  5.72220791096058E-006  6.05467912711678E-006  4.02628559910278E-006
G3  5.17032797200765E-006 -3.16574337828680E-006 -3.44695424355351E-006

G0 'V133 Day086(G) 21:22 00001045.SSF
G1 8597-2142 -6095.610352 3334.603117 -681.753060
G2  2.26811912346097E-006  3.92129312201274E-006  4.43424872702735E-006
G3  2.26382447916097E-006 -1.87125372745679E-006 -3.23729025586791E-006

G0 'V134 Day086(G) 21:22 00001049.SSF
G1 8597-2144 704.375459 -5589.710133 -3830.276423
G2  2.10086706583842E-006  3.52759499923536E-006  4.00558806517422E-006
G3  2.07827709204404E-006 -1.74486158092323E-006 -2.93068779057514E-006

G0 'V135 Day086(H) 22:23 00001053.SSF
G1 8597-2144 704.373819 -5589.714486 -3830.275656
G2  8.85576531647371E-007  1.27119986077260E-006  3.51647141749271E-006
G3  6.47094375072256E-007 -1.01300706316096E-006 -1.44185654489224E-006

G0 'V136 Day086(H) 22:22 00001057.SSF
G1 2144-2141 -13382.276763 10418.844954 942.992916
G2  8.03406623568664E-007  1.11348313036138E-006  3.07300010101442E-006
G3  5.84598308997959E-007 -9.15035829755544E-007 -1.27331287671972E-006

G0 'V137 Day086(H) 22:23 00001061.SSF
G1 2142-2141 -6582.291527 1494.530837 -2205.536854
G2  8.62086369251786E-007  1.18042014493965E-006  3.25631472584666E-006
G3  6.24774528772827E-007 -9.76565147989028E-007 -1.35099099528424E-006

G0 'V138 Day086(I) 23:23 00001065.SSF
G1 8472-2144 15152.020262 23996.698059 25876.438623
G2  1.33771137902668E-006  1.73496230109218E-006  1.56180901617419E-006
G3  9.71934624853355E-007 -7.84685632825985E-007 -7.55404515266898E-007

G0 'V139 Day086(I) 23:23 00001069.SSF
G1 8472-2142 8352.033309 32921.008615 29024.962453
G2  1.47257779076358E-006  1.90905075554622E-006  1.71161541350731E-006
G3  1.06673878201536E-006 -8.75215206805544E-007 -8.35113434669729E-007

G0 'V140 Day086(I) 23:24 00001073.SSF
G1 8472-2141 1769.743632 34415.542639 26819.430278
G2  1.28792093415627E-006  1.68409853447745E-006  1.47086073977885E-006
G3  9.44378820352262E-007 -7.48526539132517E-007 -7.38801466345532E-007

G0 'V141 Day087(J) 00:24 00001089.SSF
G1 2137-2144 10762.400739 -12817.316020 -4027.497297
G2  5.82203410439669E-006  1.35737969949972E-005  1.64252124544584E-005
G3  6.45547015001429E-006 -5.32802427487827E-006 -1.19450243443507E-005

G0 'V142 Day087(J) 00:25 00001081.SSF
G1 2137-2142 3962.417384 -3893.002164 -878.973192
G2  5.74057435681845E-006  1.35150394449071E-005  1.63831116564552E-005
G3  6.40424382796601E-006 -5.30825396467462E-006 -1.19456285187305E-005
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G0 'V143 Day087(J) 00:25 00001077.SSF
G1 2137-8472 -4389.625021 -36814.037530 -29903.922943
G2  7.42382993222802E-006  1.76499265875124E-005  2.15213879377845E-005
G3  8.31689243410149E-006 -6.95624041920408E-006 -1.56917300722002E-005

G0 'V144 Day087(J) 00:25 00001085.SSF
G1 2137-2141 -2619.867338 -2398.464194 -3084.511304
G2  7.74938159245721E-007  1.80937489035995E-006  2.18328226921987E-006
G3  8.60987992646193E-007 -7.07579960459730E-007 -1.59199204820089E-006

G0 'V145 Day087(K) 01:26 00001093.SSF
G1 8472-2144 15152.013256 23996.701035 25876.458297
G2  1.31340478435005E-006  2.41260174403381E-006  2.65314064519782E-006
G3  9.48122437331604E-007 -1.22103876986777E-006 -1.29572854266051E-006

G0 'V146 Day087(K) 01:26 00001097.SSF
G1 2144-2142 -6799.984853 8924.306369 3148.527908
G2  1.09457645675580E-006  2.02624059955718E-006  2.18817209071103E-006
G3  7.90807871985291E-007 -1.00895142452042E-006 -1.08126230791781E-006

G0 'V147 Day087(L) 02:28 00001101.SSF
G1 8597-8472 -14447.625493 -29586.402453 -29706.735157
G2  2.13050641290002E-006  2.86025541337593E-006  4.11397850684944E-006
G3  1.22097563753009E-006 -1.72067266194970E-006 -2.07553843707197E-006

G0 'V148 Day087(L) 02:10 00001105.SSF
G1 8597-2143 -6903.427931 7064.951208 1688.663385
G2  9.07259730141592E-007  1.50600165062735E-006  1.92520056168830E-006
G3  5.51459735209177E-007 -7.73156986483685E-007 -9.78210960577525E-007

G0 'V149 Day087(L) 02:27 00001109.SSF
G1 2143-2142 807.829212 -3730.345312 -2370.404096
G2  2.53317692237411E-007  3.26893676830127E-007  4.70157573323614E-007
G3  1.41129199678924E-007 -2.00879762073949E-007 -2.39352965624210E-007

G0 'V150 Day087(L) 02:27 00001113.SSF
G1 2144-2142 -6799.984641 8924.316864 3148.523204
G2  1.23532900095394E-006  1.59867675746501E-006  2.29418144512809E-006
G3  6.91668429251919E-007 -9.88295382519551E-007 -1.16655469241630E-006
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G0 'V151 Day350(1) 17:06 00005224.ssf
G1 2155-2886 809.692251 -2009.990846 -1209.877235
G2  1.71667798330459E-006  4.81604680477167E-006  3.18126610940093E-006
G3  1.89500866410835E-006 -1.33363159714702E-006 -2.17759012380450E-006

G0 'V152 Day350(1) 17:07 00005228.ssf
G1 2886-2887 985.314875 1396.580260 1446.690644
G2  1.34038254729500E-006  4.17618777891485E-006  2.47844306448541E-006
G3  1.58243043976034E-006 -1.07176397966096E-006 -1.89339491685781E-006

G0 'V153 Day357(0) 16:21 00005260.ssf
G1 2886-2887 985.316982 1396.573017 1446.701331
G2  6.88806696124616E-007  1.85627574101610E-006  1.21094284875082E-006
G3  8.16466509657296E-007 -5.80923839661905E-007 -9.46136137449712E-007

.DATA OFF
G0 'V154 Day357(1) 17:33 00005276.ssf
G1 2884-2887 1682.634512 -971.245566 -38.121231
G2  1.28469669046191E-006  1.94704986931319E-006  1.87837848330297E-006
G3  1.27217714491468E-006 -7.03940078977303E-007 -8.09523579085931E-007
```

```
G0 'V155 Day357(2) 18:40 00005284.ssf
G1 2155-2884 112.373379 357.833875 274.937992
G2  9.50411473660070E-007  2.28481590118759E-006  9.22869852663631E-007
G3  1.29631238011008E-006 -6.11049301000055E-007 -1.11722828997680E-006

.DATA ON
G0 'V156 Day357(2) 18:40 00005288.ssf
G1 2155-2887 1795.007433 -613.415073 236.815127
G2  2.60659398699497E-006  2.28488368844901E-006  1.08154760943042E-005
G3  2.26893895054179E-006  3.34217456838655E-006  3.43191880291193E-006

G0 'V157 Day357(3) 19:51 00005304.ssf
G1 2158-2886 -4349.311835 2321.404610 -429.273256
G2  1.34709420508047E-006  1.90506080120936E-006  3.85158490586301E-006
G3  1.09792468858228E-006 -7.23839038157733E-007 -6.97309181214955E-007

G0 'V158 Day357(4) 21:05 00005308.ssf
G1 2158-2887 -3363.989801 3717.994698 1017.401840
G2  4.35517556160964E-006  3.85222155046343E-006  3.93523452558115E-006
G3  3.38318287131903E-006 -2.40762051728893E-006 -2.98218062731543E-006

G0 'V159 Day357(4) 21:04 00005312.ssf
G1 2887-2886 -985.319587 -1396.584213 -1446.689833
G2  2.37855798107234E-006  3.06552015943893E-006  2.69697959158578E-006
G3  1.91708663216316E-006 -6.79394878750792E-007 -1.87442365317545E-006

[File: \\SERVER\workfiles\STARNET PROJECTS\PROJECTS\HDR\PACR 2013\HDR.gps]
.GPS WEIGHT COVARIANCE

G0 'V160 Day299(0) 15:27 00006584.ssf
G1 2155-1A 783.229847 -1982.400802 -1207.396345
G2  6.65997309795956E-007  1.36600053602421E-006  1.91651762402770E-006
G3  7.30620121408759E-007 -8.18470253102771E-007 -1.36167644357363E-006

G0 'V161 Day299(0) 15:28 00006588.ssf
G1 2155-2 767.616190 -2000.738470 -1226.087963
G2  7.14497475201021E-007  1.50762980952814E-006  2.61223724578919E-006
G3  8.14685323753002E-007 -1.00833724235704E-006 -1.68134596210393E-006

G0 'V162 Day299(0) 15:35 00006592.ssf
G1 2155-3 632.148069 -1928.235232 -1252.144106
G2  7.54839448116616E-007  1.67798558055525E-006  2.31644529841339E-006
G3  8.68778226042157E-007 -9.80908719528613E-007 -1.68669301858514E-006

G0 'V163 Day299(0) 17:28 00006596.ssf
G1 1A-2 -15.617851 -18.339312 -18.688906
G2  1.68798328639356E-007  2.95384606929580E-007  3.19652461844843E-007
G3  1.49221698422411E-007 -9.16393576618352E-008 -1.07105000611035E-007

G0 'V164 Day299(0) 15:36 00006600.ssf
G1 2887-1A -1011.780579 -1368.995412 -1444.203569
G2  9.37220018556043E-007  2.00237954648858E-006  2.61241478575683E-006
G3  1.06332232995578E-006 -1.16638366889554E-006 -1.96288671919575E-006

G0 'V165 Day299(0) 15:36 00006604.ssf
G1 2887-2 -1027.393506 -1387.332293 -1462.896917
G2  1.13921839551373E-006  2.51176094422938E-006  4.27759687179461E-006
G3  1.35361734111778E-006 -1.68050094058956E-006 -2.83125152183506E-006

G0 'V166 Day299(0) 15:36 00006608.ssf
G1 2887-3 -1162.861938 -1314.829176 -1488.952674
G2  9.14993384478023E-007  1.95900899801287E-006  2.67800819533477E-006
G3  1.04551829846478E-006 -1.17200635304949E-006 -1.96955938666946E-006
```

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G0 'V167 Day299(1) 16:47 00006612.ssf
G1 2886-1A -26.463228 27.604952 2.483476
G2  6.95139711409746E-007  9.17538092280349E-007  1.91863756191091E-006
G3  4.09186570161134E-007 -6.43629310672254E-007 -7.43624154134203E-007

G0 'V168 Day299(1) 16:47 00006616.ssf
G1 2886-2 -42.078996 9.265506 -16.202687
G2  7.30252387584588E-007  1.14530687576101E-006  1.94503176208821E-006
G3  4.83183846059408E-007 -5.05016918517043E-007 -7.68168361301953E-007

G0 'V169 Day299(1) 16:47 00006620.ssf
G1 2886-3 -177.544208 81.770636 -42.261069
G2  2.70917213568237E-006  1.63234784837578E-006  4.04750469407954E-006
G3  1.48364814689955E-006 -2.56275111456733E-006 -1.84954918607003E-006

G0 'V170 Day299(1) 17:00 00006624.ssf
G1 2158-1A -4375.763862 2349.019085 -426.794775
G2  9.72665798565359E-007  1.51855982079953E-006  1.75563768496741E-006
G3  7.11743532414093E-007 -5.15558308786729E-007 -9.60525501722259E-007

G0 'V171 Day299(1) 17:00 00006628.ssf
G1 2158-2 -4391.381161 2330.680895 -445.480229
G2  1.25233282384086E-006  1.52102876314525E-006  2.12416024639024E-006
G3  8.40670853261021E-007 -8.79810055801740E-007 -1.10640077768307E-006

G0 'V172 Day299(1) 17:00 00006632.ssf
G1 2158-3 -4526.860105 2403.185569 -471.532801
G2  2.03877287433108E-006  1.34175761174571E-006  2.90617376897934E-006
G3  1.14027430456160E-006 -1.88845643183184E-006 -1.38508780508139E-006

G0 'V173 Day299(0) 16:30 00006636.ssf
G1 2-3 -135.479696 72.494993 -26.042488
G2  1.59534698315696E-006  2.24089087992178E-006  7.85505358744573E-006
G3  1.05943101185705E-006 -2.01140753427747E-006 -2.71676686915204E-006

G0 'V174 Day299(2) 17:59 00006640.ssf
G1 2155-1A 783.217965 -1982.406165 -1207.385766
G2  4.62729221359306E-007  1.44922243187291E-006  1.79281303407705E-006
G3  4.62095415931354E-007 -3.46071695615237E-007 -1.18342052248523E-006

G0 'V175 Day299(2) 17:59 00006644.ssf
G1 2155-2 767.604850 -2000.740976 -1226.088913
G2  2.52912205393346E-007  9.95470119686885E-007  2.44964147652031E-006
G3  2.38993694581221E-007 -3.25727052539035E-007 -9.42029974244909E-007

G0 'V176 Day299(2) 17:59 00006648.ssf
G1 2155-3 632.134331 -1928.243108 -1252.134884
G2  4.35732967445362E-007  1.21974586873685E-006  1.45689948951059E-006
G3  4.33889395977587E-007 -3.06931841526379E-007 -9.65525362372601E-007

G0 'V177 Day299(2) 18:07 00006652.ssf
G1 2887-1A -1011.776685 -1368.988977 -1444.209822
G2  6.13979399294289E-007  1.62633829438553E-006  2.17445218384251E-006
G3  6.28694855253464E-007 -4.11178447386739E-007 -1.27833252248759E-006

G0 'V178 Day299(2) 18:07 00006656.ssf
G1 2887-2 -1027.394174 -1387.330519 -1462.899283
G2  3.86967280989520E-007  1.01771195861925E-006  2.93372297725561E-006
G3  3.98000295478756E-007 -4.06354449362142E-007 -9.27259127729012E-007

G0 'V179 Day299(2) 18:07 00006660.ssf
G1 2887-3 -1162.860794 -1314.827368 -1488.953427
G2  4.98989240516251E-007  1.26103143775751E-006  3.68250716432353E-006
G3  5.04732381556388E-007 -5.67960368768039E-007 -1.21145914644017E-006
```

```
G0 'V180 Day299(3) 19:22 00006664.ssf
G1 2886-1A -26.467820 27.596888 2.490820
G2  4.47059428096659E-007  3.48572764701109E-006  2.84394878173250E-006
G3  1.67578997566892E-007 -3.70531709245124E-007 -2.49331533115209E-006

G0 'V181 Day299(3) 19:22 00006668.ssf
G1 2886-2 -42.083005 9.252225 -16.197184
G2  8.84392570756556E-007  1.38459770045611E-006  4.29177727546987E-006
G3  4.59445849864497E-007 -1.11779257683971E-006 -4.24111539756730E-007

G0 'V182 Day299(0) 17:22 00006672.ssf
G1 1A-3 -151.086793 54.162805 -44.746022
G2  3.68363977983284E-007  9.47212738431866E-007  1.29958587598201E-005
G3  3.61219059053517E-007 -1.13448213797627E-006 -2.85214479348016E-006

G0 'V183 Day299(3) 20:00 00006676.ssf
G1 2158-1A -4375.763793 2349.018527 -426.785090
G2  1.53601642959569E-006  3.05961075715845E-006  2.35060118281640E-006
G3  1.52296566591241E-006 -1.50719434912983E-006 -1.44447902211235E-006

G0 'V184 Day299(3) 20:00 00006680.ssf
G1 2158-2 -4391.380812 2330.677175 -445.470991
G2  1.32430070547918E-006  2.65002805990502E-006  2.04052114672365E-006
G3  1.31246630430767E-006 -1.30204899901703E-006 -1.24460429472035E-006

# SUBSEQUENT TO PERFORMING THE GPS MEASUREMENTS AND PRIOR REMOVING THE TRIBRACH
# FROM THE TRIPOD, IT WAS DISCOVERED THAT THE GPS RECEIVER OCCUPYING PACR CP-1 WAS
# NOT CENTERED OVER THE EXISTING REBAR. USING THE OPTICAL PLUMMET AND A TAPE A DISTANCE
# OF 0.04 FEET (NORTHEASTERLY) WAS MEASURED FROM THE CENTER OF THE REBAR TO THE ACTUAL
# POINT OF OCCUPATION. THIS POINT WAS RENUMBERED 1A IN THIS ADJUSTMENT AND THE ACTUAL
# TERRESTRIAL MEASUREMENTS TO THE CENTER OF THE REBAR IS THE TRUE POINT AND IS NUMBERED
# POINT NUMBER 1 IN THE TERRESTRIAL MEASUREMENTS FILE.
```

```
[File: \\SERVER\workfiles\STARNET PROJECTS\PROJECTS\HDR\PACR 2013\HDR-1.dat]
# STAR*TDS Version 3.0.4
# Copyright 2006 Starplus Software, Inc.

# Input Field File : \\SERVER\workfiles\STARNET PROJECTS\PROJECTS\CCGF\2013 READJUSTMENT\HDR-1.RAW
# Date Processed   : 10-25-2013 20:56:18

.Units  FeetUS
.Units  DMS
.Order  AtFromTo
.Sep    -
.Delta  Off
.3D

# Job  : HDR-1
# Date : 10-24-2013
# Time : 10:11:05

# TERRESTRIAL MEASUREMENTS BETWEEN EXISTING CONTROL POINT 2886 SCHREINER AND NEW
# CONTROL POINTS ESTABLISHED FOR THIS PROJECT.

# CREW: WILLIAM VERNON AND JEFF HEISTAND
# AIR PRESSURE: 28.1" MERCURY
# TEMPERATURE: 46° F
# PPM: 10
# PRISM OFFSET 28MM
# SUNNY

# SEE FIELD BOOK # 1, 5-29-5, PAGES 14-21


DV 2886-2                           151.0330  92-11-45.86   5.310/5.260
M  2886-2-1          41-03-09.50    125.7450  95-51-36.97   5.310/5.080 'PACR CP-1
DV 2-2886                           151.0200  87-55-13.86   5.410/5.160
M  2-2886-1        304-33-41.50     100.0000  93-56-30.58   5.410/5.400 'PACR CP-1

TB 2886                                                                'SCHREINER
T  2               142-15-00.50     303.4295  90-34-29.21   5.410/5.190 'PACR CP-2
M  2-20-2886       217-45-05.50     151.0230  87-55-07.36   5.410/5.160 'SCHREINER
T  20              229-56-51.50     184.5225  91-23-02.72   5.340/5.280 'SPK
M  20-21-2         130-03-23.00     303.4265  89-29-00.71   5.340/5.260 'PACR CP-2
T  21              246-18-59.50     317.7950  94-43-36.65   5.430/5.160 'SPK
M  21-3-20         113-41-07.50     184.5140  88-42-56.22   5.430/5.190 'SPK
M  3-21-4           96-17-10.75     178.6618  88-01-57.49   5.320/5.370 'PACR CP-4
T  3               177-34-35.83     662.9440  91-45-59.36   5.320/5.250 'PACR CP-3
M  3-22-21         182-25-26.00     317.7700  85-19-43.65   5.320/5.280 'SPK
M  3-22-4          278-42-37.50     178.6495  88-07-20.24   5.320/5.070 'PACR CP-4
M  22-3-6           52-45-38.00     130.5800  87-54-26.95   5.400/5.410 'PACR CP-6
M  22-3-5          284-11-35.00     348.0520  90-53-17.03   5.400/5.560 'PACR CP-5
T  22              338-54-21.50     298.3430  89-21-40.74   5.400/5.190 'SPK
M  22-23-5         305-17-09.50     348.0585  90-56-47.03   5.400/5.210 'PACR CP-5
M  22-23-6          73-51-13.00     130.5770  88-00-17.45   5.400/5.190 'PACR CP-6
M  23-22-3         216-42-02.00     399.3560  87-37-15.31   5.340/5.160 'PACR CP-3
T  23              143-09-00.50     251.9695  88-04-21.93   5.340/5.070 'SPK
M  23-24-22        216-50-49.50     298.3490  90-42-19.74   5.340/5.250 'SPK
T  24              213-29-18.50     619.0195  85-39-07.88   5.220/5.300 'SPK
M  24-2886-23      146-30-36.50     251.9780  92-00-15.43   5.220/5.190 'SPK
TE 2886            308-22-17.00       2 #CLOSING ANGLE TO 2
DV 2886-2                           151.0545  92-24-23.86   5.450/4.860

# MEASUREMENT FROM CENTER OF REBAR TO GPS POINT OF OCCUPATION OF POINT PACR CP-1.

.2D
D  1-1A .04
```

Summary of Unadjusted Input Observations

Number of Entered Stations (Meters) = 29

Fixed Stations	Latitude	Longitude	Elev	Description
1638	48-11-52.346400	124-07-08.353170	4.8130	N 469 (TS0058)
1885	48-07-25.148280	123-27-04.017310	4.0690	944 4090 A TIDAL (TR2551)
8597	47-56-12.192210	124-23-44.165620	87.9500	FORKS RESET (SD0880)

Partially Fixed	Latitude	Longitude	Elev	Description
	N-StdErr	E-StdErr	StdErr	
1487	47-49-27.056410	122-52-31.623930	12.7300	SCHOOL(SY5641)
	0.0356	0.0358	0.0300	
1779	48-22-00.750240	124-37-15.661790	5.6750	944 3090 A TIDAL (TS0340)
	0.0044	0.0032	0.0200	
1823	n/a	n/a	76.0600	SAWMILL 2 (TR2398)
	FREE	FREE	FIXED	
1927	48-08-30.271490	123-25-32.183110	4.4000	EAST BASE AZ MK (TR2552)
	0.0194	0.0195	FREE	
2133	n/a	n/a	52.1280	CARLSBORG (TR0834)
	FREE	FREE	0.0100	
2137	47-56-22.820510	124-33-40.803780	57.8000	QUILLAYUTE RESET (SD0799)
	FIXED	FIXED	FREE	
2156	48-07-30.759810	123-30-08.015010	71.9900	CBL150 (AC5475)
	FIXED	FIXED	FREE	
8207	48-03-16.406310	122-48-33.663710	32.3980	JCIA(TR2696)
	0.0178	0.0133	0.0100	
8472	47-32-24.686040	124-19-55.026490	12.5600	QUIN (SD0881)
	0.0213	0.0189	0.0300	
8894	48-04-50.329010	123-06-14.704210	56.7000	WEGENEST (AI2209)
	FIXED	FIXED	FREE	

Free Stations	Latitude	Longitude	Elev	Description
2098	48-13-45.580811	124-15-14.852121	18.0350	GP05112-29
2111	48-04-18.909498	123-46-27.262665	180.0350	GP05101-11
2130	48-07-09.579497	123-40-11.738719	76.1290	GP05112-8
2136	48-02-24.424428	123-09-09.753912	139.4290	PETE
2141	n/a	n/a	88.6634	LAPUSH
2142	n/a	n/a	49.6093	GOODMAN
2144	n/a	n/a	71.6617	UNDIE RD.
2146	n/a	n/a	109.2375	BEDROCK
2148	n/a	n/a	150.9403	BEAVER FALLS
2149	n/a	n/a	4.3404	RAYS
2150	n/a	n/a	87.5662	S2500
2151	n/a	n/a	114.0503	CRESCENT HS
2160	n/a	n/a	14.7615	CASINO
2161	n/a	n/a	2.8316	GARDINER
8275	n/a	n/a	3.0000	QUARINTINE 2 (TR1746)
8870	n/a	n/a	2.6100	SAND (TR2365)

Number of Measured Angle Observations (DMS) = 23

At	From	To	Angle	StdErr	t-T
2	2886	1	304-33-41.50	15.88	0.00
2	2886	20	142-15-00.50	13.35	0.00
2	20	2886	217-45-05.50	13.35	-0.00
3	21	4	96-17-10.75	10.82	0.00
3	22	4	278-42-37.50	9.69	-0.00
3	22	21	182-25-26.00	7.82	-0.00
3	21	22	177-34-35.83	7.82	0.00
20	21	2	130-03-23.00	11.62	-0.00
20	2	21	229-56-51.50	11.62	0.00
21	20	3	246-18-59.50	11.11	0.00
21	3	20	113-41-07.50	11.11	-0.00
22	3	5	284-11-35.00	6.72	0.00
22	23	5	305-17-09.50	7.39	-0.00

22	3	6	52-45-38.00	11.83	0.00
22	23	6	73-51-13.00	12.60	0.00
22	3	23	338-54-21.50	6.61	0.00
23	22	3	216-42-02.00	8.75	-0.00
23	24	22	216-50-49.50	10.25	0.00
23	22	24	143-09-00.50	10.25	-0.00
24	2886	23	146-30-36.50	8.69	0.01
24	23	2886	213-29-18.50	8.69	-0.01
2886	2	1	41-03-09.50	13.02	-0.00
2886	24	2	308-22-17.00	10.48	-0.00

Number of Measured Distance Observations (Meters) = 26

From	To	Distance	StdErr	HI	HT	Comb Grid	Type
1	1A	0.0122	0.0029	0.000	0.000	0.9998967	H
2	1	30.4801	0.0030	1.649	1.646	0.9998965	S
2	20	92.4855	0.0031	1.649	1.582	0.9998964	S
2	2886	46.0319	0.0030	1.649	1.573	0.9998963	S
2	2886	46.0310	0.0030	1.649	1.573	0.9998963	S
3	4	54.4562	0.0030	1.622	1.637	0.9998979	S
3	4	54.4525	0.0030	1.622	1.545	0.9998979	S
3	21	96.8565	0.0031	1.622	1.609	0.9998974	S
3	22	202.0657	0.0032	1.622	1.600	0.9998985	S
20	2	92.4846	0.0031	1.628	1.603	0.9998964	S
20	21	56.2426	0.0030	1.628	1.609	0.9998967	S
21	3	96.8641	0.0031	1.655	1.573	0.9998974	S
21	20	56.2400	0.0030	1.655	1.582	0.9998967	S
22	5	106.0865	0.0031	1.646	1.695	0.9998991	S
22	5	106.0884	0.0031	1.646	1.588	0.9998991	S
22	6	39.7999	0.0030	1.646	1.582	0.9998988	S
22	6	39.8009	0.0030	1.646	1.649	0.9998988	S
22	23	90.9351	0.0031	1.646	1.582	0.9998989	S
23	3	121.7240	0.0031	1.628	1.573	0.9998983	S
23	22	90.9370	0.0031	1.628	1.600	0.9998989	S
23	24	76.8005	0.0030	1.628	1.545	0.9998986	S
24	23	76.8030	0.0030	1.591	1.582	0.9998986	S
24	2886	188.6775	0.0032	1.591	1.615	0.9998973	S
2886	1	38.3272	0.0030	1.618	1.548	0.9998965	S
2886	2	46.0350	0.0030	1.618	1.603	0.9998963	S
2886	2	46.0415	0.0030	1.661	1.481	0.9998963	S

Number of Zenith Observations (DMS) = 25

From	To	Zenith	StdErr	HI	HT
2	1	93-56-30.58	17.69	1.649	1.646
2	20	90-34-29.21	11.10	1.649	1.582
2	2886	87-55-13.86	13.90	1.649	1.573
2	2886	87-55-07.36	13.90	1.649	1.573
3	4	88-01-57.49	12.91	1.622	1.637
3	4	88-07-20.24	12.91	1.622	1.545
3	21	85-19-43.65	11.00	1.622	1.609
3	22	91-45-59.36	10.24	1.622	1.600
20	2	89-29-00.71	11.10	1.628	1.603
20	21	91-23-02.72	12.75	1.628	1.609
21	3	94-43-36.65	11.00	1.655	1.573
21	20	88-42-56.22	12.75	1.655	1.582
22	5	90-56-47.03	10.84	1.646	1.588
22	5	90-53-17.03	10.84	1.646	1.695
22	6	88-00-17.45	14.99	1.646	1.582
22	6	87-54-26.95	14.99	1.646	1.649
22	23	89-21-40.74	11.13	1.646	1.582
23	3	87-37-15.31	10.65	1.628	1.573
23	22	90-42-19.74	11.13	1.628	1.600
23	24	88-04-21.93	11.55	1.628	1.545
24	23	92-00-15.43	11.55	1.591	1.582
24	2886	85-39-07.88	10.27	1.591	1.615

2886	1	95-51-36.97	15.32	1.618	1.548
2886	2	92-11-45.86	13.90	1.618	1.603
2886	2	92-24-23.86	13.90	1.661	1.481

Number of GPS Vector Observations (Meters) = 182

From To	DeltaX DeltaY DeltaZ	StdErrX StdErrY StdErrZ	CorrelXY CorrelXZ CorrelYZ
(V1 Day083(A) 14:30 00000509.SSF)			
1487	7911.3995	0.0073	0.3311
2161	17765.6715	0.0120	-0.2881
	17322.8795	0.0110	-0.4829
(V2 Day083(A) 14:29 00000513.SSF)			
1487	312.9787	0.0073	0.3421
2160	19218.8098	0.0122	-0.2903
	14718.2929	0.0111	-0.4849
(V3 Day083(A) 14:25 00000517.SSF)			
8870	-1499.6134	0.0049	0.1614
2160	-2254.3010	0.0062	-0.1356
	-2418.4065	0.0059	-0.2905
(V4 Day083(A) 14:22 00000521.SSF)			
8207	-12643.4501	0.0052	0.2108
8870	8184.1555	0.0071	-0.1812
	-37.5098	0.0067	-0.3580
(V5 Day083(B) 15:33 00000525.SSF)			
2161	-7598.4098	0.0092	0.4209
2160	1453.1293	0.0107	-0.0074
	-2604.5768	0.0140	-0.3973
(V6 Day083(0) 15:33 00000529.SSF)			
1487	312.9775	0.0104	0.4418
2160	19218.7983	0.0122	-0.0094
	14718.3132	0.0161	-0.4121
(V7 Day083(B) 15:33 00000533.SSF)			
8207	-6544.6460	0.0080	0.3901
2161	4476.7263	0.0092	-0.0090
	148.6542	0.0118	-0.3751
(V8 Day083(C) 16:12 00000541.SSF)			
1487	312.9756	0.0078	0.4799
2160	19218.7943	0.0099	-0.4152
	14718.3061	0.0119	-0.4766
(V9 Day083(C) 16:12 00000537.SSF)			
1487	9594.4854	0.0083	0.6150
8275	20430.5424	0.0090	-0.4303
	20152.8316	0.0088	-0.4792
(V10 Day083(C) 16:11 00000545.SSF)			
8207	-4861.5413	0.0060	0.4059
8275	7141.6154	0.0066	-0.3012
	2978.5949	0.0069	-0.3563
(V11 Day083(C) 16:11 00000549.SSF)			
8207	-6544.6461	0.0066	0.4120
2161	4476.7256	0.0081	-0.3625
	148.6604	0.0094	-0.4281
(V12 Day083(D) 17:13 00000553.SSF)			
2161	1683.1067	0.0049	0.2121
8275	2664.8905	0.0056	-0.1802
	2829.9310	0.0055	-0.1976
(V13 Day083(F) 18:10 00000565.SSF)			
8894	12404.6831	0.0055	0.1845
8275	-6604.7375	0.0065	-0.1117
	1021.4560	0.0070	-0.3912
(V14 Day083(E) 17:43 00000557.SSF)			
8870	6098.7963	0.0111	0.4453
2161	-3707.4438	0.0115	-0.4395
	186.1924	0.0230	-0.2657

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(V15 Day083(E) 17:44 00000561.SSF)
8870                        7781.9022          0.0089           0.4034
8275                       -1042.5596          0.0094          -0.4042
                            3016.1263          0.0182          -0.2658
(V16 Day083(F) 18:08 00000573.SSF)
8894                       -1544.2648          0.0061           0.2209
2164                       -4719.7796          0.0074          -0.1292
                           -3781.0843          0.0082          -0.4524
(V17 Day083(G) 19:12 00000577.SSF)
2136                        4897.6925          0.0058           0.2536
8894                         872.9797          0.0071          -0.1812
                            2950.0941          0.0092          -0.4064
(V18 Day083(G) 19:14 00000581.SSF)
8894                        4622.7601          0.0058           0.2537
8870                       -5562.1822          0.0070          -0.1863
                           -1994.6629          0.0091          -0.4034
(V19 Day083(G) 19:12 00000585.SSF)
2136                        3353.4291          0.0061           0.2879
2164                       -3846.7964          0.0076          -0.1989
                            -830.9933          0.0099          -0.4300
(V20 Day083(H) 20:14 00000589.SSF)
8894                       -1544.2668          0.0067           0.3971
2164                       -4719.7844          0.0073          -0.3398
                           -3781.0706          0.0079          -0.3626
(V21 Day083(H) 20:13 00000593.SSF)
2160                       -4667.4442          0.0081           0.4692
2164                        3096.7203          0.0091          -0.4002
                             632.0011          0.0100          -0.4184
(V22 Day083(I) 21:13 00000601.SSF)
2133                        7089.7531          0.0114           0.7079
2163                       -1412.4275          0.0129          -0.4628
                            2347.8618          0.0121          -0.6168
(V23 Day083(I) 21:14 00000605.SSF)
2133                        2138.4780          0.0090           0.6354
2164                       -8374.5603          0.0102          -0.3949
                           -4715.2041          0.0099          -0.5736
(V24 Day083(I) 21:15 00000597.SSF)
8894                        3407.0071          0.0120           0.7070
2163                        2242.3414          0.0137          -0.4407
                            3281.9903          0.0131          -0.6212
(V25 Day083(I) 21:15 00000609.SSF)
2160                       -4667.4374          0.0107           0.6794
2164                        3096.7120          0.0122          -0.4149
                             631.9946          0.0118          -0.6026
(V26 Day083(J) 22:17 00000613.SSF)
2133                        3682.7566          0.0058           0.3377
8894                       -3654.7597          0.0067          -0.3617
                            -934.1431          0.0094          -0.5160
(V27 Day083(J) 22:16 00000617.SSF)
2133                        7089.7666          0.0083           0.5050
2163                       -1412.4235          0.0104          -0.4976
                            2347.8585          0.0158          -0.6529
(V28 Day083(J) 22:16 00000621.SSF)
2133                        2138.4895          0.0058           0.3449
2164                       -8374.5396          0.0068          -0.3693
                           -4715.2245          0.0094          -0.5294
(V29 Day083(K) 23:40 00000625.SSF)
8275                       -8997.6693          0.0109           0.5517
2163                        8847.0720          0.0127          -0.4300
                            2260.5531          0.0118          -0.4157
(V30 Day083(K) 23:36 00000629.SSF)
8894                       12404.6788          0.0061           0.3486
8275                       -6604.7371          0.0067          -0.2833
                            1021.4535          0.0065          -0.2767
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(V31 Day083(K) 23:47 00000633.SSF)
2136                        4897.6952          0.0065           0.3800
8894                         872.9949          0.0073          -0.2777
                            2950.0750          0.0070          -0.2895
(V32 Day083(K) 23:47 00000637.SSF)
2136                        1214.9443          0.0064           0.3693
2133                        4527.7589          0.0072          -0.2927
                            3884.2120          0.0071          -0.2761
(V33 Day084(L) 00:56 00000641.SSF)
2136                        1214.9455          0.0062           0.3139
2133                        4527.7521          0.0066          -0.3325
                            3884.2134          0.0089          -0.4110
(V34 Day084(L) 01:06 00000645.SSF)
2133                        3924.5821          0.0057           0.2783
2162                        3254.9574          0.0060          -0.3137
                            4301.2727          0.0075          -0.3728
(V35 Day084(L) 01:06 00000649.SSF)
2162                        3165.1831          0.0102           0.5265
2163                       -4667.3736          0.0101          -0.5098
                           -1953.4143          0.0144          -0.5503
(V36 Day084(M) 02:28 00000653.SSF)
2133                        3924.5784          0.0059           0.2447
2162                        3254.9528          0.0066          -0.3420
                            4301.2743          0.0073          -0.3487
(V37 Day084(M) 02:30 00000657.SSF)
2162                       -7999.8144          0.0085           0.3626
2159                        1320.7655          0.0100          -0.4745
                           -2880.1233          0.0114          -0.4805
(V38 Day084(M) 02:30 00000661.SSF)
2159                       -2430.9342          0.0085           0.3651
2157                       -8331.6409          0.0100          -0.4772
                           -6960.8989          0.0115          -0.4804
(V39 Day084(M) 02:03 00000665.SSF)
2136                       -5291.2338          0.0061           0.2726
2157                         771.8187          0.0074          -0.3673
                           -1655.5136          0.0077          -0.3753
(V40 Day084(A) 14:30 00000669.SSF)
2133                       -4075.2260          0.0073           0.3182
2159                        4575.7201          0.0112          -0.2707
                            1421.1531          0.0109          -0.4443
(V41 Day084(A) 14:30 00000673.SSF)
2159                       -2430.9387          0.0070           0.3120
2157                       -8331.6255          0.0108          -0.2656
                           -6960.8883          0.0105          -0.4406
(V42 Day084(A) 14:30 00000677.SSF)
1823                        6109.7323          0.0067           0.2993
2159                       -3186.5798          0.0102          -0.2555
                             576.0813          0.0099          -0.4279
(V43 Day084(A) 14:23 00000681.SSF)
2157                       -2536.3758          0.0048           0.1439
2158                        3814.3707          0.0059          -0.1194
                            1522.5008          0.0057          -0.2590
(V44 Day084(B) 15:33 00000685.SSF)
1823                        1142.4220          0.0058           0.2958
2158                       -7703.8326          0.0065          -0.0935
                           -4862.3079          0.0080          -0.3009
(V45 Day084(B) 15:34 00000689.SSF)
1823                        6109.7387          0.0083           0.4516
2159                       -3186.5745          0.0101          -0.1507
                             576.0937          0.0128          -0.4135
(V46 Day084(B) 15:34 00000693.SSF)
2133                       -4075.2280          0.0098           0.4874
2159                        4575.7259          0.0120          -0.1624
                            1421.1678          0.0153          -0.4350
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(V47 Day084(C) 16:34 00000697.SSF)
2133                        -9042.5433          0.0060           0.3525
2158                           58.4696          0.0073          -0.3459
                            -4017.2435          0.0079          -0.3694
(V48 Day084(C) 16:34 00000701.SSF)
2159                        -4967.3152          0.0077           0.4724
2158                        -4517.2500          0.0100          -0.4494
                            -5438.4018          0.0110          -0.4523
(V49 Day084(E) 18:35 00000717.SSF)
2155                        -8052.6236          0.0067           0.3306
2154                         6672.0782          0.0085          -0.1347
                              892.8790          0.0093          -0.4879
(V50 Day084(C) 16:34 00000705.SSF)
2158                        -5158.9938          0.0076           0.5896
2155                         4331.4219          0.0090          -0.4551
                              780.5918          0.0082          -0.4776
(V51 Day084(C) 16:33 00000709.SSF)
1823                        -4016.5880          0.0067           0.5204
2155                        -3372.4189          0.0077          -0.3972
                            -4081.7200          0.0072          -0.4210
(V52 Day084(D) 17:35 00000713.SSF)
1823                        -4016.5781          0.0058           0.2235
2155                        -3372.4244          0.0065          -0.1929
                            -4081.7150          0.0086          -0.3577
(V53 Day084(E) 18:35 00000721.SSF)
2155                        -4879.3032          0.0069           0.3114
2156                        11310.2693          0.0091          -0.1440
                             5623.5799          0.0103          -0.5241
(V54 Day084(E) 18:36 00000725.SSF)
1823                        -8895.8857          0.0064           0.2934
2156                         7937.8506          0.0080          -0.1291
                             1541.8571          0.0088          -0.4814
(V55 Day084(E) 18:36 00000729.SSF)
1823                        -3358.6160          0.0062           0.2926
1927                         5972.7386          0.0074          -0.1352
                             2718.3152          0.0081          -0.4543
(V56 Day084(F) 19:37 00000733.SSF)
2156                         5537.2711          0.0081           0.3558
1927                        -1965.1051          0.0096          -0.2821
                             1176.4582          0.0139          -0.4569
(V57 Day084(F) 19:37 00000737.SSF)
2156                        -3173.3157          0.0098           0.4034
2154                        -4638.1703          0.0116          -0.2921
                            -4730.7028          0.0169          -0.4777
(V58 Day084(F) 19:37 00000741.SSF)
2155                        -8052.6186          0.0091           0.3812
2154                         6672.0718          0.0110          -0.2937
                              892.8711          0.0161          -0.4746
(V59 Day084(G) 20:20 00000745.SSF)
2156                         5537.2786          0.0087           0.5505
1927                        -1965.1071          0.0098          -0.4684
                             1176.4590          0.0100          -0.4358
(V60 Day084(I) 22:19 00000765.SSF)
2154                        -5335.5550          0.0064           0.3809
2153                         4193.1138          0.0075          -0.3954
                              230.0804          0.0112          -0.5426
(V61 Day084(G) 20:20 00000749.SSF)
1885                         2409.6928          0.0103           0.7071
1927                          203.5179          0.0106          -0.5219
                             1342.7225          0.0091          -0.5639
(V62 Day084(G) 20:19 00000753.SSF)
1885                        -6300.8991          0.0180           0.7959
2154                        -2469.5535          0.0185          -0.6008
                            -4564.4464          0.0157          -0.6431
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(V63 Day084(G) 20:17 00000757.SSF)
1885                        1751.7115          0.0203           0.8003
2155                       -9141.6240          0.0207          -0.5966
                           -5457.3280          0.0176          -0.6466
(V64 Day084(H) 21:18 00000761.SSF)
2154                        3173.3213          0.0078           0.6340
2156                        4638.1879          0.0141          -0.5371
                            4730.7040          0.0106          -0.7616
(V65 Day084(I) 22:17 00000769.SSF)
2130                        2163.1141          0.0068           0.4084
2153                       -6943.5643          0.0081          -0.4150
                           -4067.1364          0.0121          -0.5685
(V66 Day084(I) 22:18 00000773.SSF)
2130                        7578.6830          0.0055           0.2930
2165                       -2350.4461          0.0062          -0.3233
                            1909.5573          0.0087          -0.4596
(V67 Day084(I) 22:19 00000777.SSF)
2165                        3093.3016          0.0057           0.3140
2156                       -4148.0462          0.0064          -0.3432
                           -1476.0727          0.0091          -0.4768
(V68 Day084(J) 23:21 00000781.SSF)
2153                        8508.8678          0.0081           0.4778
2156                         445.0616          0.0084          -0.4445
                            4500.6317          0.0087          -0.3765
(V69 Day084(J) 23:22 00000785.SSF)
2130                       10671.9802          0.0076           0.4559
2156                       -6498.4960          0.0079          -0.4363
                             433.4885          0.0078          -0.3593
(V70 Day084(J) 23:22 00000789.SSF)
2156                       -3093.3019          0.0068           0.4016
2165                        4148.0424          0.0070          -0.3911
                            1476.0743          0.0070          -0.3239
(V71 Day085(K) 00:21 00000793.SSF)
2156                       -8508.8680          0.0060           0.2433
2153                        -445.0703          0.0068          -0.1660
                           -4500.6254          0.0097          -0.4147
(V72 Day085(K) 00:22 00000801.SSF)
2111                        8679.3266          0.0100           0.4722
2130                        -992.7612          0.0087          -0.3048
                            3443.5072          0.0144          -0.4634
(V73 Day085(K) 00:21 00000797.SSF)
2111                       10842.4304          0.0121           0.5121
2153                       -7936.3392          0.0106          -0.2678
                            -623.6216          0.0172          -0.4923
(V74 Day085(K) 00:22 00000805.SSF)
2130                        7578.6774          0.0054           0.1897
2165                       -2350.4573          0.0060          -0.1366
                            1909.5658          0.0081          -0.3559
(V75 Day085(L) 01:23 00000809.SSF)
2111                       10842.4341          0.0108           0.5624
2153                       -7936.3295          0.0115          -0.5635
                            -623.6184          0.0133          -0.5398
(V76 Day085(L) 01:22 00000813.SSF)
2130                        2163.1103          0.0069           0.3818
2153                       -6943.5655          0.0080          -0.4500
                           -4067.1376          0.0091          -0.4445
(V77 Day085(M) 02:23 00000817.SSF)
2153                       -6120.8094          0.0088           0.3609
2151                       11261.0759          0.0102          -0.5192
                            5368.6692          0.0125          -0.4536
(V78 Day085(M) 02:22 00000821.SSF)
2151                        3227.5531          0.0055           0.2047
2152                         213.4848          0.0060          -0.3267
                            1617.7240          0.0073          -0.2874
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(V79 Day085(M) 02:24 00000825.SSF)
2130                        -8679.3206          0.0097          0.4244
2111                          992.7653          0.0098         -0.5649
                            -3443.5131          0.0119         -0.4991
(V80 Day085(M) 02:23 00000829.SSF)
2130                         -730.1509          0.0077          0.3382
2152                         4530.9891          0.0084         -0.4933
                             2919.2687          0.0116         -0.4058
(V81 Day085(A) 14:37 00000833.SSF)
2130                         -730.1576          0.0082          0.3575
2152                         4530.9584          0.0137         -0.3015
                             2919.2849          0.0129         -0.4149
(V82 Day085(A) 14:37 00000837.SSF)
2152                        -3227.5597          0.0053          0.2368
2151                         -213.4896          0.0077         -0.1827
                            -1617.7134          0.0070         -0.3043
(V83 Day085(B) 15:12 00000841.SSF)
2111                         4721.6072          0.0172          0.5364
2151                         3324.7486          0.0087         -0.4767
                             4745.0865          0.0119         -0.4531
(V84 Day085(B) 15:13 00000845.SSF)
2111                         7949.1695          0.0133          0.4800
2152                         3538.2357          0.0070         -0.4742
                             6362.7964          0.0125         -0.3790
(V85 Day085(D) 18:13 00000865.SSF)
2150                         6906.3957          0.0062          0.2443
2151                        -5574.2035          0.0077         -0.1248
                             -671.2870          0.0083         -0.4721
(V86 Day085(C) 16:12 00000849.SSF)
2111                       -43922.1531          0.0093          0.5578
2144                        11194.2185          0.0077         -0.4730
                           -13958.9304          0.0086         -0.3998
(V87 Day085(C) 16:11 00000853.SSF)
2144                        41737.3576          0.0058          0.3151
2150                        -2295.2621          0.0066         -0.2905
                            19375.2708          0.0078         -0.3165
(V88 Day085(D) 18:13 00000869.SSF)
2111                        -2184.7894          0.0140          0.7039
2150                         8898.9548          0.0100         -0.5888
                             5416.3585          0.0097         -0.6518
(V89 Day085(C) 16:12 00000861.SSF)
2150                         6906.3915          0.0052          0.2413
2151                        -5574.2097          0.0059         -0.2277
                             -671.2681          0.0066         -0.2626
(V90 Day085(C) 17:03 00000857.SSF)
1638                        13211.8166          0.0073          0.3971
2150                       -14179.7720          0.0084         -0.3579
                            -3799.6576          0.0107         -0.3248
(V91 Day085(D) 18:14 00000873.SSF)
2150                       -41737.3609          0.0056          0.2171
2144                         2295.2713          0.0065         -0.1404
                           -19375.2769          0.0076         -0.3813
(V92 Day085(D) 18:14 00000877.SSF)
1638                       -28525.5361          0.0067          0.2966
2144                       -11884.5074          0.0082         -0.1818
                           -23174.9382          0.0098         -0.4676
(V93 Day085(E) 20:16 00000881.SSF)
1638                        13211.8122          0.0105          0.6107
2150                       -14179.7908          0.0119         -0.5050
                            -3799.6569          0.0119         -0.4875
(V94 Day085(E) 20:19 00000885.SSF)
1638                        -6847.3296          0.0139          0.6034
2098                         7793.1031          0.0153         -0.3217
                             2340.3672          0.0192         -0.4889
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(V95 Day085(E) 20:19 00000889.SSF)
2098                        -5855.7498          0.0128           0.5862
2147                       -12653.2368          0.0140          -0.2962
                           -12092.5587          0.0178          -0.4782
(V96 Day085(E) 20:15 00000893.SSF)
2144                        15822.4630          0.0104           0.6157
2147                         7024.3932          0.0115          -0.4966
                            13422.7200          0.0114          -0.4930
(V97 Day085(F) 21:19 00000897.SSF)
1638                        -6847.3227          0.0122           0.6930
2098                         7793.1195          0.0149          -0.4810
                             2340.3426          0.0151          -0.6783
(V98 Day085(F) 21:19 00000901.SSF)
1638                       -12703.0718          0.0107           0.6698
2147                        -4860.1208          0.0129          -0.4697
                            -9752.2094          0.0131          -0.6614
(V99 Day085(F) 21:16 00000905.SSF)
2147                       -15822.4669          0.0093           0.6379
2144                        -7024.3886          0.0109          -0.4419
                           -13422.7220          0.0110          -0.6244
(V100 Day085(F) 21:15 00000909.SSF)
2150                       -25914.8932          0.0086           0.6122
2147                         9319.6548          0.0100          -0.4194
                            -5952.5517          0.0101          -0.6002
(V101 Day085(G) 22:17 00000913.SSF)
2098                        -5855.7471          0.0086           0.6552
2147                       -12653.2473          0.0127          -0.6575
                           -12092.5583          0.0149          -0.7812
(V102 Day085(G) 22:17 00000917.SSF)
1638                       -12703.0746          0.0099           0.6973
2147                        -4860.1155          0.0145          -0.6964
                            -9752.2176          0.0169          -0.8044
(V103 Day085(H) 23:18 00000921.SSF)
2147                        -9314.3110          0.0078           0.4135
2145                        -3364.2924          0.0086          -0.4557
                            -7312.5124          0.0084          -0.2416
(V104 Day085(H) 23:17 00000925.SSF)
2100                       -13775.0586          0.0112           0.4832
2145                       -20025.4203          0.0131          -0.5340
                           -21676.4964          0.0127          -0.2783
(V105 Day085(H) 23:17 00000929.SSF)
2098                        -1394.9937          0.0070           0.2674
2100                         4007.8835          0.0083          -0.4743
                             2271.4290          0.0086          -0.1235
(V106 Day086(I) 00:17 00000933.SSF)
2098                       -15170.0534          0.0110           0.4541
2145                       -16017.5454          0.0154          -0.3699
                           -19405.0936          0.0201          -0.5905
(V107 Day086(J) 01:01 00000945.SSF)
2098                        -7158.2431          0.0081           0.5133
2149                        12559.8434          0.0092          -0.5000
                             5630.0999          0.0114          -0.6371
(V108 Day086(I) 00:18 00000937.SSF)
2098                        -1394.9845          0.0065           0.3179
2100                         4007.8916          0.0084          -0.2747
                             2271.4138          0.0106          -0.5009
(V109 Day086(J) 00:58 00000949.SSF)
2098                        -7163.9554          0.0101           0.5742
2148                        -9261.1995          0.0114          -0.5463
                           -10287.1249          0.0147          -0.6861
(V110 Day086(A) 15:00 00000973.SSF)
1779                         8829.9386          0.0084           0.3496
2149                       -12258.6598          0.0103          -0.0955
                            -4535.4985          0.0143          -0.4113
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(V111 Day086(J) 00:59 00000957.SSF)
2148                      -8006.1041          0.0121           0.6572
2145                      -6756.3493          0.0119          -0.6327
                          -9117.9453          0.0157          -0.6368
(V112 Day086(K) 02:01 00000961.SSF)
2100                      -5763.2414          0.0106           0.4325
2149                       8551.9675          0.0162          -0.5281
                           3358.6689          0.0156          -0.3853
(V113 Day086(J) 00:59 00000953.SSF)
2100                      -5768.9625          0.0130           0.6642
2148                     -13269.0819          0.0133          -0.6339
                         -12558.5643          0.0175          -0.6639
(V114 Day086(K) 02:00 00000965.SSF)
2149                         -5.7162          0.0093           0.4486
2148                     -21821.0357          0.0111          -0.5471
                         -15917.2408          0.0121          -0.4152
(V115 Day086(K) 02:00 00000969.SSF)
2098                      -7163.9543          0.0120           0.4558
2148                      -9261.1659          0.0149          -0.5586
                         -10287.1402          0.0155          -0.4611
(V116 Day086(A) 14:49 00000977.SSF)
1779                     -13297.8527          0.0077           0.3365
2143                     -31841.4882          0.0097          -0.1655
                         -30161.9316          0.0119          -0.4019
(V117 Day086(A) 14:49 00000981.SSF)
1779                       -274.3927          0.0084           0.3577
2146                     -32466.8204          0.0108          -0.1722
                         -23921.4253          0.0135          -0.4218
(V118 Day086(B) 16:15 00000989.SSF)
1779                       8829.9472          0.0072           0.4444
2149                     -12258.6518          0.0092          -0.4272
                          -4535.5063          0.0105          -0.4509
(V119 Day086(A) 14:56 00000985.SSF)
1779                       8824.2213          0.0127           0.4295
2148                     -34079.7032          0.0094          -0.1457
                         -20452.7211          0.0114          -0.3762
(V120 Day086(B) 16:04 00000993.SSF)
1779                     -13297.8379          0.0079           0.4826
2143                     -31841.4718          0.0101          -0.4395
                         -30161.9540          0.0115          -0.4682
(V121 Day086(B) 16:15 00000997.SSF)
2143                      13023.4529          0.0070           0.4420
2146                       -625.3393          0.0090          -0.4212
                           6240.5158          0.0101          -0.4485
(V122 Day086(B) 16:16 00001001.SSF)
2146                      10406.8256          0.0075           0.4593
2147                      -5004.9395          0.0096          -0.4409
                           1663.2654          0.0110          -0.4618
(V123 Day086(C) 17:17 00001005.SSF)
2143                      13023.4577          0.0075           0.3770
2146                       -625.3399          0.0084          -0.3184
                           6240.5154          0.0106          -0.3596
(V124 Day086(C) 17:17 00001009.SSF)
2143                      23430.2778          0.0062           0.2982
2147                      -5630.2732          0.0068          -0.2700
                           7903.7786          0.0084          -0.2984
(V125 Day086(D) 18:18 00001013.SSF)
2148                       1308.2266          0.0078           0.4989
2147                      -3392.0414          0.0077          -0.2522
                          -1805.4453          0.0074          -0.4608
(V126 Day086(D) 18:18 00001017.SSF)
2148                      -9098.5999          0.0140           0.6652
2146                       1612.8980          0.0130          -0.3991
                          -3468.7119          0.0123          -0.6233
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(V127 Day086(E) 19:19 00001021.SSF)
2145                        -1092.5033          0.0087           0.4069
2146                         8369.2271          0.0104          -0.2810
                             5649.2394          0.0139          -0.4628
(V128 Day086(E) 19:19 00001025.SSF)
8597                         6120.0223          0.0071           0.3239
2146                         6439.6105          0.0085          -0.2680
                             7929.1698          0.0118          -0.4316
(V129 Day086(F) 20:22 00001029.SSF)
8597                         6120.0142          0.0126           0.7287
2146                         6439.6111          0.0135          -0.5553
                             7929.1784          0.0120          -0.5730
(V130 Day086(F) 20:22 00001033.SSF)
8597                        -6095.6068          0.0097           0.6715
2142                         3334.6015          0.0103          -0.5081
                             -681.7563          0.0093          -0.5248
(V131 Day086(F) 20:25 00001037.SSF)
8597                         7212.5292          0.0133           0.7990
2145                        -1929.6128          0.0137          -0.6276
                             2279.9369          0.0113          -0.6292
(V132 Day086(F) 20:25 00001041.SSF)
2145                        -6508.1504          0.0116           0.7631
2144                        -3660.0984          0.0119          -0.5554
                            -6110.2123          0.0100          -0.5900
(V133 Day086(G) 21:22 00001045.SSF)
8597                        -6095.6104          0.0080           0.5809
2142                         3334.6031          0.0099          -0.4565
                             -681.7531          0.0104          -0.6398
(V134 Day086(G) 21:22 00001049.SSF)
8597                          704.3755          0.0078           0.5719
2144                        -5589.7101          0.0095          -0.4561
                            -3830.2764          0.0100          -0.6303
(V135 Day086(H) 22:23 00001053.SSF)
8597                          704.3738          0.0060           0.3305
2144                        -5589.7145          0.0066          -0.3623
                            -3830.2757          0.0094          -0.4674
(V136 Day086(H) 22:22 00001057.SSF)
2144                       -13382.2768          0.0059           0.3176
2141                        10418.8450          0.0064          -0.3534
                              942.9929          0.0090          -0.4521
(V137 Day086(H) 22:23 00001061.SSF)
2142                        -6582.2915          0.0060           0.3282
2141                         1494.5308          0.0065          -0.3625
                            -2205.5369          0.0092          -0.4613
(V138 Day086(I) 23:23 00001065.SSF)
8472                        15152.0203          0.0067           0.4021
2144                        23996.6981          0.0073          -0.3359
                            25876.4386          0.0070          -0.2979
(V139 Day086(I) 23:23 00001069.SSF)
8472                         8352.0333          0.0069           0.4150
2142                        32921.0086          0.0075          -0.3532
                            29024.9625          0.0073          -0.3096
(V140 Day086(I) 23:24 00001073.SSF)
8472                         1769.7436          0.0066           0.3990
2141                        34415.5426          0.0072          -0.3303
                            26819.4303          0.0069          -0.2998
(V141 Day087(J) 00:24 00001089.SSF)
2137                        10762.4007          0.0117           0.6553
2144                       -12817.3160          0.0171          -0.4943
                            -4027.4973          0.0187          -0.7549
(V142 Day087(J) 00:25 00001081.SSF)
2137                         3962.4174          0.0116           0.6554
2142                        -3893.0022          0.0171          -0.4961
                             -878.9732          0.0187          -0.7574
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(V143 Day087(J) 00:25 00001077.SSF)
2137                      -4389.6250          0.0130           0.6700
8472                     -36814.0375          0.0194          -0.5097
                         -29903.9229          0.0213          -0.7699
(V144 Day087(J) 00:25 00001085.SSF)
2137                      -2619.8673          0.0058           0.4064
2141                      -2398.4642          0.0074          -0.3130
                          -3084.5113          0.0079          -0.5529
(V145 Day087(K) 01:26 00001093.SSF)
8472                      15152.0133          0.0067           0.3516
2144                      23996.7010          0.0082          -0.4372
                          25876.4583          0.0085          -0.3789
(V146 Day087(K) 01:26 00001097.SSF)
2144                      -6799.9849          0.0063           0.3289
2142                       8924.3064          0.0077          -0.4084
                           3148.5279          0.0079          -0.3610
(V147 Day087(L) 02:28 00001101.SSF)
8597                     -14447.6255          0.0078           0.3629
8472                     -29586.4025          0.0087          -0.4427
                         -29706.7352          0.0101          -0.4792
(V148 Day087(L) 02:10 00001105.SSF)
8597                      -6903.4279          0.0060           0.2659
2143                       7064.9512          0.0070          -0.3439
                           1688.6634          0.0075          -0.3768
(V149 Day087(L) 02:27 00001109.SSF)
2143                        807.8292          0.0048           0.1198
2142                      -3730.3453          0.0050          -0.1612
                          -2370.4041          0.0052          -0.1862
(V150 Day087(L) 02:27 00001113.SSF)
2144                      -6799.9846          0.0066           0.3009
2142                       8924.3169          0.0071          -0.3801
                           3148.5232          0.0080          -0.4146
(V151 Day350(1) 17:06 00005224.ssf)
2155                        809.6923          0.0073           0.4915
2886                      -2009.9908          0.0107          -0.4095
                          -1209.8772          0.0091          -0.4519
(V152 Day350(1) 17:07 00005228.ssf)
2886                        985.3149          0.0067           0.4709
2887                       1396.5803          0.0101          -0.3912
                           1446.6906          0.0083          -0.4585
(V153 Day357(0) 16:21 00005260.ssf)
2886                        985.3170          0.0057           0.3923
2887                       1396.5730          0.0075          -0.3192
                           1446.7013          0.0065          -0.3941
(V156 Day357(2) 18:40 00005288.ssf)
2155                       1795.0074          0.0084           0.6812
2887                       -613.4151          0.0080           0.5225
                            236.8151          0.0154           0.5631
(V157 Day357(3) 19:51 00005304.ssf)
2158                      -4349.3118          0.0067           0.4393
2886                       2321.4046          0.0075          -0.2223
                           -429.2733          0.0098          -0.1916
(V158 Day357(4) 21:05 00005308.ssf)
2158                      -3363.9898          0.0103           0.6785
2887                       3717.9947          0.0098          -0.4787
                           1017.4018          0.0099          -0.6236
(V159 Day357(4) 21:04 00005312.ssf)
2887                       -985.3196          0.0081           0.5333
2886                      -1396.5842          0.0089          -0.1985
                          -1446.6898          0.0085          -0.4978
(V160 Day299(0) 15:27 00006584.ssf)
2155                        783.2298          0.0056           0.3902
1A                        -1982.4008          0.0068          -0.3919
                          -1207.3963          0.0075          -0.5414
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(V161 Day299(0) 15:28 00006588.ssf)
2155                          767.6162          0.0057           0.4156
2                           -2000.7385          0.0070          -0.4256
                            -1226.0880          0.0084          -0.5804
(V162 Day299(0) 15:35 00006592.ssf)
2155                          632.1481          0.0058           0.4230
3                           -1928.2352          0.0072          -0.4273
                            -1252.1441          0.0081          -0.5880
(V163 Day299(0) 17:28 00006596.ssf)
1A                            -15.6179          0.0046           0.1333
2                             -18.3393          0.0049          -0.0811
                              -18.6889          0.0049          -0.0895
(V164 Day299(0) 15:36 00006600.ssf)
2887                        -1011.7806          0.0061           0.4628
1A                          -1368.9954          0.0077          -0.4613
                            -1444.2036          0.0084          -0.6169
(V165 Day299(0) 15:36 00006604.ssf)
2887                        -1027.3935          0.0064           0.5154
2                           -1387.3323          0.0083          -0.5192
                            -1462.8969          0.0102          -0.6755
(V166 Day299(0) 15:36 00006608.ssf)
2887                        -1162.8619          0.0060           0.4613
3                           -1314.8292          0.0076          -0.4620
                            -1488.9527          0.0085          -0.6180
(V167 Day299(1) 16:47 00006612.ssf)
2886                          -26.4632          0.0057           0.2419
1A                             27.6050          0.0060          -0.3052
                                2.4835          0.0075          -0.3302
(V168 Day299(1) 16:47 00006616.ssf)
2886                          -42.0790          0.0057           0.2662
2                               9.2655          0.0064          -0.2358
                              -16.2027          0.0076          -0.3199
(V169 Day299(1) 16:47 00006620.ssf)
2886                        -177.5442           0.0085           0.4926
3                             81.7706           0.0071          -0.6081
                             -42.2611           0.0100          -0.5243
(V170 Day299(1) 17:00 00006624.ssf)
2158                        -4375.7639          0.0061           0.3362
1A                           2349.0191          0.0070          -0.2324
                             -426.7948          0.0073          -0.3807
(V171 Day299(1) 17:00 00006628.ssf)
2158                        -4391.3812          0.0066           0.3701
2                           2330.6809           0.0070          -0.3464
                             -445.4802          0.0078          -0.4106
(V172 Day299(1) 17:00 00006632.ssf)
2158                        -4526.8601          0.0077           0.4462
3                            2403.1856          0.0067          -0.5665
                             -471.5328          0.0088          -0.4760
(V173 Day299(0) 16:30 00006636.ssf)
2                           -135.4797           0.0071           0.3799
3                             72.4950           0.0080          -0.4316
                             -26.0425           0.0133          -0.5193
(V174 Day299(2) 17:59 00006640.ssf)
2155                          783.2180          0.0052           0.2599
1A                          -1982.4062          0.0069          -0.1818
                            -1207.3858          0.0074          -0.4726
(V175 Day299(2) 17:59 00006644.ssf)
2155                          767.6049          0.0048           0.1629
2                           -2000.7410          0.0062          -0.1668
                            -1226.0889          0.0082          -0.3756
(V176 Day299(2) 17:59 00006648.ssf)
2155                          632.1343          0.0052           0.2596
3                           -1928.2431          0.0065          -0.1741
                            -1252.1349          0.0069          -0.4341
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(V177 Day299(2) 18:07 00006652.ssf)
2887                        -1011.7767          0.0055          0.3234
1A                          -1368.9890          0.0071         -0.1916
                            -1444.2098          0.0079         -0.4605
(V178 Day299(2) 18:07 00006656.ssf)
2887                        -1027.3942          0.0051          0.2552
2                           -1387.3305          0.0062         -0.1840
                            -1462.8993          0.0088         -0.3435
(V179 Day299(2) 18:07 00006660.ssf)
2887                        -1162.8608          0.0053          0.2922
3                           -1314.8274          0.0066         -0.2255
                            -1488.9534          0.0096         -0.3864
(V180 Day299(3) 19:22 00006664.ssf)
2886                          -26.4678          0.0052          0.0693
1A                             27.5969          0.0094         -0.1659
                                2.4908          0.0087         -0.6170
(V181 Day299(3) 19:22 00006668.ssf)
2886                          -42.0830          0.0060          0.2288
2                               9.2522          0.0068         -0.3688
                              -16.1972          0.0102         -0.1236
(V182 Day299(0) 17:22 00006672.ssf)
1A                           -151.0868          0.0050          0.2377
3                              54.1628          0.0061         -0.2715
                              -44.7460          0.0168         -0.5649
(V183 Day299(3) 20:00 00006676.ssf)
2158                        -4375.7638          0.0070          0.4922
1A                           2349.0185          0.0089         -0.5378
                             -426.7851          0.0081         -0.4039
(V184 Day299(3) 20:00 00006680.ssf)
2158                        -4391.3808          0.0067          0.4690
2                            2330.6772          0.0085         -0.5114
                             -445.4710          0.0077         -0.3866
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Adjustment Statistical Summary
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Iterations = 3

Number of Stations = 58

Number of Observations = 635
Number of Unknowns = 162
Number of Redundant Obs = 473

Observation	Count	Sum Squares of StdRes	Error Factor
Coordinates	15	81.777	2.705
Angles	23	6.874	0.633
Distances	26	3.093	0.400
Zeniths	25	14.752	0.890
GPS Deltas	546	394.321	0.985
Total	635	500.817	1.029

The Chi-Square Test at 5.00% Level Passed
Lower/Upper Bounds (0.936/1.064)

Adjusted Station Information

Coordinate Changes from Entered Provisionals (Meters)

Station	dN	dE	dZ
1487	0.0435	-0.0037	0.0150
1638	-0.0000	-0.0000	-0.0000
1779	-0.0143	0.0118	-0.0069
1823	n/a	n/a	-0.0000
1885	-0.0000	-0.0000	-0.0000
1927	0.0039	-0.0793	0.0656
2098	-0.0033	-0.0054	-0.0097
2111	-0.0037	0.0051	-0.0238
2130	-0.0172	0.0109	0.0182
2133	n/a	n/a	-0.0228
2136	0.0103	-0.0028	-0.0057
2137	-0.0000	-0.0000	-0.0223
2141	n/a	n/a	-0.2074
2142	n/a	n/a	-0.1728
2144	n/a	n/a	-0.1767
2146	n/a	n/a	-0.1319
2148	n/a	n/a	-0.0806
2149	n/a	n/a	-0.0172
2150	n/a	n/a	-0.0204
2151	n/a	n/a	0.0024
2156	-0.0000	-0.0000	-0.0929
2160	n/a	n/a	0.0100
2161	n/a	n/a	0.0333
8207	0.0358	-0.0491	-0.0157
8275	n/a	n/a	-0.2254
8472	-0.0074	-0.0259	-0.1029
8597	-0.0000	-0.0000	-0.0000
8870	n/a	n/a	0.4046
8894	-0.0000	-0.0000	-0.1112

Adjusted Coordinates (Meters)

Station	N	E	Elev	Description
1	117651.7695	313053.5171	317.9122	PACR CP-1
2	117621.6233	313049.5721	320.0047	PACR CP-2
3	117598.8776	312895.7431	309.9115	PACR CP-3
4	117569.7904	312849.7513	311.7690	PACR CP-4
5	117799.1088	312857.8437	302.0219	PACR CP-5
6	117712.3023	312755.1046	305.1647	PACR CP-6
20	117537.9110	313010.2861	319.1460	SPK
21	117523.4411	312955.9599	317.8111	SPK
22	117751.2414	312763.1966	303.7147	SPK
23	117708.7161	312843.5596	304.8008	SPK
24	117720.6717	312919.3724	307.4724	SPK
1487	93662.7016	347113.9365	12.7450	SCHOOL(SY5641)
1638	138395.8808	255834.0925	4.8130	N 469 (TS0058)
1779	158878.7502	219479.5009	5.6681	944 3090 A TIDAL (TS0340)
1823	125839.1195	313078.3608	76.0600	SAWMILL 2 (TR2398)
1885	128244.4167	305163.1644	4.0690	944 4090 A TIDAL (TR2551)
1927	130190.3490	307128.7283	4.4656	EAST BASE AZ MK (TR2552)
2098	142327.3133	245953.4604	18.0253	GP05112-29
2100	145873.4123	242699.0885	30.1602	K473 RESET
2111	123365.1810	280904.9605	180.0112	GP05101-11
2130	128341.0075	288866.8017	76.1472	GP05112-8
2133	124199.1965	325805.8791	52.1052	CARLSBORG (TR0834)
2136	118248.3761	327085.9803	139.4233	PETE
2137	111219.1905	221596.0726	57.7777	QUILLAYUTE RESET (SD0799)
2141	106627.2603	220575.6669	88.4560	LAPUSH
2142	109655.6623	226997.9579	49.4365	GOODMAN
2143	113314.5082	224390.7760	56.7652	WENTWORTH
2144	104443.5370	237419.7590	71.4850	UNDIE RD.

2145	113345.6110	241138.0267	121.9408	FS29 PIT
2146	122049.9569	235906.2920	109.1056	BEDROCK
2147	123931.6992	247419.2880	189.1665	SCALES
2148	126806.1096	244553.8642	150.8597	BEAVER FALLS
2149	151383.5731	233357.9615	4.3232	RAYS
2150	131835.9112	274461.1612	87.5458	S2500
2151	130459.6869	283254.0399	114.0527	CRESCENT HS
2152	132907.7321	285913.5783	4.8125	CEMETERY
2153	122012.6698	294286.6744	110.5737	DOT ELWHA PIT
2154	121214.5906	301026.1687	304.2105	LITTLE RIVER
2155	119426.1714	311366.7498	396.4589	MT. PLEASANT
2156	128548.2880	301366.6241	71.8971	CBL150 (AC5475)
2157	115618.0457	322153.0510	413.1247	LOST MOUNTAIN
2158	118104.7403	318017.0297	341.4580	GELLOR
2159	126517.9570	319959.2751	43.8829	FINN HALL
2160	115893.4859	337531.5822	14.7715	CASINO
2161	119602.6357	344802.4813	2.8649	GARDINER
2162	130648.8390	327506.5866	2.7917	CLINE SPIT
2163	127568.9075	332618.2105	2.9016	SERPENTINE
2164	116514.5378	331946.5782	450.7710	BURNT HILL
2165	131005.0642	296580.2169	4.0824	ELWHA CONTROL NO.1
2886	117642.5803	313090.5158	321.7552	SCHREINER
2887	119876.9307	313218.9268	255.5260	SKYLINE
8207	119138.9151	352719.0762	32.3823	JCIA(TR2696)
8275	123837.5757	344881.8946	2.7746	QUARINTINE 2 (TR1746)
8472	66045.7803	236695.4438	12.4571	QUIN (SD0881)
8597	110305.0454	233948.6220	87.9500	FORKS RESET (SD0880)
8870	119521.2071	337663.6485	3.0146	SAND (TR2365)
8894	122644.5217	330842.9478	56.5888	WEGENEST (AI2209)
1A	117651.7799	313053.5231	317.9143	

Adjusted Positions and Ellipsoid Heights (Meters)

Station	Latitude	Longitude	Ellip Ht
1	48-01-50.871256	123-20-25.960574	297.8587
2	48-01-49.891523	123-20-26.103502	299.9530
3	48-01-48.993130	123-20-33.489424	289.8653
4	48-01-48.003272	123-20-35.662573	291.7262
5	48-01-55.432872	123-20-35.633110	281.9665
6	48-01-52.515194	123-20-40.453339	285.1182
20	48-01-47.141035	123-20-27.867260	299.1003
21	48-01-46.615452	123-20-30.465509	297.7665
22	48-01-53.783862	123-20-40.124249	283.6658
23	48-01-52.492561	123-20-36.179992	284.7509
24	48-01-52.959493	123-20-32.541049	287.4187
1487	47-49-27.057815	122-52-31.624165	-8.4828
1638	48-11-52.346400	124-07-08.353170	-15.8689
1779	48-22-00.749797	124-37-15.661181	-15.1711
1823	48-06-15.849833	123-20-37.652530	55.6182
1885	48-07-25.148280	123-27-04.017310	-16.1654
1927	48-08-30.271530	123-25-32.186949	-15.8192
2098	48-13-45.580697	124-15-14.852375	-2.7697
2100	48-15-35.565408	124-18-00.133782	9.4020
2111	48-04-18.909383	123-46-27.262414	159.9166
2130	48-07-09.578954	123-40-11.738160	56.0834
2133	48-05-35.760277	123-10-20.261311	31.2982
2136	48-02-24.424757	123-09-09.754063	118.7682
2137	47-56-22.820510	124-33-40.803780	34.6659
2141	47-53-52.710881	124-34-19.170923	65.1728
2142	47-55-40.639865	124-29-17.217774	26.4144
2143	47-57-34.946548	124-31-31.131351	33.8060
2144	47-53-07.766632	124-20-44.198573	48.7400
2145	47-58-01.168941	124-18-04.698458	99.7195
2146	48-02-34.998001	124-22-35.983736	86.9461
2147	48-03-52.651203	124-13-24.631485	167.6800
2148	48-05-21.518505	124-15-49.092663	129.3783

2149	48-18-19.907472	124-25-45.048190	-16.4264
2150	48-08-44.875376	123-51-54.444740	67.3190
2151	48-08-11.342678	123-44-46.828071	93.9897
2152	48-09-33.788693	123-42-42.700474	-15.2239
2153	48-03-51.194345	123-35-38.851123	90.5816
2154	48-03-33.067982	123-30-12.167059	284.2953
2155	48-02-46.505712	123-21-50.157053	376.3917
2156	48-07-30.759810	123-30-08.015010	51.7420
2157	48-00-54.417599	123-13-03.873177	392.7970
2158	48-02-10.695976	123-16-27.173582	321.1670
2159	48-06-44.951446	123-15-06.214889	23.2442
2160	48-01-18.091544	123-00-42.411975	-6.1597
2161	48-03-24.658744	122-54-56.461585	-18.5118
2162	48-09-06.157926	123-09-07.492632	-18.0666
2163	48-07-31.390671	123-04-55.913987	-18.1891
2164	48-01-32.985530	123-05-12.728328	430.0768
2165	48-08-44.817001	123-34-03.564490	-16.0326
2886	48-01-50.612897	123-20-24.161058	301.7006
2887	48-03-03.054898	123-20-21.477219	235.3410
8207	48-03-16.407428	122-48-33.666124	10.6474
8275	48-05-41.798476	122-54-58.162596	-18.7471
8472	47-32-24.685762	124-19-55.027710	-11.2785
8597	47-56-12.192210	124-23-44.165620	65.2235
8870	48-03-15.625833	123-00-40.995233	-18.1047
8894	48-04-50.329010	123-06-14.704210	35.6277
1A	48-01-50.871600	123-20-25.960301	297.8608

Geoid Heights (Meters) and Vertical Deflections (Seconds)

Station	Geoid Ht	North Def	East Def
1	-20.0536	11.7055	7.0951
2	-20.0518	11.7214	7.0975
3	-20.0462	11.5139	7.6564
4	-20.0428	11.5230	7.7212
5	-20.0554	11.3520	7.7652
6	-20.0465	11.3752	7.9066
20	-20.0457	11.7598	7.1447
21	-20.0446	11.6005	7.5496
22	-20.0489	11.3494	7.9037
23	-20.0500	11.4085	7.7639
24	-20.0537	11.4297	7.6488
1487	-21.2278	-1.4606	17.8956
1638	-20.6819	-6.7861	-6.1472
1779	-20.8393	-10.7550	-7.6965
1823	-20.4418	4.1739	6.1186
1885	-20.2344	2.5832	5.3229
1927	-20.2848	-2.1687	4.8253
2098	-20.7950	-7.2759	-6.0881
2100	-20.7583	-7.3655	-4.9016
2111	-20.0946	2.7569	-11.8709
2130	-20.0637	2.0129	0.1238
2133	-20.8070	3.1229	6.8551
2136	-20.6551	9.8965	6.8022
2137	-23.1117	-7.3099	-4.4883
2141	-23.2832	-5.7750	-3.9710
2142	-23.0221	-7.3561	-6.2594
2143	-22.9592	-7.9959	-5.3566
2144	-22.7449	-7.1993	-10.9170
2145	-22.2214	-8.0665	-12.7497
2146	-22.1595	-11.4767	-8.2499
2147	-21.4865	-10.6294	-11.8449
2148	-21.4814	-13.9979	-10.9471
2149	-20.7496	-8.2926	-3.2443
2150	-20.2268	-0.3617	-4.5901
2151	-20.0630	1.5475	-1.7506
2152	-20.0363	-3.1677	-0.8602

2153	-19.9922	1.7870	0.7669
2154	-19.9151	7.2774	-0.1473
2155	-20.0672	12.2034	12.5708
2156	-20.1551	2.7887	2.9534
2157	-20.3277	10.7134	6.5046
2158	-20.2910	10.8680	8.0938
2159	-20.6388	0.4861	5.1201
2160	-20.9312	13.0074	8.7006
2161	-21.3766	9.0360	8.5194
2162	-20.8583	-1.1776	8.1807
2163	-21.0906	0.2399	8.5990
2164	-20.6942	14.1806	9.0106
2165	-20.1149	-0.6948	1.0586
2886	-20.0546	11.7249	7.0475
2887	-20.1850	12.3598	8.2470
8207	-21.7349	5.4058	9.9162
8275	-21.5217	5.5218	7.8868
8472	-23.7357	-6.5394	-7.4950
8597	-22.7265	-7.0354	-11.1898
8870	-21.1193	8.4211	5.8862
8894	-20.9611	5.6717	7.4247
1A	-20.0536	11.7055	7.0951
Averages:	-20.8537	2.6438	2.1381

Convergence Angles (DMS) and Grid Factors at Stations
(Grid Azimuth = Geodetic Azimuth - Convergence)
(Elevation Factor Includes a Geoid Height Correction at Each Station))

	Convergence	------- Factors -------				
Station	Angle	Scale	x	Elevation	=	Combined
1	-1-52-00.01	0.99994341		0.99995332		0.99989673
2	-1-52-00.12	0.99994341		0.99995299		0.99989641
3	-1-52-05.62	0.99994342		0.99995457		0.99989799
4	-1-52-07.23	0.99994343		0.99995428		0.99989771
5	-1-52-07.21	0.99994337		0.99995581		0.99989918
6	-1-52-10.80	0.99994339		0.99995532		0.99989871
20	-1-52-01.43	0.99994343		0.99995312		0.99989656
21	-1-52-03.37	0.99994344		0.99995333		0.99989677
22	-1-52-10.56	0.99994338		0.99995554		0.99989893
23	-1-52-07.62	0.99994339		0.99995537		0.99989877
24	-1-52-04.91	0.99994339		0.99995495		0.99989835
1487	-1-31-13.43	0.99995533		1.00000133		0.99995666
1638	-2-26-46.45	0.99994322		1.00000249		0.99994571
1779	-2-49-12.03	0.99995168		1.00000238		0.99995406
1823	-1-52-08.72	0.99994228		0.99999128		0.99993356
1885	-1-56-56.37	0.99994226		1.00000253		0.99994479
1927	-1-55-48.00	0.99994234		1.00000248		0.99994482
2098	-2-32-48.66	0.99994414		1.00000043		0.99994457
2100	-2-34-51.71	0.99994532		0.99999853		0.99994384
2111	-2-11-22.43	0.99994257		0.99997494		0.99991751
2130	-2-06-42.85	0.99994225		0.99999121		0.99993346
2133	-1-44-29.06	0.99994235		0.99999509		0.99993744
2136	-1-43-36.56	0.99994317		0.99998139		0.99992456
2137	-2-46-32.06	0.99994707		0.99999457		0.99994164
2141	-2-47-00.63	0.99994959		0.99998979		0.99993937
2142	-2-43-15.82	0.99994773		0.99999586		0.99994359
2143	-2-44-55.52	0.99994605		0.99999470		0.99994075
2144	-2-36-53.86	0.99995044		0.99999236		0.99994281
2145	-2-34-55.11	0.99994571		0.99998437		0.99993008
2146	-2-38-17.09	0.99994310		0.99998637		0.99992948
2147	-2-31-26.60	0.99994268		0.99997372		0.99991641
2148	-2-33-14.15	0.99994238		0.99997972		0.99992210
2149	-2-40-37.85	0.99994760		1.00000257		0.99995018
2150	-2-15-26.03	0.99994237		0.99998945		0.99993182
2151	-2-10-07.66	0.99994231		0.99998527		0.99992758
2152	-2-08-35.24	0.99994251		1.00000239		0.99994490

2153	-2-03-19.68	0.99994269	0.99998580	0.99992850
2154	-1-59-16.45	0.99994278	0.99995544	0.99989822
2155	-1-53-02.70	0.99994303	0.99994101	0.99988405
2156	-1-59-13.36	0.99994226	0.99999189	0.99993415
2157	-1-46-30.87	0.99994386	0.99993844	0.99988230
2158	-1-49-02.23	0.99994326	0.99994967	0.99989293
2159	-1-48-01.95	0.99994226	0.99999636	0.99993862
2160	-1-37-18.84	0.99994366	1.00000097	0.99994462
2161	-1-33-01.27	0.99994282	1.00000290	0.99994572
2162	-1-43-34.88	0.99994243	1.00000283	0.99994526
2163	-1-40-27.57	0.99994226	1.00000285	0.99994511
2164	-1-40-40.09	0.99994354	0.99993260	0.99987614
2165	-2-02-08.73	0.99994237	1.00000251	0.99994488
2886	-1-51-58.67	0.99994341	0.99995272	0.99989613
2887	-1-51-56.67	0.99994294	0.99996312	0.99990605
8207	-1-28-16.27	0.99994286	0.99999833	0.99994119
8275	-1-33-02.53	0.99994233	1.00000294	0.99994527
8472	-2-36-17.25	0.99999275	1.00000177	0.99999451
8597	-2-39-07.85	0.99994723	0.99998978	0.99993701
8870	-1-37-17.78	0.99994287	1.00000284	0.99994570
8894	-1-41-26.23	0.99994246	0.99999442	0.99993688
1A	-1-52-00.01	0.99994341	0.99995332	0.99989673
Project Averages:	-2-04-05.42	0.99994485	0.99998063	0.99992548

Adjusted Observations and Residuals

Adjusted Coordinate Observations (Meters)
(Stations with Partially Fixed Coordinate Components)

Station	Component	Adj Coordinate	Residual	StdErr	StdRes
1487	N	93662.7016	0.0435	0.0356	1.2
	E	347113.9365	-0.0037	0.0358	0.1
	Elev	12.7450	0.0150	0.0300	0.5
1779	N	158878.7502	-0.0143	0.0044	3.2*
	E	219479.5009	0.0118	0.0032	3.7*
	Elev	5.6681	-0.0069	0.0200	0.3
1927	N	130190.3490	0.0039	0.0194	0.2
	E	307128.7283	-0.0793	0.0195	4.1*
2133	Elev	52.1052	-0.0228	0.0100	2.3
8207	N	119138.9151	0.0358	0.0178	2.0
	E	352719.0762	-0.0491	0.0133	3.7*
	Elev	32.3823	-0.0157	0.0100	1.6
8472	N	66045.7803	-0.0074	0.0213	0.3
	E	236695.4438	-0.0259	0.0189	1.4
	Elev	12.4571	-0.1029	0.0300	3.4*

Adjusted Measured Angle Observations (DMS)

At	From	To	Angle	Residual	StdErr	StdRes
2	2886	1	304-33-39.61	-0-00-01.89	15.88	0.1
2	2886	20	142-14-45.69	-0-00-14.81	13.35	1.1
2	20	2886	217-45-14.31	0-00-08.81	13.35	0.7
3	21	4	96-17-13.14	0-00-02.39	10.82	0.2
3	22	4	278-42-35.58	-0-00-01.92	9.69	0.2
3	22	21	182-25-22.44	-0-00-03.56	7.82	0.5
3	21	22	177-34-37.56	0-00-01.73	7.82	0.2
20	21	2	130-03-18.29	-0-00-04.71	11.62	0.4
20	2	21	229-56-41.71	-0-00-09.79	11.62	0.8
21	20	3	246-18-59.06	-0-00-00.44	11.11	0.0
21	3	20	113-41-00.94	-0-00-06.56	11.11	0.6
22	3	5	284-11-35.31	0-00-00.31	6.72	0.0
22	23	5	305-17-09.12	-0-00-00.38	7.39	0.1
22	3	6	52-45-38.56	0-00-00.56	11.83	0.0
22	23	6	73-51-12.36	-0-00-00.64	12.60	0.1
22	3	23	338-54-26.20	0-00-04.70	6.61	0.7

23	22	3	216-42-06.50	0-00-04.50	8.75	0.5
23	24	22	216-50-52.17	0-00-02.67	10.25	0.3
23	22	24	143-09-07.83	0-00-07.33	10.25	0.7
24	2886	23	146-30-40.63	0-00-04.13	8.69	0.5
24	23	2886	213-29-19.37	0-00-00.87	8.69	0.1
2886	2	1	41-03-14.36	0-00-04.86	13.02	0.4
2886	24	2	308-22-02.58	-0-00-14.42	10.48	1.4

Adjusted Measured Distance Observations (Meters)

From	To	Distance	Residual	StdErr	StdRes
1	1A	0.0120	-0.0002	0.0029	0.1
2	1	30.4786	-0.0015	0.0030	0.5
2	20	92.4866	0.0011	0.0031	0.4
2	2886	46.0305	-0.0014	0.0030	0.5
2	2886	46.0305	-0.0005	0.0030	0.2
3	4	54.4559	-0.0003	0.0030	0.1
3	4	54.4528	0.0003	0.0030	0.1
3	21	96.8550	-0.0015	0.0031	0.5
3	22	202.0650	-0.0007	0.0032	0.2
20	2	92.4857	0.0012	0.0031	0.4
20	21	56.2423	-0.0003	0.0030	0.1
21	3	96.8628	-0.0014	0.0031	0.4
21	20	56.2402	0.0002	0.0030	0.1
22	5	106.0866	0.0001	0.0031	0.0
22	5	106.0883	-0.0001	0.0031	0.0
22	6	39.7992	-0.0007	0.0030	0.2
22	6	39.8016	0.0007	0.0030	0.2
22	23	90.9358	0.0006	0.0031	0.2
23	3	121.7219	-0.0020	0.0031	0.6
23	22	90.9368	-0.0001	0.0031	0.0
23	24	76.8010	0.0006	0.0030	0.2
24	23	76.8042	0.0011	0.0030	0.4
24	2886	188.6804	0.0029	0.0032	0.9
2886	1	38.3269	-0.0003	0.0030	0.1
2886	2	46.0339	-0.0010	0.0030	0.3
2886	2	46.0405	-0.0010	0.0030	0.3

Adjusted Zenith Observations (DMS)

From	To	Zenith	Residual	StdErr	StdRes
2	1	93-56-33.09	0-00-02.51	17.69	0.1
2	20	90-34-25.98	-0-00-03.23	11.10	0.3
2	2886	87-54-57.27	-0-00-16.59	13.90	1.2
2	2886	87-54-57.27	-0-00-10.09	13.90	0.7
3	4	88-01-45.78	-0-00-11.71	12.91	0.9
3	4	88-07-31.95	0-00-11.71	12.91	0.9
3	21	85-19-45.82	0-00-02.17	11.00	0.2
3	22	91-45-50.70	-0-00-08.66	10.24	0.8
20	2	89-29-00.46	-0-00-00.25	11.10	0.0
20	21	91-22-50.35	-0-00-12.37	12.75	1.0
21	3	94-43-37.27	0-00-00.62	11.00	0.1
21	20	88-42-46.14	-0-00-10.08	12.75	0.8
22	5	90-56-45.73	-0-00-01.30	10.84	0.1
22	5	90-53-18.34	0-00-01.31	10.84	0.1
22	6	88-00-15.85	-0-00-01.60	14.99	0.1
22	6	87-54-28.56	0-00-01.61	14.99	0.1
22	23	89-21-23.04	-0-00-17.70	11.13	1.6
23	3	87-37-12.13	-0-00-03.18	10.65	0.3
23	22	90-42-06.73	-0-00-13.01	11.13	1.2
23	24	88-04-05.95	-0-00-15.98	11.55	1.4
24	23	92-00-01.50	-0-00-13.93	11.55	1.2
24	2886	85-39-05.36	-0-00-02.52	10.27	0.2
2886	1	95-51-35.23	-0-00-01.74	15.32	0.1
2886	2	92-11-53.41	0-00-07.55	13.90	0.5
2886	2	92-24-10.26	-0-00-13.60	13.90	1.0

Adjusted GPS Vector Observations (Meters)

Datum Transformations		StdDev	
Scale Factor 1.000000865041 :	-0.865041 PPM	0.0557	(Solved)
Rotation Around North Axis :	0.038925 Sec	0.0293	(Solved)
Rotation Around East Axis :	-0.191669 Sec	0.0465	(Solved)
Rotation Around Vert Axis :	-0.041499 Sec	0.0115	(Solved)

From	Component	Adj Value	Residual	StdErr	StdRes
To					
(V1 Day083(A) 14:30 00000509.SSF)					
1487	Delta-N	25870.6981	-0.0020	0.0082	0.2
2161	Delta-E	-2999.0616	-0.0035	0.0073	0.5
	Delta-U	-63.2864	0.0150	0.0140	1.1
	Length	26044.0280			
(V2 Day083(A) 14:29 00000513.SSF)					
1487	Delta-N	21969.7567	-0.0006	0.0083	0.1
2160	Delta-E	-10169.3898	0.0059	0.0073	0.8
	Delta-U	-43.6705	0.0149	0.0142	1.0
	Length	24209.2669			
(V3 Day083(A) 14:25 00000517.SSF)					
8870	Delta-N	-3630.2111	-0.0015	0.0051	0.3
2160	Delta-E	-29.3564	0.0068	0.0049	1.4
	Delta-U	10.9140	-0.0007	0.0069	0.1
	Length	3630.3462			
(V4 Day083(A) 14:22 00000521.SSF)					
8207	Delta-N	-4.3872	0.0015	0.0055	0.3
8870	Delta-E	-15061.0968	-0.0060	0.0052	1.2
	Delta-U	-46.4991	-0.0119	0.0080	1.5
	Length	15061.1693			
(V5 Day083(B) 15:33 00000525.SSF)					
2161	Delta-N	-3904.7334	-0.0040	0.0108	0.4
2160	Delta-E	-7168.2872	-0.0047	0.0075	0.6
	Delta-U	7.1396	-0.0084	0.0149	0.6
	Length	8162.8019			
(V6 Day083(0) 15:33 00000529.SSF)					
1487	Delta-N	21969.7567	-0.0065	0.0123	0.5
2160	Delta-E	-10169.3898	0.0007	0.0083	0.1
	Delta-U	-43.6705	-0.0070	0.0172	0.4
	Length	24209.2669			
(V7 Day083(B) 15:33 00000533.SSF)					
8207	Delta-N	260.3259	0.0044	0.0092	0.5
2161	Delta-E	-7926.3260	-0.0004	0.0066	0.1
	Delta-U	-34.0795	0.0039	0.0126	0.3
	Length	7930.6731			
(V8 Day083(C) 16:12 00000541.SSF)					
1487	Delta-N	21969.7567	0.0015	0.0079	0.2
2160	Delta-E	-10169.3898	0.0001	0.0062	0.0
	Delta-U	-43.6705	-0.0047	0.0141	0.3
	Length	24209.2669			
(V9 Day083(C) 16:12 00000537.SSF)					
1487	Delta-N	30106.4467	0.0057	0.0072	0.8
8275	Delta-E	-3032.0436	0.0017	0.0055	0.3
	Delta-U	-82.1506	-0.0153	0.0120	1.3
	Length	30258.8528			
(V10 Day083(C) 16:11 00000545.SSF)					
8207	Delta-N	4496.1429	0.0009	0.0056	0.2
8275	Delta-E	-7955.6719	-0.0011	0.0048	0.2
	Delta-U	-35.9365	-0.0007	0.0085	0.1
	Length	9138.3427			
(V11 Day083(C) 16:11 00000549.SSF)					
8207	Delta-N	260.3259	0.0007	0.0066	0.1
2161	Delta-E	-7926.3260	-0.0007	0.0054	0.1
	Delta-U	-34.0795	-0.0011	0.0111	0.1
	Length	7930.6731			

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(V12 Day083(D) 17:13 00000553.SSF)
2161               Delta-N          4235.7725        0.0013   0.0050   0.3
8275               Delta-E           -35.1950       -0.0017   0.0046   0.4
                   Delta-U            -1.6475        0.0040   0.0063   0.6
                   Length           4235.9191
(V13 Day083(F) 18:10 00000565.SSF)
8894               Delta-N          1606.7966       -0.0053   0.0054   1.0
8275               Delta-E         13998.4049       -0.0019   0.0053   0.3
                   Delta-U           -69.9143        0.0003   0.0080   0.0
                   Length          14090.4941
(V14 Day083(E) 17:43 00000557.SSF)
8870               Delta-N           283.4246       -0.0039   0.0147   0.3
2161               Delta-E          7134.0615        0.0043   0.0086   0.5
                   Delta-U            -4.3972       -0.0164   0.0222   0.7
                   Length           7139.6906
(V15 Day083(E) 17:44 00000561.SSF)
8870               Delta-N          4519.1500       -0.0002   0.0118   0.0
8275               Delta-E          7093.6021       -0.0002   0.0072   0.0
                   Delta-U            -6.1880       -0.0182   0.0176   1.0
                   Length           8410.8231
(V16 Day083(F) 18:08 00000573.SSF)
8894               Delta-N         -6095.5193        0.0037   0.0060   0.6
2164               Delta-E          1284.1594       -0.0039   0.0058   0.7
                   Delta-U           391.4101        0.0082   0.0094   0.9
                   Length           6241.6041
(V17 Day083(G) 19:12 00000577.SSF)
2136               Delta-N          4507.6467       -0.0054   0.0064   0.8
8894               Delta-E          3623.0195        0.0017   0.0054   0.3
                   Delta-U            -85.7671       -0.0133   0.0099   1.3
                   Length           5783.8141
(V18 Day083(G) 19:14 00000581.SSF)
8894               Delta-N         -2920.8920        0.0011   0.0063   0.2
8870               Delta-E          6910.2569        0.0134   0.0054   2.5
                   Delta-U            -58.1368       0.0031   0.0098   0.3
                   Length           7502.4423
(V19 Day083(G) 19:12 00000585.SSF)
2136               Delta-N         -1586.7824       -0.0023   0.0067   0.3
2164               Delta-E          4911.2496       -0.0016   0.0056   0.3
                   Delta-U           309.2248       -0.0004   0.0108   0.0
                   Length           5170.4807
(V20 Day083(H) 20:14 00000589.SSF)
8894               Delta-N         -6095.5193       -0.0016   0.0062   0.3
2164               Delta-E          1284.1594       -0.0048   0.0054   0.9
                   Delta-U           391.4101       -0.0055   0.0096   0.6
                   Length           6241.6041
(V21 Day083(H) 20:13 00000593.SSF)
2160               Delta-N           462.7820       -0.0037   0.0075   0.5
2164               Delta-E         -5601.0417        0.0124   0.0062   2.0
                   Delta-U           433.7659       -0.0088   0.0124   0.7
                   Length           5636.8420
(V22 Day083(I) 21:13 00000601.SSF)
2133               Delta-N          3575.3678        0.0050   0.0095   0.5
2163               Delta-E          6707.1580        0.0073   0.0068   1.1
                   Delta-U            -54.0150       -0.0070   0.0176   0.4
                   Length           7600.7987
(V23 Day083(I) 21:14 00000605.SSF)
2133               Delta-N         -7495.4442        0.0055   0.0078   0.7
2164               Delta-E          6372.1804        0.0001   0.0059   0.0
                   Delta-U           391.1990       -0.0183   0.0137   1.3
                   Length           9845.7810
(V24 Day083(I) 21:15 00000597.SSF)
8894               Delta-N          4974.8932        0.0061   0.0101   0.6
2163               Delta-E          1629.2995       -0.0005   0.0071   0.1
                   Delta-U            -55.9719       0.0052   0.0188   0.3
                   Length           5235.1993
(V25 Day083(I) 21:15 00000609.SSF)
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2160	Delta-N	462.7820	0.0030	0.0091	0.3
2164	Delta-E	-5601.0417	0.0022	0.0066	0.3
	Delta-U	433.7659	-0.0061	0.0166	0.4
	Length	5636.8420			
(V26 Day083(J) 22:17 00000613.SSF)					
2133	Delta-N	-1400.9792	-0.0014	0.0056	0.3
8894	Delta-E	5082.3110	0.0040	0.0050	0.8
	Delta-U	2.1549	0.0077	0.0105	0.7
	Length	5271.8718			
(V27 Day083(J) 22:16 00000617.SSF)					
2133	Delta-N	3575.3678	-0.0007	0.0079	0.1
2163	Delta-E	6707.1580	-0.0018	0.0064	0.3
	Delta-U	-54.0150	0.0026	0.0180	0.1
	Length	7600.7987			
(V28 Day083(J) 22:16 00000621.SSF)					
2133	Delta-N	-7495.4442	0.0015	0.0056	0.3
2164	Delta-E	6372.1804	0.0018	0.0050	0.4
	Delta-U	391.1990	0.0127	0.0106	1.2
	Length	9845.7810			
(V29 Day083(K) 23:40 00000625.SSF)					
8275	Delta-N	3398.2775	0.0004	0.0100	0.0
2163	Delta-E	-12360.8493	-0.0080	0.0079	1.0
	Delta-U	-12.3049	-0.0106	0.0160	0.7
	Length	12819.4788			
(V30 Day083(K) 23:36 00000629.SSF)					
8894	Delta-N	1606.7966	-0.0020	0.0058	0.3
8275	Delta-E	13998.4049	0.0020	0.0052	0.4
	Delta-U	-69.9143	0.0009	0.0081	0.1
	Length	14090.4941			
(V31 Day083(K) 23:47 00000633.SSF)					
2136	Delta-N	4507.6467	-0.0032	0.0063	0.5
8894	Delta-E	3623.0195	0.0076	0.0054	1.4
	Delta-U	-85.7671	0.0104	0.0088	1.2
	Length	5783.8141			
(V32 Day083(K) 23:47 00000637.SSF)					
2136	Delta-N	5909.9151	-0.0028	0.0063	0.4
2133	Delta-E	-1458.9343	0.0013	0.0054	0.2
	Delta-U	-90.3831	0.0117	0.0087	1.3
	Length	6088.0009			
(V33 Day084(L) 00:56 00000641.SSF)					
2136	Delta-N	5909.9151	0.0001	0.0059	0.0
2133	Delta-E	-1458.9343	-0.0034	0.0053	0.6
	Delta-U	-90.3831	0.0073	0.0099	0.7
	Length	6088.0009			
(V34 Day084(L) 01:06 00000645.SSF)					
2133	Delta-N	6498.7064	-0.0007	0.0053	0.1
2162	Delta-E	1504.0116	0.0003	0.0050	0.1
	Delta-U	-52.8627	0.0023	0.0085	0.3
	Length	6670.6844			
(V35 Day084(L) 01:06 00000649.SSF)					
2162	Delta-N	-2924.7032	-0.0039	0.0084	0.5
2163	Delta-E	5202.3787	0.0030	0.0073	0.4
	Delta-U	-2.9096	0.0040	0.0171	0.2
	Length	5968.1355			
(V36 Day084(M) 02:28 00000653.SSF)					
2133	Delta-N	6498.7064	0.0026	0.0054	0.5
2162	Delta-E	1504.0116	0.0010	0.0053	0.2
	Delta-U	-52.8627	-0.0028	0.0086	0.3
	Length	6670.6844			
(V37 Day084(M) 02:30 00000657.SSF)					
2162	Delta-N	-4356.6440	0.0069	0.0073	0.9
2159	Delta-E	-7419.8999	-0.0014	0.0072	0.2
	Delta-U	35.5186	-0.0052	0.0140	0.4
	Length	8604.4478			

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(V38 Day084(M) 02:30 00000661.SSF)
2159              Delta-N         -10826.8917        0.0036   0.0074   0.5
2157              Delta-E           2535.4686       -0.0072   0.0072   1.0
                  Delta-U            359.8606        0.0040   0.0141   0.3
                  Length           11125.6318
(V39 Day084(M) 02:03 00000665.SSF)
2136              Delta-N          -2778.1175        0.0096   0.0057   1.7
2157              Delta-E          -4852.0012       -0.0094   0.0056   1.7
                  Delta-U            271.5848       -0.0218   0.0093   2.3
                  Length            5597.6433
(V40 Day084(A) 14:30 00000669.SSF)
2133              Delta-N           2140.1529        0.0029   0.0082   0.4
2159              Delta-E          -5914.7345       -0.0078   0.0071   1.1
                  Delta-U            -11.1519       -0.0049   0.0134   0.4
                  Length            6290.0288
(V41 Day084(A) 14:30 00000673.SSF)
2159              Delta-N         -10826.8917       -0.0113   0.0079   1.4
2157              Delta-E           2535.4686        0.0050   0.0069   0.7
                  Delta-U            359.8606        0.0030   0.0129   0.2
                  Length           11125.6318
(V42 Day084(A) 14:30 00000677.SSF)
1823              Delta-N            902.9578       -0.0019   0.0075   0.2
2159              Delta-E           6855.5380        0.0039   0.0066   0.6
                  Delta-U            -36.1175        0.0113   0.0121   0.9
                  Length            6914.8419
(V43 Day084(A) 14:23 00000681.SSF)
2157              Delta-N           2357.6241        0.0038   0.0050   0.8
2158              Delta-E          -4211.5245       -0.0085   0.0048   1.8
                  Delta-U            -73.4557       -0.0111   0.0065   1.7
                  Length            4827.0826
(V44 Day084(B) 15:33 00000685.SSF)
1823              Delta-N          -7570.0066       -0.0112   0.0064   1.8
2158              Delta-E           5188.8631       -0.0021   0.0051   0.4
                  Delta-U            258.9513        0.0071   0.0085   0.8
                  Length            9181.3046
(V45 Day084(B) 15:34 00000689.SSF)
1823              Delta-N            902.9578       -0.0161   0.0095   1.7
2159              Delta-E           6855.5380        0.0015   0.0067   0.2
                  Delta-U            -36.1175        0.0074   0.0142   0.5
                  Length            6914.8419
(V46 Day084(B) 15:34 00000693.SSF)
2133              Delta-N           2140.1529       -0.0097   0.0112   0.9
2159              Delta-E          -5914.7345       -0.0029   0.0076   0.4
                  Delta-U            -11.1519       -0.0134   0.0171   0.8
                  Length            6290.0288
(V47 Day084(C) 16:34 00000697.SSF)
2133              Delta-N          -6329.0196       -0.0001   0.0060   0.0
2158              Delta-E          -7600.8697       -0.0066   0.0052   1.3
                  Delta-U            282.2122       -0.0050   0.0094   0.5
                  Length            9894.9155
(V48 Day084(C) 16:34 00000701.SSF)
2159              Delta-N          -8471.0060       -0.0006   0.0077   0.1
2158              Delta-E          -1677.1238       -0.0003   0.0062   0.1
                  Delta-U            292.0797        0.0050   0.0136   0.4
                  Length            8640.3702
(V49 Day084(E) 18:35 00000717.SSF)
2155              Delta-N           1447.6196        0.0019   0.0068   0.3
2154              Delta-E         -10394.8511       -0.0029   0.0060   0.5
                  Delta-U            -100.7151       -0.0037   0.0110   0.3
                  Length           10495.6503
(V50 Day084(C) 16:34 00000705.SSF)
2158              Delta-N           1109.9969        0.0031   0.0068   0.5
2155              Delta-E          -6689.6202       -0.0009   0.0052   0.2
                  Delta-U              51.6266        0.0055   0.0115   0.5
                  Length            6781.2813
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(V51 Day084(C) 16:33 00000709.SSF)
1823              Delta-N          -6466.1192        0.0063   0.0061   1.0
2155              Delta-E          -1501.7125        0.0061   0.0049   1.2
                  Delta-U            317.3223        0.0050   0.0097   0.5
                  Length            6645.7905
(V52 Day084(D) 17:35 00000713.SSF)
1823              Delta-N          -6466.1192        0.0023   0.0061   0.4
2155              Delta-E          -1501.7125       -0.0053   0.0053   1.0
                  Delta-U            317.3223        0.0018   0.0092   0.2
                  Length            6645.7905
(V53 Day084(E) 18:35 00000721.SSF)
2155              Delta-N            8788.9788       -0.0019   0.0071   0.3
2156              Delta-E          -10295.3126       -0.0065   0.0064   1.0
                  Delta-U            -339.0126        0.0042   0.0121   0.4
                  Length           13540.8471
(V54 Day084(E) 18:36 00000725.SSF)
1823              Delta-N            2325.8927        0.0038   0.0064   0.6
2156              Delta-E          -11794.6473       -0.0049   0.0058   0.8
                  Delta-U             -15.1863        0.0135   0.0103   1.3
                  Length           12021.8015
(V55 Day084(E) 18:36 00000729.SSF)
1823              Delta-N            4155.0949        0.0041   0.0061   0.7
1927              Delta-E          -6088.7261        0.0040   0.0055   0.7
                  Delta-U            -75.6962        0.0088   0.0095   0.9
                  Length            7371.7792
(V56 Day084(F) 19:37 00000733.SSF)
2156              Delta-N            1840.9684       -0.0046   0.0089   0.5
1927              Delta-E            5702.0226        0.0116   0.0069   1.7
                  Delta-U            -70.3739       -0.0004   0.0150   0.0
                  Length            5992.2599
(V57 Day084(F) 19:37 00000737.SSF)
2156              Delta-N          -7341.8474       -0.0097   0.0107   0.9
2154              Delta-E            -85.9758        0.0111   0.0081   1.4
                  Delta-U            228.3296        0.0068   0.0183   0.4
                  Length            7345.9002
(V58 Day084(F) 19:37 00000741.SSF)
2155              Delta-N            1447.6196        0.0091   0.0101   0.9
2154              Delta-E          -10394.8511       -0.0106   0.0077   1.4
                  Delta-U            -100.7151        0.0005   0.0173   0.0
                  Length           10495.6503
(V59 Day084(G) 20:20 00000745.SSF)
2156              Delta-N            1840.9684       -0.0070   0.0078   0.9
1927              Delta-E            5702.0226        0.0043   0.0062   0.7
                  Delta-U            -70.3739        0.0007   0.0131   0.1
                  Length            5992.2599
(V60 Day084(I) 22:19 00000765.SSF)
2154              Delta-N             563.8542        0.0087   0.0064   1.4
2153              Delta-E          -6763.6104        0.0004   0.0054   0.1
                  Delta-U            -197.3178        0.0012   0.0124   0.1
                  Length            6789.9405
(V61 Day084(G) 20:20 00000749.SSF)
1885              Delta-N            2011.7674        0.0076   0.0081   0.9
1927              Delta-E            1898.3529       -0.0055   0.0061   0.9
                  Delta-U              -0.2556       -0.0165   0.0141   1.2
                  Length            2766.0354
(V62 Day084(G) 20:19 00000753.SSF)
1885              Delta-N          -7167.1938        0.0137   0.0135   1.0
2154              Delta-E          -3895.9204       -0.0052   0.0093   0.6
                  Delta-U             295.2493       -0.0088   0.0253   0.3
                  Length            8162.9673
(V63 Day084(G) 20:17 00000757.SSF)
1885              Delta-N          -8603.1698        0.0140   0.0152   0.9
2155              Delta-E            6500.6592        0.0128   0.0104   1.2
                  Delta-U             383.4495       -0.0037   0.0284   0.1
                  Length           10789.8163
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(V64 Day084(H) 21:18 00000761.SSF)
2154                Delta-N          7341.5807       -0.0043   0.0073   0.6
2156                Delta-E            85.8627       -0.0060   0.0062   1.0
                    Delta-U          -236.7911        0.0042   0.0167   0.2
                    Length           7345.9002
(V65 Day084(I) 22:17 00000769.SSF)
2130                Delta-N         -6124.7552       -0.0034   0.0067   0.5
2153                Delta-E          5649.8056       -0.0011   0.0056   0.2
                    Delta-U            29.0613        0.0040   0.0135   0.3
                    Length           8332.6931
(V66 Day084(I) 22:18 00000773.SSF)
2130                Delta-N          2946.6601       -0.0066   0.0054   1.2
2165                Delta-E          7610.4269       -0.0012   0.0049   0.3
                    Delta-U           -77.3334        0.0068   0.0095   0.7
                    Length           8161.3347
(V67 Day084(I) 22:19 00000777.SSF)
2165                Delta-N         -2285.3493       -0.0044   0.0056   0.8
2156                Delta-E          4870.9828       -0.0027   0.0050   0.6
                    Delta-U            65.5096       -0.0011   0.0100   0.1
                    Length           5380.8537
(V68 Day084(J) 23:21 00000781.SSF)
2153                Delta-N          6785.7951       -0.0071   0.0070   1.0
2156                Delta-E          6841.4379       -0.0062   0.0061   1.0
                    Delta-U           -46.1232       -0.0131   0.0112   1.2
                    Length           9636.0996
(V69 Day084(J) 23:22 00000785.SSF)
2130                Delta-N           667.8167       -0.0094   0.0065   1.4
2156                Delta-E         12484.5184       -0.0023   0.0058   0.4
                    Delta-U           -16.5748       -0.0009   0.0102   0.1
                    Length          12502.3779
(V70 Day084(J) 23:22 00000789.SSF)
2156                Delta-N          2289.4667        0.0059   0.0059   1.0
2165                Delta-E         -4868.9858        0.0009   0.0054   0.2
                    Delta-U           -70.0424       -0.0023   0.0090   0.3
                    Length           5380.8537
(V71 Day085(K) 00:21 00000793.SSF)
2156                Delta-N         -6777.6648        0.0084   0.0065   1.3
2153                Delta-E         -6849.5751        0.0016   0.0055   0.3
                    Delta-U            31.5708        0.0035   0.0102   0.3
                    Length           9636.0996
(V72 Day085(K) 00:22 00000801.SSF)
2111                Delta-N          5276.7313       -0.0066   0.0093   0.7
2130                Delta-E          7766.4451       -0.0083   0.0074   1.1
                    Delta-U          -110.7443        0.0036   0.0155   0.2
                    Length           9390.0920
(V73 Day085(K) 00:21 00000797.SSF)
2111                Delta-N           -840.3395       -0.0024   0.0114   0.2
2153                Delta-E         13424.5788       -0.0085   0.0087   1.0
                    Delta-U           -83.4933       -0.0096   0.0188   0.5
                    Length          13451.1136
(V74 Day085(K) 00:22 00000805.SSF)
2130                Delta-N          2946.6601       -0.0029   0.0058   0.5
2165                Delta-E          7610.4269       -0.0027   0.0051   0.5
                    Delta-U           -77.3334       -0.0078   0.0084   0.9
                    Length           8161.3347
(V75 Day085(L) 01:23 00000809.SSF)
2111                Delta-N           -840.3395       -0.0121   0.0085   1.4
2153                Delta-E         13424.5788       -0.0062   0.0076   0.8
                    Delta-U           -83.4933       -0.0052   0.0172   0.3
                    Length          13451.1136
(V76 Day085(L) 01:22 00000813.SSF)
2130                Delta-N         -6124.7552       -0.0003   0.0062   0.0
2153                Delta-E          5649.8056        0.0014   0.0058   0.2
                    Delta-U            29.0613        0.0028   0.0111   0.3
                    Length           8332.6931
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(V77 Day085(M) 02:23 00000817.SSF)
2153              Delta-N          8046.4553        0.0230   0.0078   3.0
2151              Delta-E        -11329.3271       -0.0052   0.0075   0.7
                  Delta-U           -11.7221        0.0258   0.0149   1.7
                  Length          13896.0150
(V78 Day085(M) 02:22 00000821.SSF)
2151              Delta-N          2547.0803       -0.0063   0.0054   1.2
2152              Delta-E          2565.1346        0.0023   0.0051   0.5
                  Delta-U          -110.2405       -0.0059   0.0081   0.7
                  Length           3616.5849
(V79 Day085(M) 02:24 00000825.SSF)
2130              Delta-N         -5266.2888        0.0055   0.0073   0.8
2111              Delta-E         -7773.7143        0.0055   0.0076   0.7
                  Delta-U            96.9344        0.0054   0.0149   0.4
                  Length           9390.0920
(V80 Day085(M) 02:23 00000829.SSF)
2130              Delta-N          4455.0429        0.0134   0.0072   1.9
2152              Delta-E         -3119.6807       -0.0009   0.0065   0.1
                  Delta-U           -73.6302        0.0079   0.0131   0.6
                  Length           5439.2312
(V81 Day085(A) 14:37 00000833.SSF)
2130              Delta-N          4455.0429        0.0244   0.0100   2.4
2152              Delta-E         -3119.6807       -0.0123   0.0082   1.5
                  Delta-U           -73.6302       -0.0237   0.0160   1.5
                  Length           5439.2312
(V82 Day085(A) 14:37 00000837.SSF)
2152              Delta-N         -2545.9739        0.0049   0.0061   0.8
2151              Delta-E         -2566.3200        0.0005   0.0054   0.1
                  Delta-U           108.1924       -0.0071   0.0084   0.8
                  Length           3616.5849
(V83 Day085(B) 15:12 00000841.SSF)
2111              Delta-N          7179.5985       -0.0071   0.0096   0.7
2151              Delta-E          2076.4665        0.0045   0.0124   0.4
                  Delta-U           -70.3168       -0.0112   0.0164   0.7
                  Length           7474.1750
(V84 Day085(B) 15:13 00000845.SSF)
2111              Delta-N          9727.4820       -0.0092   0.0084   1.1
2152              Delta-E          4640.6413        0.0003   0.0098   0.0
                  Delta-U          -184.2619       -0.0018   0.0147   0.1
                  Length          10779.3047
(V85 Day085(D) 18:13 00000865.SSF)
2150              Delta-N         -1028.9152       -0.0054   0.0061   0.9
2151              Delta-E          8840.9046       -0.0003   0.0059   0.0
                  Delta-U            20.4714        0.0106   0.0098   1.1
                  Length           8900.6000
(V86 Day085(C) 16:12 00000849.SSF)
2111              Delta-N        -20570.5806        0.0265   0.0069   3.8*
2144              Delta-E        -42732.7051        0.0155   0.0064   2.4
                  Delta-U          -287.2502       -0.0034   0.0114   0.3
                  Length          47426.9479
(V87 Day085(C) 16:11 00000853.SSF)
2144              Delta-N         29055.2469       -0.0059   0.0059   1.0
2150              Delta-E         35755.3720       -0.0027   0.0051   0.5
                  Delta-U          -147.7455        0.0058   0.0088   0.7
                  Length          46072.5062
(V88 Day085(D) 18:13 00000869.SSF)
2111              Delta-N          8218.9190        0.0070   0.0082   0.8
2150              Delta-E         -6763.1897        0.0069   0.0087   0.8
                  Delta-U          -101.4849       -0.0096   0.0157   0.6
                  Length          10644.3254
(V89 Day085(C) 16:12 00000861.SSF)
2150              Delta-N         -1028.9152       -0.0124   0.0053   2.3
2151              Delta-E          8840.9046       -0.0002   0.0048   0.0
                  Delta-U            20.4714       -0.0084   0.0074   1.1
                  Length           8900.6000
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(V90 Day085(C) 17:03 00000857.SSF)
1638              Delta-N          -5759.3125       -0.0106   0.0077   1.4
2150              Delta-E          18891.3614        0.0116   0.0060   1.9
                  Delta-U             52.6625       -0.0081   0.0119   0.7
                  Length           19749.8352
(V91 Day085(D) 18:14 00000873.SSF)
2150              Delta-N         -28831.7140        0.0056   0.0057   1.0
2144              Delta-E         -35935.6919        0.0105   0.0052   2.0
                  Delta-U           -184.8357        0.0024   0.0084   0.3
                  Length           46072.5064
(V92 Day085(D) 18:14 00000877.SSF)
1638              Delta-N         -34709.3823       -0.0018   0.0069   0.3
2144              Delta-E         -16949.3734        0.0115   0.0061   1.9
                  Delta-U            -52.3866       -0.0036   0.0112   0.3
                  Length           38626.7424
(V93 Day085(E) 20:16 00000881.SSF)
1638              Delta-N          -5759.3125        0.0023   0.0092   0.3
2150              Delta-E          18891.3614        0.0047   0.0070   0.7
                  Delta-U             52.6625       -0.0207   0.0162   1.3
                  Length           19749.8352
(V94 Day085(E) 20:19 00000885.SSF)
1638              Delta-N           3506.3376        0.0041   0.0137   0.3
2098              Delta-E         -10039.9894       -0.0041   0.0093   0.4
                  Delta-U             4.2452       -0.0276   0.0229   1.2
                  Length           10634.6513
(V95 Day085(E) 20:19 00000889.SSF)
2098              Delta-N         -18313.8284       -0.0075   0.0127   0.6
2147              Delta-E           2282.0011        0.0094   0.0087   1.1
                  Delta-U            143.7374       -0.0078   0.0209   0.4
                  Length           18456.0153
(V96 Day085(E) 20:15 00000893.SSF)
2144              Delta-N          19925.6481        0.0015   0.0088   0.2
2147              Delta-E           9100.7605       -0.0004   0.0069   0.1
                  Delta-U             81.2793        0.0012   0.0156   0.1
                  Length           21905.7504
(V97 Day085(F) 21:19 00000897.SSF)
1638              Delta-N           3506.3376        0.0075   0.0101   0.7
2098              Delta-E         -10039.9894       -0.0005   0.0074   0.1
                  Delta-U             4.2452        0.0023   0.0210   0.1
                  Length           10634.6513
(V98 Day085(F) 21:19 00000901.SSF)
1638              Delta-N         -14811.3929       -0.0025   0.0089   0.3
2147              Delta-E          -7790.4361        0.0064   0.0067   0.9
                  Delta-U            161.5986       -0.0121   0.0181   0.7
                  Length           16736.0201
(V99 Day085(F) 21:16 00000905.SSF)
2147              Delta-N         -19910.8442       -0.0014   0.0078   0.2
2144              Delta-E          -9132.1231        0.0062   0.0061   1.0
                  Delta-U           -156.5597        0.0014   0.0152   0.1
                  Length           21905.7504
(V100 Day085(F) 21:15 00000909.SSF)
2150              Delta-N          -8963.8721        0.0078   0.0073   1.1
2147              Delta-E         -26711.7555        0.0007   0.0058   0.1
                  Delta-U             38.2378       -0.0038   0.0138   0.3
                  Length           28175.7049
(V101 Day085(G) 22:17 00000913.SSF)
2098              Delta-N         -18313.8284       -0.0025   0.0064   0.4
2147              Delta-E           2282.0011        0.0013   0.0059   0.2
                  Delta-U            143.7374       -0.0129   0.0195   0.7
                  Length           18456.0153
(V102 Day085(G) 22:17 00000917.SSF)
1638              Delta-N         -14811.3929        0.0008   0.0070   0.1
2147              Delta-E          -7790.4361        0.0116   0.0063   1.8
                  Delta-U            161.5986       -0.0042   0.0225   0.2
                  Length           16736.0201
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(V103 Day085(H) 23:18 00000921.SSF)
2147              Delta-N         -10853.2208       -0.0005   0.0073   0.1
2145              Delta-E          -5809.3810        0.0015   0.0063   0.2
                  Delta-U            -79.8349        0.0045   0.0107   0.4
                  Length           12310.4704
(V104 Day085(H) 23:17 00000925.SSF)
2100              Delta-N         -32567.3424       -0.0094   0.0107   0.9
2145              Delta-E            -94.6908       -0.0002   0.0086   0.0
                  Delta-U              7.1080        0.0001   0.0164   0.0
                  Length           32567.4808
(V105 Day085(H) 23:17 00000929.SSF)
2098              Delta-N           3398.1823       -0.0000   0.0072   0.0
2100              Delta-E          -3408.9263       -0.0002   0.0064   0.0
                  Delta-U             10.3534       -0.0073   0.0099   0.7
                  Length           4813.3697
(V106 Day086(I) 00:17 00000933.SSF)
2098              Delta-N         -29169.0892        0.0138   0.0116   1.2
2145              Delta-E          -3523.0933       -0.0043   0.0093   0.5
                  Delta-U             34.7713        0.0072   0.0233   0.3
                  Length          29381.1021
(V107 Day086(J) 01:01 00000945.SSF)
2098              Delta-N           8488.0892        0.0083   0.0064   1.3
2149              Delta-E         -12986.1313       -0.0017   0.0060   0.3
                  Delta-U            -32.5126       -0.0087   0.0143   0.6
                  Length          15514.1329
(V108 Day086(I) 00:18 00000937.SSF)
2098              Delta-N           3398.1823        0.0012   0.0068   0.2
2100              Delta-E          -3408.9263       -0.0033   0.0059   0.6
                  Delta-U             10.3534        0.0120   0.0120   1.0
                  Length           4813.3697
(V109 Day086(J) 00:58 00000949.SSF)
2098              Delta-N         -15569.2699       -0.0002   0.0076   0.0
2148              Delta-E           -708.5681       -0.0063   0.0070   0.9
                  Delta-U            113.0998       -0.0064   0.0185   0.3
                  Length          15585.7956
(V110 Day086(A) 15:00 00000973.SSF)
1779              Delta-N          -6803.5646       -0.0041   0.0101   0.4
2149              Delta-E          14231.1140        0.0059   0.0073   0.8
                  Delta-U            -20.7305        0.0019   0.0150   0.1
                  Length          15773.8241
(V111 Day086(J) 00:59 00000957.SSF)
2148              Delta-N         -13600.3177        0.0031   0.0085   0.4
2145              Delta-E          -2812.8500        0.0052   0.0075   0.7
                  Delta-U            -44.7815       -0.0079   0.0201   0.4
                  Length          13888.2242
(V112 Day086(K) 02:01 00000961.SSF)
2100              Delta-N           5084.2019        0.0016   0.0117   0.1
2149              Delta-E          -9580.2667       -0.0039   0.0095   0.4
                  Delta-U            -35.0420        0.0073   0.0197   0.4
                  Length          10845.8216
(V113 Day086(J) 00:59 00000953.SSF)
2100              Delta-N         -18965.8863        0.0064   0.0092   0.7
2148              Delta-E           2711.7476       -0.0048   0.0080   0.6
                  Delta-U             91.1889        0.0089   0.0224   0.4
                  Length          19158.9857
(V114 Day086(K) 02:00 00000965.SSF)
2149              Delta-N         -24029.4589       -0.0007   0.0084   0.1
2148              Delta-E          12332.6210        0.0027   0.0074   0.4
                  Delta-U             88.6096        0.0166   0.0152   1.1
                  Length          27009.5592
(V115 Day086(K) 02:00 00000969.SSF)
2098              Delta-N         -15569.2699       -0.0112   0.0106   1.1
2148              Delta-E           -708.5681        0.0117   0.0096   1.2
                  Delta-U            113.0998        0.0239   0.0200   1.2
                  Length          15585.7956
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(V116 Day086(A) 14:49 00000977.SSF)
1779              Delta-N         -45269.8246       -0.0085   0.0087   1.0
2143              Delta-E           7147.4411        0.0139   0.0068   2.0
                  Delta-U           -115.8150       -0.0192   0.0131   1.5
                  Length           45830.7358
(V117 Day086(A) 14:49 00000981.SSF)
1779              Delta-N         -35978.2301       -0.0083   0.0097   0.9
2146              Delta-E          18220.0902        0.0130   0.0074   1.7
                  Delta-U            -25.4146       -0.0068   0.0149   0.5
                  Length           40328.7165
(V118 Day086(B) 16:15 00000989.SSF)
1779              Delta-N          -6803.5646       -0.0075   0.0072   1.0
2149              Delta-E          14231.1140        0.0035   0.0059   0.6
                  Delta-U            -20.7305        0.0154   0.0127   1.2
                  Length           15773.8241
(V119 Day086(A) 14:56 00000985.SSF)
1779              Delta-N         -30802.1671       -0.0117   0.0101   1.2
2148              Delta-E          26623.9392        0.0053   0.0095   0.6
                  Delta-U             14.6517        0.0002   0.0137   0.0
                  Length           40713.7305
(V120 Day086(B) 16:04 00000993.SSF)
1779              Delta-N         -45269.8246       -0.0101   0.0078   1.3
2143              Delta-E           7147.4411        0.0110   0.0062   1.8
                  Delta-U           -115.8150        0.0121   0.0140   0.9
                  Length           45830.7358
(V121 Day086(B) 16:15 00000997.SSF)
2143              Delta-N           9278.2594        0.0013   0.0070   0.2
2146              Delta-E          11084.1331        0.0009   0.0058   0.2
                  Delta-U             36.7603       -0.0013   0.0123   0.1
                  Length           14454.9457
(V122 Day086(B) 16:16 00001001.SSF)
2146              Delta-N           2409.8434        0.0020   0.0074   0.3
2147              Delta-E          11415.1418       -0.0080   0.0060   1.3
                  Delta-U             70.0785        0.0009   0.0133   0.1
                  Length           11666.9498
(V123 Day086(C) 17:17 00001005.SSF)
2143              Delta-N           9278.2594       -0.0001   0.0077   0.0
2146              Delta-E          11084.1331       -0.0034   0.0062   0.5
                  Delta-U             36.7603        0.0004   0.0119   0.0
                  Length           14454.9457
(V124 Day086(C) 17:17 00001009.SSF)
2143              Delta-N          11710.1930        0.0019   0.0064   0.3
2147              Delta-E          22494.7085       -0.0034   0.0054   0.6
                  Delta-U             83.5045        0.0043   0.0093   0.5
                  Length           25360.3530
(V125 Day086(D) 18:18 00001013.SSF)
2148              Delta-N          -2744.1059       -0.0059   0.0066   0.9
2147              Delta-E           2990.9124       -0.0039   0.0057   0.7
                  Delta-U             37.0130        0.0128   0.0100   1.3
                  Length            4059.1926
(V126 Day086(D) 18:18 00001017.SSF)
2148              Delta-N          -5137.1317       -0.0067   0.0104   0.6
2146              Delta-E          -8427.6499        0.0048   0.0086   0.6
                  Delta-U            -50.0548        0.0124   0.0183   0.7
                  Length            9870.0512
(V127 Day086(E) 19:19 00001021.SSF)
2145              Delta-N           8460.4127        0.0017   0.0093   0.2
2146              Delta-E          -5618.9416       -0.0056   0.0072   0.8
                  Delta-U            -20.8686        0.0019   0.0155   0.1
                  Length           10156.3538
(V128 Day086(E) 19:19 00001025.SSF)
8597              Delta-N          11823.7334        0.0065   0.0078   0.8
2146              Delta-E           1412.2067       -0.0122   0.0063   1.9
                  Delta-U             10.5833        0.0059   0.0128   0.5
                  Length           11907.7752
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(V129 Day086(F) 20:22 00001029.SSF)
8597              Delta-N          11823.7334        0.0038   0.0101   0.4
2146              Delta-E           1412.2067       -0.0052   0.0071   0.7
                  Delta-U             10.5833       -0.0032   0.0183   0.2
                  Length           11907.7752
(V130 Day086(F) 20:22 00001033.SSF)
8597              Delta-N           -970.3802        0.0046   0.0079   0.6
2142              Delta-E          -6913.5649       -0.0045   0.0059   0.8
                  Delta-U            -42.6212        0.0052   0.0137   0.4
                  Length            6981.4636
(V131 Day086(F) 20:25 00001037.SSF)
8597              Delta-N           3370.2047       -0.0034   0.0100   0.3
2145              Delta-E           7041.5059       -0.0074   0.0067   1.1
                  Delta-U             29.7207        0.0027   0.0186   0.1
                  Length            7806.5337
(V132 Day086(F) 20:25 00001041.SSF)
2145              Delta-N          -9061.0875       -0.0000   0.0090   0.0
2144              Delta-E          -3313.6598       -0.0011   0.0062   0.2
                  Delta-U            -58.2735       -0.0002   0.0159   0.0
                  Length            9648.1628
(V133 Day086(G) 21:22 00001045.SSF)
8597              Delta-N           -970.3802        0.0029   0.0067   0.4
2142              Delta-E          -6913.5649       -0.0006   0.0056   0.1
                  Delta-U            -42.6212        0.0023   0.0139   0.2
                  Length            6981.4636
(V134 Day086(G) 21:22 00001049.SSF)
8597              Delta-N          -5694.9544       -0.0020   0.0065   0.3
2144              Delta-E           3738.8628       -0.0052   0.0055   0.9
                  Delta-U            -20.1180        0.0025   0.0133   0.2
                  Length            6812.6357
(V135 Day086(H) 22:23 00001053.SSF)
8597              Delta-N          -5694.9544        0.0009   0.0058   0.1
2144              Delta-E           3738.8628       -0.0063   0.0051   1.2
                  Delta-U            -20.1180       -0.0010   0.0104   0.1
                  Length            6812.6357
(V136 Day086(H) 22:22 00001057.SSF)
2144              Delta-N           1412.9560        0.0031   0.0056   0.5
2141              Delta-E         -16927.2028        0.0067   0.0050   1.3
                  Delta-U              -6.1431       -0.0042   0.0099   0.4
                  Length           16986.0730
(V137 Day086(H) 22:23 00001061.SSF)
2142              Delta-N          -3330.0934        0.0033   0.0057   0.6
2141              Delta-E          -6271.6659        0.0022   0.0051   0.4
                  Delta-U             34.8144        0.0000   0.0101   0.0
                  Length            7101.0230
(V138 Day086(I) 23:23 00001065.SSF)
8472              Delta-N          38392.2999        0.0000   0.0062   0.0
2144              Delta-E          -1021.5303       -0.0074   0.0054   1.4
                  Delta-U            -55.7887        0.0046   0.0089   0.5
                  Length           38405.9283
(V139 Day086(I) 23:23 00001069.SSF)
8472              Delta-N          43125.3338        0.0066   0.0064   1.0
2142              Delta-E         -11670.0381       -0.0034   0.0055   0.6
                  Delta-U            -118.9759        0.0020   0.0093   0.2
                  Length           44676.5975
(V140 Day086(I) 23:24 00001073.SSF)
8472              Delta-N          39808.1702        0.0041   0.0061   0.7
2141              Delta-E         -17948.4817       -0.0009   0.0054   0.2
                  Delta-U            -73.1710        0.0011   0.0088   0.1
                  Length           43667.4222
(V141 Day087(J) 00:24 00001089.SSF)
2137              Delta-N          -6001.8844       -0.0102   0.0100   1.0
2144              Delta-E          16134.1454       -0.0114   0.0080   1.4
                  Delta-U             -9.1185       -0.0059   0.0248   0.2
                  Length           17214.3355
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(V142 Day087(J) 00:25 00001081.SSF)
2137              Delta-N          -1300.1968       -0.0073   0.0099   0.7
2142              Delta-E           5471.5728       -0.0086   0.0080   1.1
                  Delta-U            -10.7264       -0.0054   0.0248   0.2
                  Length            5623.9431
(V143 Day087(J) 00:25 00001077.SSF)
2137              Delta-N         -44390.4352       -0.0025   0.0110   0.2
8472              Delta-E          17269.2123       -0.0128   0.0088   1.5
                  Delta-U           -223.9028       -0.0354   0.0283   1.3
                  Length           47631.7810
(V144 Day087(J) 00:25 00001085.SSF)
2137              Delta-N          -4636.2461       -0.0104   0.0054   1.9
2141              Delta-E           -796.8993       -0.0080   0.0049   1.6
                  Delta-U             28.7747        0.0021   0.0099   0.2
                  Length            4704.3229
(V145 Day087(K) 01:26 00001093.SSF)
8472              Delta-N          38392.2999       -0.0122   0.0063   1.9
2144              Delta-E          -1021.5303        0.0001   0.0058   0.0
                  Delta-U            -55.7887       -0.0110   0.0105   1.0
                  Length           38405.9283
(V146 Day087(K) 01:26 00001097.SSF)
2144              Delta-N           4731.4457        0.0056   0.0060   0.9
2142              Delta-E         -10649.3501       -0.0001   0.0056   0.0
                  Delta-U            -32.9596       -0.0070   0.0097   0.7
                  Length           11653.1679
(V147 Day087(L) 02:28 00001101.SSF)
8597              Delta-N         -44085.8657       -0.0003   0.0066   0.0
8472              Delta-E           4791.8992       -0.0104   0.0065   1.6
                  Delta-U           -230.8040        0.0231   0.0123   1.9
                  Length           44346.1286
(V148 Day087(L) 02:10 00001105.SSF)
8597              Delta-N           2564.1026       -0.0029   0.0056   0.5
2143              Delta-E          -9687.4422       -0.0145   0.0055   2.7
                  Delta-U            -39.2778        0.0021   0.0090   0.2
                  Length           10021.1128
(V149 Day087(L) 02:27 00001109.SSF)
2143              Delta-N          -3529.8124       -0.0090   0.0046   2.0
2142              Delta-E           2779.8057        0.0058   0.0046   1.3
                  Delta-U             -8.9713       -0.0030   0.0058   0.5
                  Length            4492.9919
(V150 Day087(L) 02:27 00001113.SSF)
2144              Delta-N           4731.4457        0.0022   0.0057   0.4
2142              Delta-E         -10649.3501        0.0056   0.0057   1.0
                  Delta-U            -32.9596        0.0023   0.0097   0.2
                  Length           11653.1679
(V151 Day350(1) 17:06 00005224.ssf)
2155              Delta-N          -1726.1358       -0.0067   0.0076   0.9
2886              Delta-E           1781.6602        0.0052   0.0060   0.9
                  Delta-U            -75.1720        0.0041   0.0125   0.3
                  Length            2481.8358
(V152 Day350(1) 17:07 00005228.ssf)
2886              Delta-N           2237.5589        0.0045   0.0071   0.6
2887              Delta-E             55.5819       -0.0032   0.0058   0.6
                  Delta-U            -66.7550        0.0013   0.0115   0.1
                  Length            2239.2444
(V153 Day357(0) 16:21 00005260.ssf)
2886              Delta-N           2237.5589        0.0010   0.0056   0.2
2887              Delta-E             55.5819       -0.0090   0.0049   1.8
                  Delta-U            -66.7550       -0.0099   0.0086   1.1
                  Length            2239.2444
(V156 Day357(2) 18:40 00005288.ssf)
2155              Delta-N            511.4582       -0.0006   0.0161   0.0
2887              Delta-E           1836.5299       -0.0007   0.0052   0.1
                  Delta-U           -141.3360        0.0017   0.0092   0.2
                  Length            1911.6504
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(V157 Day357(3) 19:51 00005304.ssf)
2158              Delta-N          -618.2253        0.0089   0.0080   1.1
2886              Delta-E         -4909.8935       -0.0016   0.0053   0.3
                  Delta-U           -21.3813       -0.0180   0.0103   1.8
                  Length           4948.7083
(V158 Day357(4) 21:05 00005308.ssf)
2158              Delta-N           1619.2918        0.0148   0.0075   2.0
2887              Delta-E         -4852.3490       -0.0054   0.0063   0.9
                  Delta-U           -87.8749        0.0030   0.0143   0.2
                  Length           5116.1625
(V159 Day357(4) 21:04 00005312.ssf)
2887              Delta-N          -2237.5817       -0.0007   0.0074   0.1
2886              Delta-E            -55.6041        0.0050   0.0059   0.8
                  Delta-U             65.9686       -0.0059   0.0114   0.5
                  Length           2239.2444
(V160 Day299(0) 15:27 00006584.ssf)
2155              Delta-N          -1718.1554        0.0013   0.0049   0.3
1A                Delta-E           1744.3801       -0.0003   0.0047   0.1
                  Delta-U            -78.9994        0.0074   0.0094   0.8
                  Length           2449.7267
(V161 Day299(0) 15:28 00006588.ssf)
2155              Delta-N          -1748.4293       -0.0009   0.0050   0.2
2                 Delta-E           1741.4231       -0.0019   0.0047   0.4
                  Delta-U            -76.9146        0.0135   0.0102   1.3
                  Length           2468.9016
(V162 Day299(0) 15:35 00006592.ssf)
2155              Delta-N          -1776.2203       -0.0002   0.0049   0.0
3                 Delta-E           1588.4065       -0.0027   0.0048   0.6
                  Delta-U            -86.9701        0.0115   0.0102   1.1
                  Length           2384.4407
(V163 Day299(0) 17:28 00006596.ssf)
1A                Delta-N            -30.2725       -0.0013   0.0047   0.3
2                 Delta-E             -2.9668        0.0010   0.0044   0.2
                  Delta-U              2.0922        0.0016   0.0053   0.3
                  Length              30.4894
(V164 Day299(0) 15:36 00006600.ssf)
2887              Delta-N          -2229.5891        0.0039   0.0050   0.8
1A                Delta-E            -92.8805       -0.0024   0.0049   0.5
                  Delta-U             62.1311       -0.0067   0.0108   0.6
                  Length           2232.3876
(V165 Day299(0) 15:36 00006604.ssf)
2887              Delta-N          -2259.8622        0.0021   0.0053   0.4
2                 Delta-E            -95.8479       -0.0042   0.0049   0.8
                  Delta-U             64.2127        0.0014   0.0127   0.1
                  Length           2262.8052
(V166 Day299(0) 15:36 00006608.ssf)
2887              Delta-N          -2287.6034        0.0027   0.0050   0.5
3                 Delta-E           -248.8704       -0.0048   0.0048   1.0
                  Delta-U             54.1110       -0.0011   0.0108   0.1
                  Length           2301.7371
(V167 Day299(1) 16:47 00006612.ssf)
2886              Delta-N              7.9909       -0.0026   0.0054   0.5
1A                Delta-E            -37.2765        0.0033   0.0051   0.7
                  Delta-U             -3.8400        0.0094   0.0084   1.1
                  Length              38.3163
(V168 Day299(1) 16:47 00006616.ssf)
2886              Delta-N            -22.2815       -0.0065   0.0058   1.1
2                 Delta-E            -40.2436        0.0026   0.0051   0.5
                  Delta-U             -1.7478        0.0097   0.0085   1.1
                  Length              46.0334
(V169 Day299(1) 16:47 00006620.ssf)
2886              Delta-N            -50.0278       -0.0068   0.0057   1.2
3                 Delta-E           -193.2660        0.0003   0.0062   0.1
                  Delta-U            -11.8384        0.0115   0.0124   0.9
                  Length             199.9866
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(V170 Day299(1) 17:00 00006624.ssf)
2158               Delta-N          -610.2022       -0.0009   0.0059   0.2
1A                 Delta-E         -4947.1603       -0.0024   0.0053   0.5
                   Delta-U           -25.2491        0.0046   0.0088   0.5
                   Length           4984.7145
(V171 Day299(1) 17:00 00006628.ssf)
2158               Delta-N          -640.4722       -0.0054   0.0058   0.9
2                  Delta-E         -4950.1548       -0.0012   0.0054   0.2
                   Delta-U           -23.1621        0.0044   0.0095   0.5
                   Length           4991.4701
(V172 Day299(1) 17:00 00006632.ssf)
2158               Delta-N          -668.0868       -0.0036   0.0054   0.7
3                  Delta-E         -5103.1930        0.0078   0.0058   1.3
                   Delta-U           -33.3730       -0.0034   0.0109   0.3
                   Length           5146.8468
(V173 Day299(0) 16:30 00006636.ssf)
2                  Delta-N           -27.7473        0.0014   0.0074   0.2
3                  Delta-E          -153.0222        0.0043   0.0059   0.7
                   Delta-U           -10.0895       -0.0210   0.0142   1.5
                   Length            155.8445
(V174 Day299(2) 17:59 00006640.ssf)
2155               Delta-N         -1718.1554        0.0024   0.0053   0.5
1A                 Delta-E          1744.3801        0.0066   0.0050   1.3
                   Delta-U           -78.9994       -0.0078   0.0087   0.9
                   Length           2449.7267
(V175 Day299(2) 17:59 00006644.ssf)
2155               Delta-N         -1748.4293        0.0060   0.0056   1.1
2                  Delta-E          1741.4231        0.0062   0.0048   1.3
                   Delta-U           -76.9146        0.0086   0.0086   1.0
                   Length           2468.9016
(V176 Day299(2) 17:59 00006648.ssf)
2155               Delta-N         -1776.2203        0.0041   0.0052   0.8
3                  Delta-E          1588.4065        0.0044   0.0049   0.9
                   Delta-U           -86.9701       -0.0048   0.0082   0.6
                   Length           2384.4407
(V177 Day299(2) 18:07 00006652.ssf)
2887               Delta-N         -2229.5891        0.0025   0.0057   0.4
1A                 Delta-E           -92.8805       -0.0022   0.0050   0.4
                   Delta-U            62.1311        0.0030   0.0093   0.3
                   Length           2232.3876
(V178 Day299(2) 18:07 00006656.ssf)
2887               Delta-N         -2259.8622        0.0028   0.0061   0.5
2                  Delta-E           -95.8479       -0.0026   0.0047   0.6
                   Delta-U            64.2127        0.0039   0.0090   0.4
                   Length           2262.8052
(V179 Day299(2) 18:07 00006660.ssf)
2887               Delta-N         -2287.6034        0.0016   0.0064   0.2
3                  Delta-E          -248.8704       -0.0048   0.0048   1.0
                   Delta-U            54.1110        0.0009   0.0100   0.1
                   Length           2301.7371
(V180 Day299(3) 19:22 00006664.ssf)
2886               Delta-N             7.9909       -0.0007   0.0053   0.1
1A                 Delta-E           -37.2765        0.0027   0.0065   0.4
                   Delta-U            -3.8400       -0.0022   0.0110   0.2
                   Length             38.3163
(V181 Day299(3) 19:22 00006668.ssf)
2886               Delta-N           -22.2815       -0.0003   0.0075   0.0
2                  Delta-E           -40.2436       -0.0014   0.0055   0.3
                   Delta-U            -1.7478       -0.0033   0.0100   0.3
                   Length             46.0334
(V182 Day299(0) 17:22 00006672.ssf)
1A                 Delta-N           -58.0197        0.0010   0.0094   0.1
3                  Delta-E          -155.9891        0.0003   0.0047   0.1
                   Delta-U            -7.9976       -0.0006   0.0153   0.0
                   Length            166.6218
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(V183 Day299(3) 20:00 00006676.ssf)
2158                Delta-N          -610.2022       -0.0071   0.0066   1.1
1A                  Delta-E         -4947.1603       -0.0028   0.0055   0.5
                    Delta-U           -25.2491       -0.0029   0.0110   0.3
                    Length           4984.7145
(V184 Day299(3) 20:00 00006680.ssf)
2158                Delta-N          -640.4722       -0.0094   0.0063   1.5
2                   Delta-E         -4950.1548       -0.0036   0.0053   0.7
                    Delta-U           -23.1621       -0.0044   0.0104   0.4
                    Length           4991.4701
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GPS Vector Residual Summary (Meters)

From	To	N	E	Up	2D	3D	Length	VectID
1487	2161	-0.002	-0.004	0.015	0.004	0.016	26044	1
1487	2160	-0.001	0.006	0.015	0.006	0.016	24209	2
8870	2160	-0.001	0.007	-0.001	0.007	0.007	3630	3
8207	8870	0.002	-0.006	-0.012	0.006	0.013	15061	4
2161	2160	-0.004	-0.005	-0.008	0.006	0.010	8163	5
1487	2160	-0.007	0.001	-0.007	0.007	0.010	24209	6
8207	2161	0.004	-0.000	0.004	0.004	0.006	7931	7
1487	2160	0.001	0.000	-0.005	0.001	0.005	24209	8
1487	8275	0.006	0.002	-0.015	0.006	0.016	30259	9
8207	8275	0.001	-0.001	-0.001	0.001	0.002	9138	10
8207	2161	0.001	-0.001	-0.001	0.001	0.001	7931	11
2161	8275	0.001	-0.002	0.004	0.002	0.005	4236	12
8894	8275	-0.005	-0.002	0.000	0.006	0.006	14090	13
8870	2161	-0.004	0.004	-0.016	0.006	0.017	7140	14
8870	8275	-0.000	-0.000	-0.018	0.000	0.018	8411	15
8894	2164	0.004	-0.004	0.008	0.005	0.010	6242	16
2136	8894	-0.005	0.002	-0.013	0.006	0.014	5784	17
8894	8870	0.001	0.013	0.003	0.013	0.014	7502	18
2136	2164	-0.002	-0.002	-0.000	0.003	0.003	5170	19
8894	2164	-0.002	-0.005	-0.005	0.005	0.007	6242	20
2160	2164	-0.004	0.012	-0.009	0.013	0.016	5637	21
2133	2163	0.005	0.007	-0.007	0.009	0.011	7601	22
2133	2164	0.005	0.000	-0.018	0.005	0.019	9846	23
8894	2163	0.006	-0.000	0.005	0.006	0.008	5235	24
2160	2164	0.003	0.002	-0.006	0.004	0.007	5637	25
2133	8894	-0.001	0.004	0.008	0.004	0.009	5272	26
2133	2163	-0.001	-0.002	0.003	0.002	0.003	7601	27
2133	2164	0.001	0.002	0.013	0.002	0.013	9846	28
8275	2163	0.000	-0.008	-0.011	0.008	0.013	12819	29
8894	8275	-0.002	0.002	0.001	0.003	0.003	14090	30
2136	8894	-0.003	0.008	0.010	0.008	0.013	5784	31
2136	2133	-0.003	0.001	0.012	0.003	0.012	6088	32
2136	2133	0.000	-0.003	0.007	0.003	0.008	6088	33
2133	2162	-0.001	0.000	0.002	0.001	0.002	6671	34
2162	2163	-0.004	0.003	0.004	0.005	0.006	5968	35
2133	2162	0.003	0.001	-0.003	0.003	0.004	6671	36
2162	2159	0.007	-0.001	-0.005	0.007	0.009	8604	37
2159	2157	0.004	-0.007	0.004	0.008	0.009	11126	38
2136	2157	0.010	-0.009	-0.022	0.013	0.026	5598	39
2133	2159	0.003	-0.008	-0.005	0.008	0.010	6290	40
2159	2157	-0.011	0.005	0.003	0.012	0.013	11126	41
1823	2159	-0.002	0.004	0.011	0.004	0.012	6915	42
2157	2158	0.004	-0.009	-0.011	0.009	0.015	4827	43
1823	2158	-0.011	-0.002	0.007	0.011	0.013	9181	44
1823	2159	-0.016	0.001	0.007	0.016	0.018	6915	45
2133	2159	-0.010	-0.003	-0.013	0.010	0.017	6290	46
2133	2158	-0.000	-0.007	-0.005	0.007	0.008	9895	47
2159	2158	-0.001	-0.000	0.005	0.001	0.005	8640	48
2155	2154	0.002	-0.003	-0.004	0.004	0.005	10496	49
2158	2155	0.003	-0.001	0.006	0.003	0.006	6781	50
1823	2155	0.006	0.006	0.005	0.009	0.010	6646	51
1823	2155	0.002	-0.005	0.002	0.006	0.006	6646	52

2155	2156	-0.002	-0.007	0.004	0.007	0.008	13541	53
1823	2156	0.004	-0.005	0.013	0.006	0.015	12022	54
1823	1927	0.004	0.004	0.009	0.006	0.011	7372	55
2156	1927	-0.005	0.012	-0.000	0.013	0.013	5992	56
2156	2154	-0.010	0.011	0.007	0.015	0.016	7346	57
2155	2154	0.009	-0.011	0.000	0.014	0.014	10496	58
2156	1927	-0.007	0.004	0.001	0.008	0.008	5992	59
2154	2153	0.009	0.000	0.001	0.009	0.009	6790	60
1885	1927	0.008	-0.006	-0.017	0.009	0.019	2766	61
1885	2154	0.014	-0.005	-0.009	0.015	0.017	8163	62
1885	2155	0.014	0.013	-0.004	0.019	0.019	10790	63
2154	2156	-0.004	-0.006	0.004	0.007	0.008	7346	64
2130	2153	-0.003	-0.001	0.004	0.004	0.005	8333	65
2130	2165	-0.007	-0.001	0.007	0.007	0.010	8161	66
2165	2156	-0.004	-0.003	-0.001	0.005	0.005	5381	67
2153	2156	-0.007	-0.006	-0.013	0.009	0.016	9636	68
2130	2156	-0.009	-0.002	-0.001	0.010	0.010	12502	69
2156	2165	0.006	0.001	-0.002	0.006	0.006	5381	70
2156	2153	0.008	0.002	0.003	0.009	0.009	9636	71
2111	2130	-0.007	-0.008	0.004	0.011	0.011	9390	72
2111	2153	-0.002	-0.008	-0.010	0.009	0.013	13451	73
2130	2165	-0.003	-0.003	-0.008	0.004	0.009	8161	74
2111	2153	-0.012	-0.006	-0.005	0.014	0.015	13451	75
2130	2153	-0.000	0.001	0.003	0.001	0.003	8333	76
2153	2151	0.023	-0.005	0.026	0.024	0.035	13896	77
2151	2152	-0.006	0.002	-0.006	0.007	0.009	3617	78
2130	2111	0.006	0.006	0.005	0.008	0.009	9390	79
2130	2152	0.013	-0.001	0.008	0.013	0.016	5439	80
2130	2152	0.024	-0.012	-0.024	0.027	0.036	5439	81
2152	2151	0.005	0.001	-0.007	0.005	0.009	3617	82
2111	2151	-0.007	0.004	-0.011	0.008	0.014	7474	83
2111	2152	-0.009	0.000	-0.002	0.009	0.009	10779	84
2150	2151	-0.005	-0.000	0.011	0.005	0.012	8901	85
2111	2144	0.026	0.015	-0.003	0.031	0.031	47427	86
2144	2150	-0.006	-0.003	0.006	0.007	0.009	46073	87
2111	2150	0.007	0.007	-0.010	0.010	0.014	10644	88
2150	2151	-0.012	-0.000	-0.008	0.012	0.015	8901	89
1638	2150	-0.011	0.012	-0.008	0.016	0.018	19750	90
2150	2144	0.006	0.010	0.002	0.012	0.012	46073	91
1638	2144	-0.002	0.011	-0.004	0.012	0.012	38627	92
1638	2150	0.002	0.005	-0.021	0.005	0.021	19750	93
1638	2098	0.004	-0.004	-0.028	0.006	0.028	10635	94
2098	2147	-0.008	0.009	-0.008	0.012	0.014	18456	95
2144	2147	0.002	-0.000	0.001	0.002	0.002	21906	96
1638	2098	0.008	-0.001	0.002	0.008	0.008	10635	97
1638	2147	-0.003	0.006	-0.012	0.007	0.014	16736	98
2147	2144	-0.001	0.006	0.001	0.006	0.007	21906	99
2150	2147	0.008	0.001	-0.004	0.008	0.009	28176	100
2098	2147	-0.002	0.001	-0.013	0.003	0.013	18456	101
1638	2147	0.001	0.012	-0.004	0.012	0.012	16736	102
2147	2145	-0.000	0.002	0.004	0.002	0.005	12310	103
2100	2145	-0.009	-0.000	0.000	0.009	0.009	32567	104
2098	2100	-0.000	-0.000	-0.007	0.000	0.007	4813	105
2098	2145	0.014	-0.004	0.007	0.014	0.016	29381	106
2098	2149	0.008	-0.002	-0.009	0.008	0.012	15514	107
2098	2100	0.001	-0.003	0.012	0.003	0.013	4813	108
2098	2148	-0.000	-0.006	-0.006	0.006	0.009	15586	109
1779	2149	-0.004	0.006	0.002	0.007	0.007	15774	110
2148	2145	0.003	0.005	-0.008	0.006	0.010	13888	111
2100	2149	0.002	-0.004	0.007	0.004	0.008	10846	112
2100	2148	0.006	-0.005	0.009	0.008	0.012	19159	113
2149	2148	-0.001	0.003	0.017	0.003	0.017	27010	114
2098	2148	-0.011	0.012	0.024	0.016	0.029	15586	115
1779	2143	-0.009	0.014	-0.019	0.016	0.025	45831	116
1779	2146	-0.008	0.013	-0.007	0.015	0.017	40329	117
1779	2149	-0.008	0.003	0.015	0.008	0.017	15774	118

1779	2148	-0.012	0.005	0.000	0.013	0.013	40714	119
1779	2143	-0.010	0.011	0.012	0.015	0.019	45831	120
2143	2146	0.001	0.001	-0.001	0.002	0.002	14455	121
2146	2147	0.002	-0.008	0.001	0.008	0.008	11667	122
2143	2146	-0.000	-0.003	0.000	0.003	0.003	14455	123
2143	2147	0.002	-0.003	0.004	0.004	0.006	25360	124
2148	2147	-0.006	-0.004	0.013	0.007	0.015	4059	125
2148	2146	-0.007	0.005	0.012	0.008	0.015	9870	126
2145	2146	0.002	-0.006	0.002	0.006	0.006	10156	127
8597	2146	0.007	-0.012	0.006	0.014	0.015	11908	128
8597	2146	0.004	-0.005	-0.003	0.006	0.007	11908	129
8597	2142	0.005	-0.005	0.005	0.006	0.008	6981	130
8597	2145	-0.003	-0.007	0.003	0.008	0.009	7807	131
2145	2144	-0.000	-0.001	-0.000	0.001	0.001	9648	132
8597	2142	0.003	-0.001	0.002	0.003	0.004	6981	133
8597	2144	-0.002	-0.005	0.003	0.006	0.006	6813	134
8597	2144	0.001	-0.006	-0.001	0.006	0.006	6813	135
2144	2141	0.003	0.007	-0.004	0.007	0.009	16986	136
2142	2141	0.003	0.002	0.000	0.004	0.004	7101	137
8472	2144	0.000	-0.007	0.005	0.007	0.009	38406	138
8472	2142	0.007	-0.003	0.002	0.007	0.008	44677	139
8472	2141	0.004	-0.001	0.001	0.004	0.004	43667	140
2137	2144	-0.010	-0.011	-0.006	0.015	0.016	17214	141
2137	2142	-0.007	-0.009	-0.005	0.011	0.012	5624	142
2137	8472	-0.002	-0.013	-0.035	0.013	0.038	47632	143
2137	2141	-0.010	-0.008	0.002	0.013	0.013	4704	144
8472	2144	-0.012	0.000	-0.011	0.012	0.016	38406	145
2144	2142	0.006	-0.000	-0.007	0.006	0.009	11653	146
8597	8472	-0.000	-0.010	0.023	0.010	0.025	44346	147
8597	2143	-0.003	-0.014	0.002	0.015	0.015	10021	148
2143	2142	-0.009	0.006	-0.003	0.011	0.011	4493	149
2144	2142	0.002	0.006	0.002	0.006	0.006	11653	150
2155	2886	-0.007	0.005	0.004	0.008	0.009	2482	151
2886	2887	0.005	-0.003	0.001	0.006	0.006	2239	152
2886	2887	0.001	-0.009	-0.010	0.009	0.013	2239	153
2155	2887	-0.001	-0.001	0.002	0.001	0.002	1912	156
2158	2886	0.009	-0.002	-0.018	0.009	0.020	4949	157
2158	2887	0.015	-0.005	0.003	0.016	0.016	5116	158
2887	2886	-0.001	0.005	-0.006	0.005	0.008	2239	159
2155	1A	0.001	-0.000	0.007	0.001	0.008	2450	160
2155	2	-0.001	-0.002	0.013	0.002	0.014	2469	161
2155	3	-0.000	-0.003	0.011	0.003	0.012	2384	162
1A	2	-0.001	0.001	0.002	0.002	0.002	30	163
2887	1A	0.004	-0.002	-0.007	0.005	0.008	2232	164
2887	2	0.002	-0.004	0.001	0.005	0.005	2263	165
2887	3	0.003	-0.005	-0.001	0.005	0.006	2302	166
2886	1A	-0.003	0.003	0.009	0.004	0.010	38	167
2886	2	-0.007	0.003	0.010	0.007	0.012	46	168
2886	3	-0.007	0.000	0.011	0.007	0.013	200	169
2158	1A	-0.001	-0.002	0.005	0.003	0.005	4985	170
2158	2	-0.005	-0.001	0.004	0.006	0.007	4991	171
2158	3	-0.004	0.008	-0.003	0.009	0.009	5147	172
2	3	0.001	0.004	-0.021	0.005	0.021	156	173
2155	1A	0.002	0.007	-0.008	0.007	0.011	2450	174
2155	2	0.006	0.006	0.009	0.009	0.012	2469	175
2155	3	0.004	0.004	-0.005	0.006	0.008	2384	176
2887	1A	0.003	-0.002	0.003	0.003	0.004	2232	177
2887	2	0.003	-0.003	0.004	0.004	0.005	2263	178
2887	3	0.002	-0.005	0.001	0.005	0.005	2302	179
2886	1A	-0.001	0.003	-0.002	0.003	0.004	38	180
2886	2	-0.000	-0.001	-0.003	0.001	0.004	46	181
1A	3	0.001	0.000	-0.001	0.001	0.001	167	182
2158	1A	-0.007	-0.003	-0.003	0.008	0.008	4985	183
2158	2	-0.009	-0.004	-0.004	0.010	0.011	4991	184

Adjusted Bearings (DMS) and Horizontal Distances (Meters)

(Relative Confidence of Bearing is in Seconds)

From	To	Grid Bearing	Grid Dist Grnd Dist	95% RelConfidence Brg	 Dist	 PPM
1	2	S07-27-19.50W	30.4032 30.4063	33.86	0.0043	140.3273
1	2886	S76-03-06.66E	38.1228 38.1267	26.41	0.0047	123.0966
1	1A	N29-51-22.09E	0.0120 0.0120	112084.64	0.0049	406437.7355
2	3	S81-35-20.37W	155.5016 155.5176	6.98	0.0044	28.1012
2	20	S25-08-26.01W	92.4724 92.4820	12.83	0.0050	53.7259
2	2155	N43-00-03.30W	2467.4450 2467.7159	0.40	0.0048	1.9543
2	2158	N84-26-42.32E	4990.8954 4991.4207	0.23	0.0049	0.9797
2	2886	N62-53-40.04E	45.9954 46.0001	15.25	0.0028	61.8980
2	2887	N04-17-39.74E	2261.6570 2261.8806	0.39	0.0050	2.2018
3	4	S57-41-20.09W	54.4180 54.4235	21.64	0.0052	95.9329
20	21	S75-05-07.48W	56.2202 56.2260	13.95	0.0047	84.0509
21	3	N38-35-54.35W	96.5233 96.5332	12.84	0.0051	52.4726
22	3	S41-01-16.11E	201.9487 201.9692	14.34	0.0058	28.9278
22	5	N63-10-19.75E	106.0630 106.0737	18.80	0.0053	50.4204
22	6	S11-44-22.68W	39.7709 39.7750	25.52	0.0052	130.3484
22	23	S62-06-49.66E	90.9208 90.9300	15.44	0.0048	52.4226
23	3	S25-24-43.51E	121.6043 121.6167	15.24	0.0055	44.9900
23	24	N81-02-18.01E	76.7497 76.7575	13.01	0.0050	64.5998
24	2886	S65-28-23.32E	188.1179 188.1372	9.94	0.0067	35.7145
1487	2160	N23-19-04.69W	24208.0417 24209.2459	0.08	0.0103	0.4245
1487	2161	N05-05-31.42W	26042.7150 26044.0036	0.08	0.0120	0.4596
1487	8275	N04-13-49.72W	30257.3137 30258.8249	0.07	0.0115	0.3800
1638	2098	N68-18-09.89W	10634.0515 10634.6340	0.18	0.0074	0.6978
1638	2144	S28-28-24.80W	38624.4654 38626.6548	0.03	0.0055	0.1429
1638	2147	S30-11-22.18W	16733.8425 16734.9991	0.07	0.0066	0.3939
1638	2150	S70-35-56.62E	19748.4402 19749.6429	0.08	0.0066	0.3330
1779	2143	S06-09-07.35E	45828.1657 45830.6699	0.04	0.0094	0.2061
1779	2146	S24-02-18.11E	40326.1637 40328.5523	0.04	0.0097	0.2395
1779	2148	S38-01-05.76E	40710.9072 40713.4386	0.05	0.0096	0.2355
1779	2149	S61-37-42.13E	15773.0576 15773.8104	0.13	0.0091	0.5763

1823	1927	N53-49-13.24W	7370.9786	0.28	0.0089	1.2013
			7371.4267			
1823	2155	S14-56-37.89W	6637.4329	0.19	0.0074	1.1083
			6638.0388			
1823	2156	N76-58-31.37W	12020.9971	0.14	0.0068	0.5662
			12021.7905			
1823	2158	S32-33-34.71E	9176.6591	0.16	0.0074	0.8057
			9177.4557			
1823	2159	N84-21-56.55E	6914.3186	0.27	0.0076	1.0975
			6914.7601			
1885	1927	N45-17-15.23E	2765.8804	0.60	0.0086	3.1235
			2766.0330			
1885	2154	S30-28-35.28W	8156.7879	0.18	0.0082	1.0095
			8157.4287			
1885	2155	S35-07-34.21E	10781.7402	0.14	0.0071	0.6612
			10782.6635			
1927	2156	S74-05-37.41W	5991.5115	0.30	0.0078	1.3093
			5991.8739			
2098	2100	N42-32-37.06W	4813.0816	0.35	0.0096	1.9989
			4813.3502			
2098	2145	S09-26-01.52W	29379.0311	0.06	0.0109	0.3705
			29380.8979			
2098	2147	S04-33-21.26E	18453.9228	0.08	0.0089	0.4821
			18455.2122			
2098	2148	S05-09-09.38W	15584.1789	0.11	0.0092	0.5908
			15585.2219			
2098	2149	N54-17-00.88W	15513.2986	0.13	0.0095	0.6126
			15514.1135			
2100	2145	S02-44-51.39W	32565.2387	0.07	0.0129	0.3961
			32567.3273			
2100	2148	S05-33-21.52E	19157.3021	0.11	0.0116	0.6072
			19158.5934			
2100	2149	N59-27-51.91W	10845.2075	0.22	0.0118	1.0864
			10845.7815			
2111	2130	N57-59-46.66E	9388.8105	0.18	0.0087	0.9214
			9389.5097			
2111	2144	S66-29-05.19W	47423.5318	0.04	0.0093	0.1956
			47426.7764			
2111	2150	N37-15-38.67W	10643.1113	0.19	0.0078	0.7359
			10643.9135			
2111	2151	N18-19-13.26E	7473.2983	0.24	0.0099	1.3250
			7473.8778			
2111	2152	N27-41-37.40E	10777.1301	0.18	0.0106	0.9809
			10777.8725			
2111	2153	S84-13-43.04E	13449.8905	0.14	0.0081	0.6022
			13450.9233			
2130	2152	N32-53-24.23W	5438.4282	0.33	0.0096	1.7620
			5438.7591			
2130	2153	S40-34-41.64E	8332.0393	0.18	0.0074	0.8824
			8332.6145			
2130	2156	N89-02-59.89E	12501.5409	0.12	0.0065	0.5228
			12502.3663			
2130	2165	N70-56-46.06E	8160.5131	0.19	0.0071	0.8678
			8161.0090			
2133	2136	S12-08-24.33E	6086.9469	0.22	0.0072	1.1892
			6087.3673			
2133	2158	S51-57-29.78W	9889.8216	0.17	0.0075	0.7603
			9890.6602			
2133	2159	N68-22-00.28W	6289.6286	0.28	0.0077	1.2242
			6290.0182			
2133	2162	N14-46-19.50E	6670.1045	0.24	0.0079	1.1836
			6670.4960			
2133	2163	N63-40-50.73E	7600.1849	0.25	0.0090	1.1827
			7600.6310			
2133	2164	S38-37-40.24E	9836.7762	0.15	0.0069	0.7055
			9837.6934			

2133	8894	S72-50-50.38E	5271.5344	0.26	0.0058	1.1071
			5271.8655			
2136	2157	S61-55-57.45W	5590.3873	0.36	0.0088	1.5752
			5590.9269			
2136	2164	S70-22-04.88E	5160.5821	0.34	0.0074	1.4267
			5161.0960			
2136	8894	N40-31-02.50E	5782.8108	0.24	0.0070	1.2071
			5783.2115			
2137	2141	S12-31-42.72W	4703.9399	0.32	0.0080	1.7063
			4704.2199			
2137	2142	S73-51-26.56E	5623.6096	0.24	0.0057	1.0089
			5623.9322			
2137	2144	S66-49-10.35E	17213.3243	0.07	0.0050	0.2922
			17214.3149			
2137	8472	S18-28-56.59E	47630.1165	0.04	0.0101	0.2121
			47631.7175			
2141	2142	N64-45-14.38E	7100.4958	0.23	0.0075	1.0571
			7100.9111			
2141	2144	S82-36-47.48E	16985.0549	0.09	0.0071	0.4169
			16986.0504			
2141	8472	S21-39-50.28E	43665.8187	0.05	0.0104	0.2376
			43667.3176			
2142	2143	N35-28-21.04W	4492.7220	0.33	0.0074	1.6577
			4492.9819			
2142	2144	S63-25-46.43E	11652.4757	0.11	0.0060	0.5134
			11653.1365			
2142	8472	S12-32-12.56E	44675.0829	0.04	0.0099	0.2224
			44676.5431			
2142	8597	N84-39-44.97E	6980.9333	0.19	0.0057	0.8183
			6981.3497			
2143	2146	N52-49-00.29E	14453.8982	0.12	0.0077	0.5301
			14454.8355			
2143	2147	N65-14-53.34E	25358.1764	0.07	0.0074	0.2931
			25359.9777			
2143	8597	S72-31-20.77E	10020.4434	0.15	0.0066	0.6621
			10021.0549			
2144	2145	N22-40-10.52E	9647.4057	0.17	0.0098	1.0110
			9648.0197			
2144	2147	N27-09-45.77E	21903.8592	0.06	0.0075	0.3407
			21905.4085			
2144	2150	N53-31-00.54E	46069.5956	0.03	0.0078	0.1698
			46072.4627			
2144	8472	S01-04-50.41W	38404.5876	0.04	0.0087	0.2253
			38405.8483			
2144	8597	N30-38-01.21W	6812.2003	0.16	0.0054	0.7868
			6812.6099			
2145	2146	N31-00-28.48W	10155.6233	0.19	0.0099	0.9718
			10156.3370			
2145	2147	N30-40-58.07E	12309.3260	0.13	0.0091	0.7363
			12310.2722			
2145	2148	N14-14-21.22E	13887.1512	0.13	0.0107	0.7679
			13888.1805			
2145	8597	S67-04-31.34W	7805.9324	0.24	0.0080	1.0298
			7806.4507			
2146	2147	N80-43-02.52E	11665.7632	0.15	0.0072	0.6164
			11666.6604			
2146	2148	N61-11-21.36E	9869.2195	0.20	0.0099	1.0006
			9869.9514			
2146	8597	S09-27-47.52W	11906.9483	0.11	0.0080	0.6715
			11907.7451			
2147	2148	N44-54-37.06W	4058.6806	0.46	0.0077	1.8916
			4059.0084			
2147	2150	N73-42-23.79E	28173.3824	0.06	0.0078	0.2769
			28175.5017			
2148	2149	N24-29-27.39W	27007.4055	0.08	0.0111	0.4104
			27009.1423			

2150	2151	S81-06-16.11E	8899.9275	0.18	0.0072	0.8122
			8900.5523			
2151	2152	N47-22-16.07E	3614.7019	0.46	0.0076	2.0992
			3614.9324			
2151	2153	S52-33-39.30E	13895.0035	0.14	0.0092	0.6608
			13896.0026			
2153	2154	S83-14-47.70E	6786.5833	0.29	0.0083	1.2196
			6787.1708			
2153	2156	N47-17-21.79E	9635.3512	0.15	0.0069	0.7140
			9636.0130			
2154	2155	S80-11-15.63E	10494.0965	0.19	0.0079	0.7525
			10495.2371			
2154	2156	N02-39-28.65E	7341.5958	0.20	0.0084	1.1374
			7342.2118			
2155	3	S39-55-15.62E	2382.6085	0.46	0.0054	2.2605
			2382.8682			
2155	2156	N47-37-44.12W	13535.7130	0.11	0.0069	0.5081
			13536.9430			
2155	2158	S78-45-41.53E	6780.2952	0.18	0.0051	0.7506
			6781.0506			
2155	2886	S44-01-22.07E	2480.4368	0.42	0.0054	2.1945
			2480.7095			
2155	2887	N76-19-19.14E	1906.2380	0.66	0.0052	2.7271
			1906.4380			
2156	2165	N62-49-45.81W	5380.0969	0.29	0.0072	1.3402
			5380.4222			
2157	2158	N58-59-04.23W	4826.0047	0.36	0.0087	1.7959
			4826.5469			
2157	2159	N11-22-46.68W	11118.4855	0.16	0.0096	0.8598
			11119.4829			
2158	3	S84-21-31.77W	5146.2097	0.26	0.0055	1.0692
			5146.7472			
2158	2159	N12-59-57.70E	8634.4967	0.18	0.0088	1.0147
			8635.2249			
2158	2886	S84-38-26.61W	4948.1443	0.26	0.0051	1.0223
			4948.6657			
2158	2887	N69-43-41.43W	5114.9244	0.26	0.0055	1.0785
			5115.4381			
2159	2162	N61-18-24.19E	8603.8419	0.25	0.0095	1.1055
			8604.3412			
2160	2161	N62-58-19.99E	8162.3382	0.26	0.0095	1.1599
			8162.7855			
2160	2164	N83-39-17.22W	5619.4284	0.37	0.0083	1.4704
			5619.9316			
2160	8870	N02-05-05.70E	3630.1243	0.47	0.0094	2.6029
			3630.3235			
2161	8207	S86-38-51.67E	7930.1647	0.25	0.0077	0.9694
			7930.6126			
2161	8275	N01-04-27.41E	4235.6845	0.36	0.0088	2.0692
			4235.9154			
2161	8870	S89-20-47.36W	7139.2972	0.31	0.0086	1.2096
			7139.6844			
2162	2163	S58-55-46.46E	5967.8033	0.39	0.0099	1.6664
			5968.1304			
2163	8275	S73-04-37.79E	12818.7669	0.20	0.0100	0.7793
			12819.4677			
2163	8894	S19-49-28.04W	5234.6092	0.34	0.0109	2.0762
			5234.9182			
2164	8894	N10-12-21.91W	6228.5394	0.21	0.0071	1.1439
			6229.1223			
2886	3	S77-21-12.84W	199.6154	6.49	0.0045	22.5966
			199.6359			
2886	2887	N03-17-21.28E	2238.0374	0.41	0.0053	2.3738
			2238.2589			
2887	3	S08-04-28.47W	2300.8636	0.44	0.0060	2.5933
			2301.0892			

8207	8275	N59-03-21.09W	9137.7692	0.20	0.0082	0.8933
			9138.2875			
8207	8870	N88-32-43.59W	15060.2805	0.14	0.0086	0.5705
			15061.1288			
8275	8870	S59-07-17.08W	8410.3576	0.23	0.0084	0.9959
			8410.8158			
8275	8894	S85-08-33.28W	14089.5495	0.12	0.0071	0.5063
			14090.3770			
8472	8597	N03-33-04.82W	44344.4198	0.04	0.0101	0.2283
			44346.0241			
8870	8894	N65-23-46.15W	7501.8033	0.26	0.0084	1.1250
			7502.2434			
1A	2	S07-27-50.59W	30.4143	30.95	0.0044	144.8512
			30.4175			
1A	3	S71-27-50.88W	166.4127	7.27	0.0051	30.5256
			166.4297			
1A	2155	N43-32-59.59W	2448.1972	0.42	0.0052	2.1150
			2448.4656			
1A	2158	N84-47-08.65E	4984.1320	0.24	0.0052	1.0467
			4984.6557			
1A	2886	S76-02-04.06E	38.1195	25.92	0.0048	124.7363
			38.1234			
1A	2887	N04-15-04.28E	2231.2898	0.45	0.0054	2.4301
			2231.5100			

Traverse Closures of Unadjusted Observations

(Beginning and Ending on Adjusted Stations)

(Unadjusted Bearings and Distances Shown Reduced to Grid)

TRAVERSE 1: SCHREINER
Error Angular = 24.83 Sec, 8 Angles, 3.10 Sec/Angle
Error Linear = 0.0333 N, 0.0068 E, -0.0294 Vert
Horiz Precision = 0.0340 Error in 802.9503, 1:23649, 42.28 PPM

From	To	Unadj Bearing	Unadj Dist	Unadj Elev Diff
2	2886	N62-53-40.04E BS		
2	20	S25-08-37.72W	92.4713	-0.8601
20	21	S75-05-25.88W	56.2204	-1.3383
21	3	N38-35-38.62W	96.5246	-7.8995
3	22	N41-01-05.21W	201.9491	-6.2053
22	23	S62-06-46.56E	90.9203	1.0783
23	24	N81-02-10.67E	76.7493	2.6656
24	2886	S65-28-34.64E	188.1152	14.2802
2886	2	S62-53-40.04W FS		

Error Propagation

Station Coordinate Standard Deviations (Meters)

Station	N	E	Elev
1	0.003811	0.003537	0.005510
2	0.003486	0.003036	0.005182
3	0.003682	0.003168	0.005538
4	0.004512	0.003853	0.006040
5	0.005130	0.006730	0.008508
6	0.006650	0.004855	0.007812
20	0.003861	0.003797	0.005781
21	0.003877	0.003969	0.005854
22	0.006135	0.005286	0.007539
23	0.004794	0.004416	0.007099
24	0.004266	0.004443	0.007353
1487	0.005141	0.004387	0.011308
1638	0.000000	0.000000	0.000000
1779	0.003385	0.002654	0.011596
1823	0.003252	0.002810	0.000000
1885	0.000000	0.000000	0.000000
1927	0.003710	0.003083	0.006292
2098	0.003765	0.003038	0.008489
2100	0.004930	0.004071	0.010142
2111	0.003528	0.003318	0.006798
2130	0.002967	0.002670	0.006374
2133	0.002745	0.002383	0.005429
2136	0.002994	0.002614	0.006484
2137	0.000000	0.000000	0.010174
2141	0.003271	0.002967	0.007474
2142	0.002616	0.002321	0.005228
2143	0.002959	0.002657	0.005323
2144	0.002279	0.002043	0.005291
2145	0.003855	0.003038	0.006970
2146	0.003266	0.002658	0.005906
2147	0.002729	0.002259	0.005279
2148	0.003848	0.003267	0.007274
2149	0.004594	0.003773	0.011012
2150	0.003054	0.002685	0.005579
2151	0.003728	0.003409	0.006699
2152	0.004164	0.003754	0.007453
2153	0.002971	0.002608	0.006497
2154	0.003404	0.002920	0.006842
2155	0.003143	0.002701	0.004527
2156	0.000000	0.000000	0.005335
2157	0.004056	0.003712	0.006589
2158	0.003300	0.002858	0.004861
2159	0.003776	0.003222	0.005844
2160	0.004127	0.003481	0.008169
2161	0.004395	0.003745	0.007979
2162	0.004055	0.003712	0.007474
2163	0.004381	0.003560	0.009212
2164	0.002947	0.002595	0.007149
2165	0.003177	0.002892	0.007060
2886	0.003648	0.003093	0.005233
2887	0.003747	0.003179	0.005492
8207	0.004488	0.003909	0.007444
8275	0.003266	0.002904	0.007255
8472	0.004132	0.003875	0.012486
8597	0.000000	0.000000	0.000000
8870	0.003938	0.003357	0.007667
8894	0.000000	0.000000	0.006444
1A	0.003556	0.003131	0.005372

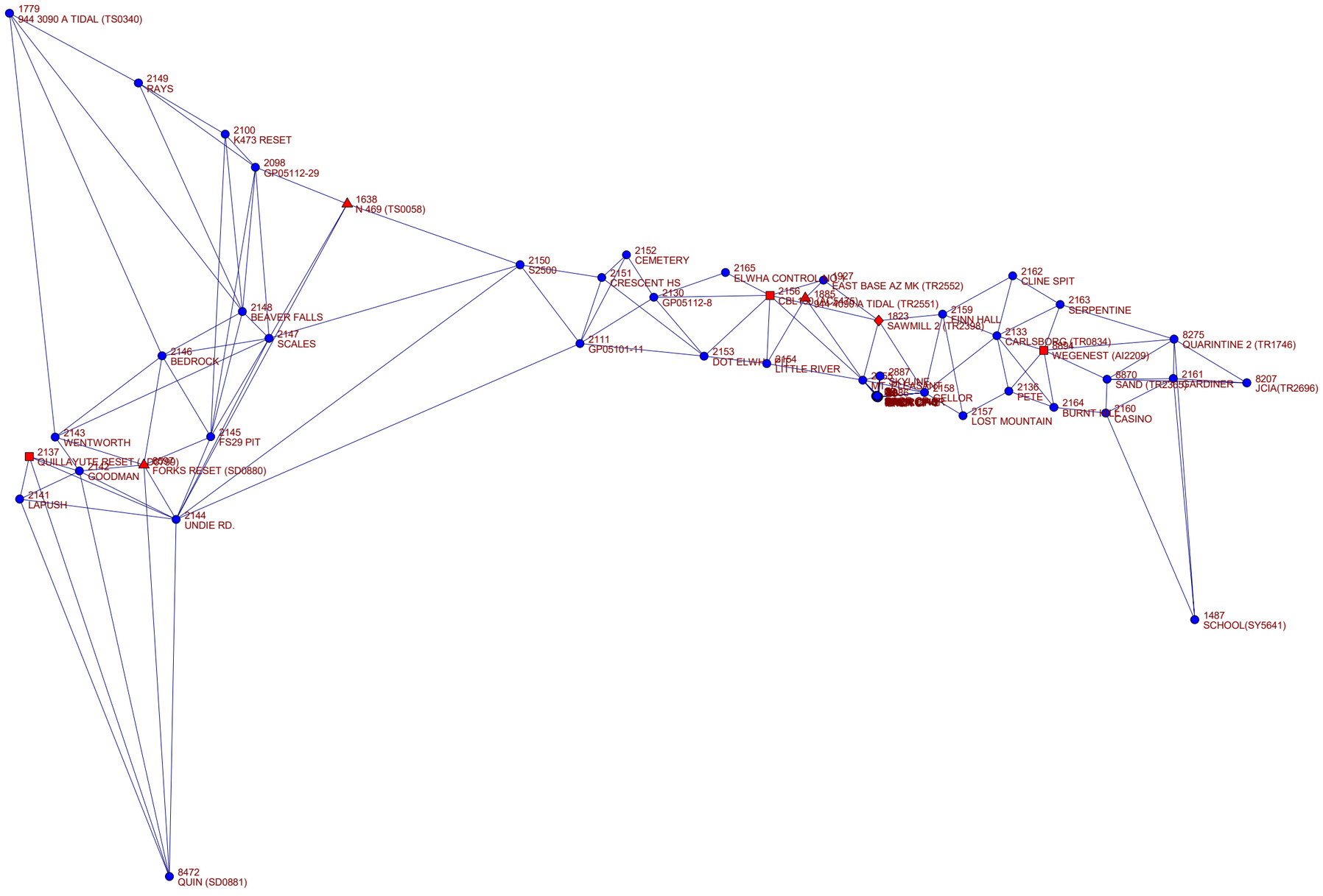
Station Coordinate Error Ellipses (Meters)
Confidence Region = 95%

Station	Semi-Major Axis	Semi-Minor Axis	Azimuth of Major Axis	Elev
1	0.009344	0.008641	171-05	0.010800
2	0.008548	0.007412	7-10	0.010157
3	0.009031	0.007735	6-57	0.010854
4	0.011055	0.009419	175-03	0.011837
5	0.017023	0.011801	69-32	0.016676
6	0.017324	0.010298	25-12	0.015311
20	0.009684	0.009050	37-49	0.011331
21	0.009744	0.009460	108-41	0.011473
22	0.017322	0.009637	36-51	0.014777
23	0.012925	0.009355	37-24	0.013914
24	0.011631	0.009594	51-11	0.014411
1487	0.012589	0.010733	2-48	0.022164
1638	0.000000	0.000000	0-00	0.000000
1779	0.008286	0.006496	1-05	0.022728
1823	0.008022	0.006806	13-39	0.000000
1885	0.000000	0.000000	0-00	0.000000
1927	0.009134	0.007484	10-47	0.012332
2098	0.009283	0.007351	11-26	0.016639
2100	0.012103	0.009922	172-17	0.019878
2111	0.009098	0.007598	34-57	0.013325
2130	0.007262	0.006534	1-45	0.012493
2133	0.006737	0.005812	8-14	0.010640
2136	0.007330	0.006397	1-49	0.012709
2137	0.000000	0.000000	0-00	0.019941
2141	0.008028	0.007238	9-42	0.014648
2142	0.006422	0.005662	9-07	0.010246
2143	0.007257	0.006488	172-12	0.010433
2144	0.005589	0.004987	8-13	0.010370
2145	0.009489	0.007371	9-32	0.013662
2146	0.008004	0.006493	4-44	0.011575
2147	0.006718	0.005481	10-43	0.010348
2148	0.009710	0.007642	23-10	0.014257
2149	0.011248	0.009233	178-20	0.021584
2150	0.007500	0.006546	9-24	0.010934
2151	0.009126	0.008343	1-23	0.013131
2152	0.010201	0.009179	174-16	0.014607
2153	0.007277	0.006376	4-43	0.012733
2154	0.008373	0.007101	10-31	0.013410
2155	0.007740	0.006557	12-02	0.008872
2156	0.000000	0.000000	0-00	0.010456
2157	0.009986	0.009023	165-32	0.012914
2158	0.008087	0.006985	5-20	0.009527
2159	0.009244	0.007884	177-54	0.011454
2160	0.010138	0.008478	8-50	0.016011
2161	0.010764	0.009161	3-35	0.015639
2162	0.009926	0.009086	0-07	0.014648
2163	0.010879	0.008520	15-42	0.018055
2164	0.007249	0.006310	11-51	0.014012
2165	0.007777	0.007078	1-52	0.013837
2886	0.008930	0.007569	1-50	0.010257
2887	0.009211	0.007735	9-46	0.010765
8207	0.010990	0.009564	3-07	0.014590
8275	0.008007	0.007095	6-42	0.014220
8472	0.010126	0.009473	172-12	0.024472
8597	0.000000	0.000000	0-00	0.000000
8870	0.009640	0.008216	2-06	0.015027
8894	0.000000	0.000000	0-00	0.012630
1A	0.008714	0.007653	5-43	0.010529

Elapsed Time = 00:00:02



DATE: 10-26-2013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RAYS
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K473 RESET
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N 469 (TS0058)
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S2500
2152
CEMETERY
2151
CRESCENT HS
2130
GP05112-8
2165
ELWHA CONTROL
1927
EAST BASE AZ MK (TR2552)
2156
1885
944 4090 A TIDAL (TR2551)
1823
SAWMILL 2 (TR2398)
2159
FINN HALL
2162
CLINE SPIT
2163
SERPENTINE
2133
CARLSBORG (TR0834)
8894
WEGENEST (AI2209)
8275
QUARINTINE 2 (TR1746)
8870
SAND (TR2355)
2161
GARDINER
8207
JCIA(TR2696)
2148
BEAVER FALLS
2147
SCALES
2146
BEDROCK
2111
GP05101-11
2153
DOT ELWHA
2154
LITTLE RIVER
2887
SKYLINE
2158
CELLOR
2136
PETE
2164
BURNT HILL
2160
CASINO
2157
LOST MOUNTAIN
2143
WENTWORTH
2145
FS29 PIT
2137
QUILLAYUTE RESET (AD0799)
2142
GOODMAN
FORKS RESET (SD0880)
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UNDIE RD.
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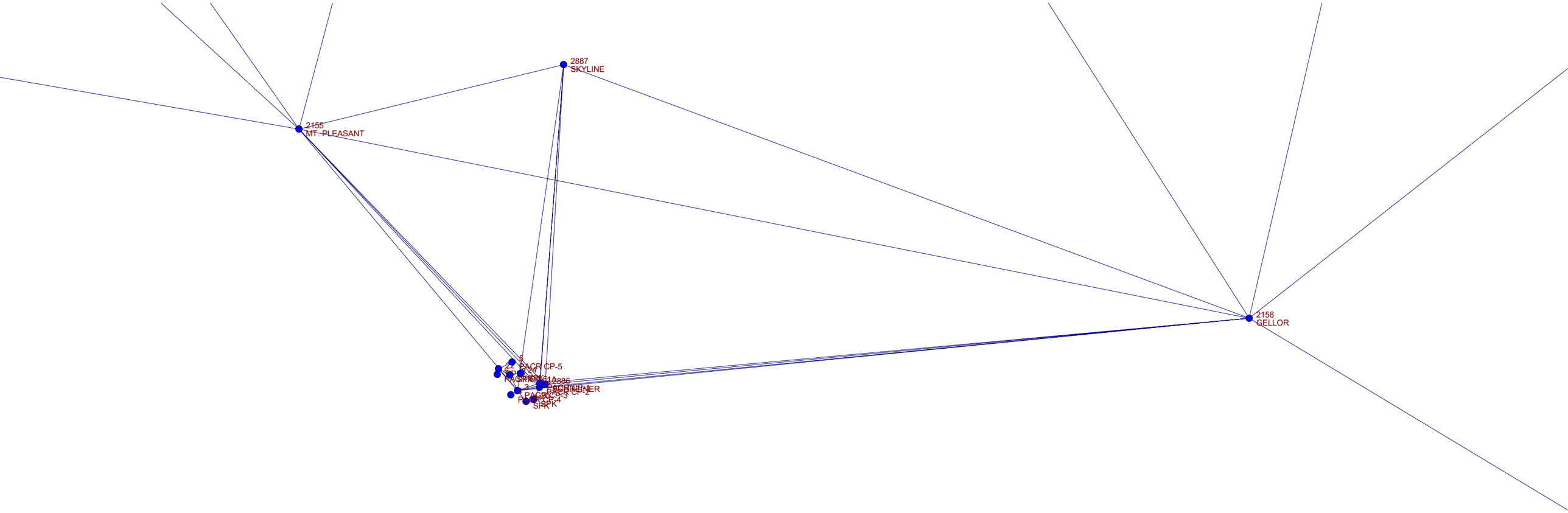
SCHOOL(SY5641)
8472
QUIN (SD0881)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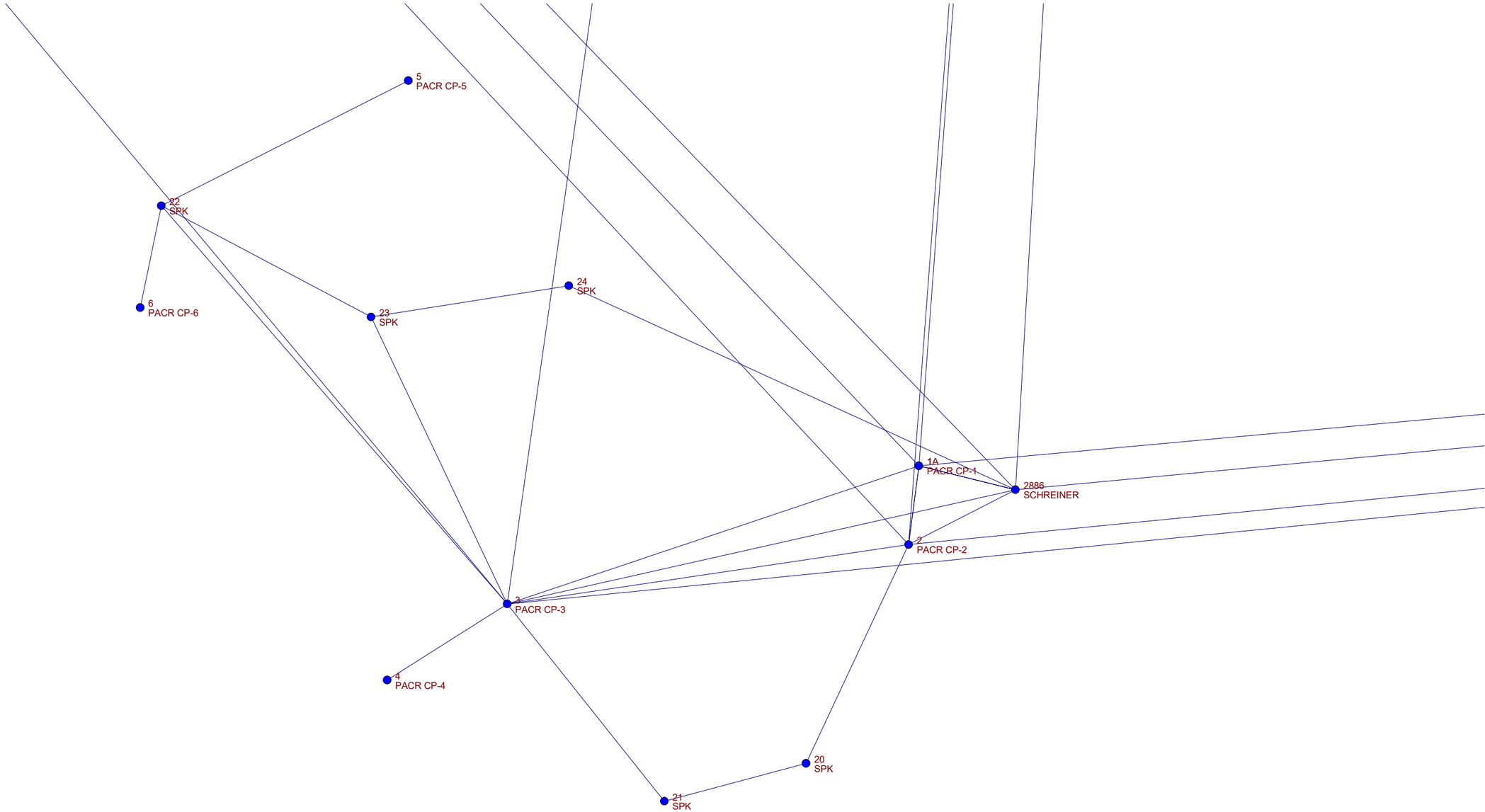
MT. PLEASANT
2158
GELLOR
5
PACR CP-5
SPRK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SRK
6
PACR CP-6
23
SPK
24
SPK
1A
PACR CP-1
2886
SCHREINER
2
PACR CP-2
3
PACR CP-3
4
PACR CP-4
20
SPK
21
SPK


PACR CP-5
PACR CP-6
PACR CP-1
SCHREINER
PACR CP-2
PACR CP-3
PACR CP-4
Deer Park Dr

APPENDIX E

Field Notes and Forms

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ACCIDENT PREVENTION PLAN ACKNOWLEDGMENT

I have read and understand and I agree to abide by the provisions as detailed in this APP. Failure to comply with these provisions may lead to disciplinary action that may include dismissal from the work site, termination of employment, or, for subcontractors, termination of the work contract.

Printed Name	Company	Signature	Date
Byron D. Cook	HDR		18 Oct 2013
Rick St. Amand	HDR		18 OCT 13
Jon Jacobson	HDR		18 Oct 13
Rob Nelson	HDR		18 Oct 13
Matt Reed	HDR		18 Oct 13
Kim Hawkins	HDR		21-Oct-13
N Rawson	HDR		21 Oct 13
Jeff Rueter	HDR		21 OCT 13
LAMM DEVANS	HDR		22 OCT 13
Charles Dunmire	HDR		22 Oct 13
D. GORDON	HDR		22 Oct 13
F. CZAJKOWSKI	VERSAR		18 NOV 2013
Ed Coughlin	Versar		18 NOV 13
JEFF MASSIE	VERSAR		18 NOV 13
JOSH GULLICKSON	HDR		18 NOV 2013
JOHN BRUNKHORST	HDR		18 NOV 2013
NICK INFANTE	HDR		3 DEC 2013
PEDRO Valle	HDR		3 DEC 2013
Ronald D. Hetzel	HDR		3 Dec 2013

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 001 **Day/Date:** 10/18/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 3

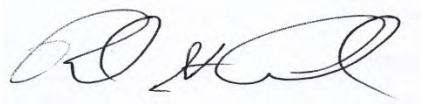
Activities Conducted: (Include location of work performed including equipment used):
General site preparation was performed. Unloaded, inspected, and operationally checked all gear. Acquired additional supplies such as plywood for mounting the explosives day box, safety supplies, water, etc. The locations of the survey control points were marked and cleared. GPS data was collected to establish preliminary survey control. Reconnaissance of the explosives storage magazine location was performed. The County Sheriff and Fire District 2 personnel were contacted and briefed about upcoming operations.

Munitions and Other Items Found Today: (Include location of the items found): None.

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today):The dirt pile that needs to be moved by a skid steer is more accurately described as a berm.

Other comments or additional information: None.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 10/18/2013
	

USACE OESS:	TBD	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	3	
Byron Cook	UXOQC/SO	HDR	3	
Jon Jacobson	Geo Field Lead	HDR	3	
Matt Reece	UXO Tech III	HDR	3	
Rob Nelson	UXO Tech II	HDR	3	

PHOTOGRAPHIC LOG

Photo No.	Date:
1	10/18/13

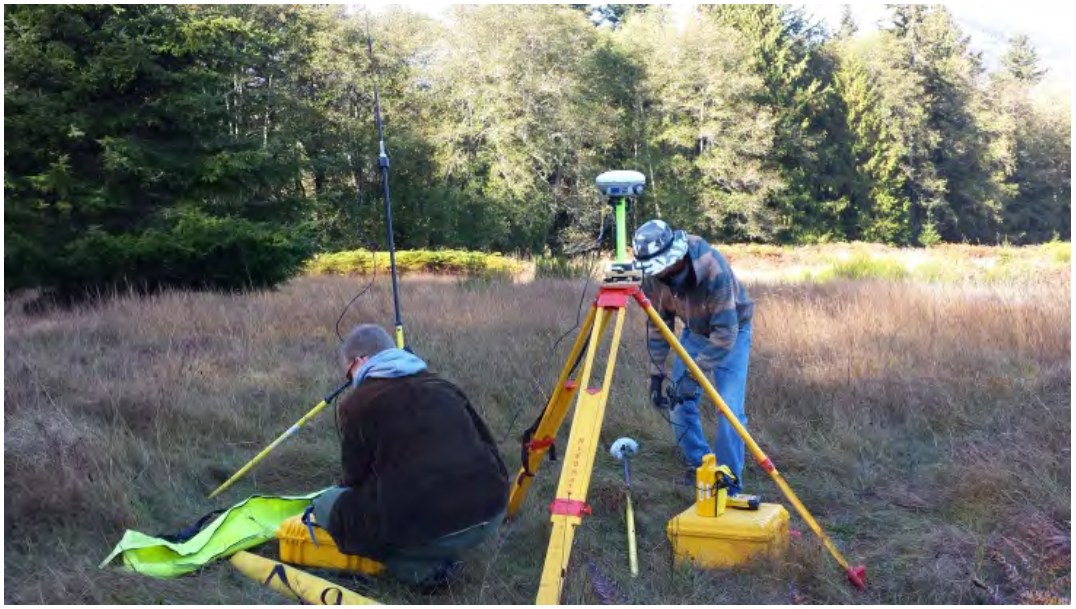
Description:
Dirt pile at the magazine entrance. Note: vehicles have been driving over the dirt pile and the existing cable restricting access has been cut.



PHOTOGRAPHIC LOG

Photo No.	Date:
2	10/18/13

Description:
Establishing preliminary survey control points.



Date: 10/18/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 001
USACE Safety Specialist: TBD	**Project Manager**: Larry deVries
SUXOX: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments: General site preparation was performed. Unloaded, inspected, and operationally checked all gear. Acquired additional supplies such as plywood for mounting the explosives day box, safety supplies, water, etc. The locations of the survey control points were marked and cleared. GPS data was collected to establish preliminary survey control. Reconnaissance of the explosives storage magazine location was performed. The County Sheriff and Fire District 2 personnel were contacted and briefed about upcoming operations.

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	N/A	N/A	Yes	N/A	N/A	N/A
Record Sensor Position	N/A	N/A	Yes	N/A	N/A	N/A
Personnel Test	N/A	N/A	Yes	N/A	N/A	N/A
Cable Shake Test	N/A	N/A	Yes	N/A	N/A	N/A
Static/Spike	N/A	N/A	Yes	N/A	N/A	N/A
Point Position/Control Point Check	N/A	N/A	Yes	N/A	N/A	N/A
IVS	N/A	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: Gear assembly, preliminary survey control activities

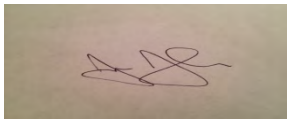
Comments for Visual Survey Activities:

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



10/18/2013

1T

1T

Bryon Cook, UXOQCS



10/18/2013

Project Name: Port Angeles Combat Range		Report No: 001
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 10/18/2013

I. Site Safety Brief Topics:

Driving, slips, trips, and falls, weather, Personal Protection Equipment (PPE)

II. Safety Inspections:

Verified PPE adequacy and implementation.

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

General site preparation was performed. Unloaded, inspected, and operationally checked all gear. Acquired additional supplies such as plywood for mounting the explosives day box, safety supplies, water, etc. The locations of the survey control points were marked and cleared. GPS data was collected to establish preliminary survey control. Reconnaissance of the explosives storage magazine location was performed. The County Sheriff and Fire District 2 personnel were contacted and briefed about upcoming operations.

VII. Visitors

None

VIII. Approval

	Date: 10/18/2013
Byron D. Card	

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 002 **Day/Date:** 10/19/2013 **Contract #:** W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 7

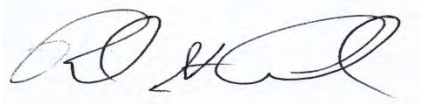
Activities Conducted: (Include location of work performed including equipment used): Acquired additional safety supplies and equipment. The GPS unit was setup and the locations of the survey control points were verified. An area approximately 5x20 meters was swept with a schonstedt for the Instrument Verification Strip (IVS). EM61 data was collected with the litter over the area proposed for the IVS. Anomalies identified by the EM61 and Schonstedt were investigated, anomalies included wire, nails and small scrap metal from cans. After the metallic anomalies were removed from the proposed IVS additional EM61 data was collected to check the suitability. The EM61 data are being processed to verify the IVS location is appropriate.

Munitions and Other Items Found Today: (Include location of the items found): None.

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): None.

Other comments or additional information: None.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 10/19/2013
	

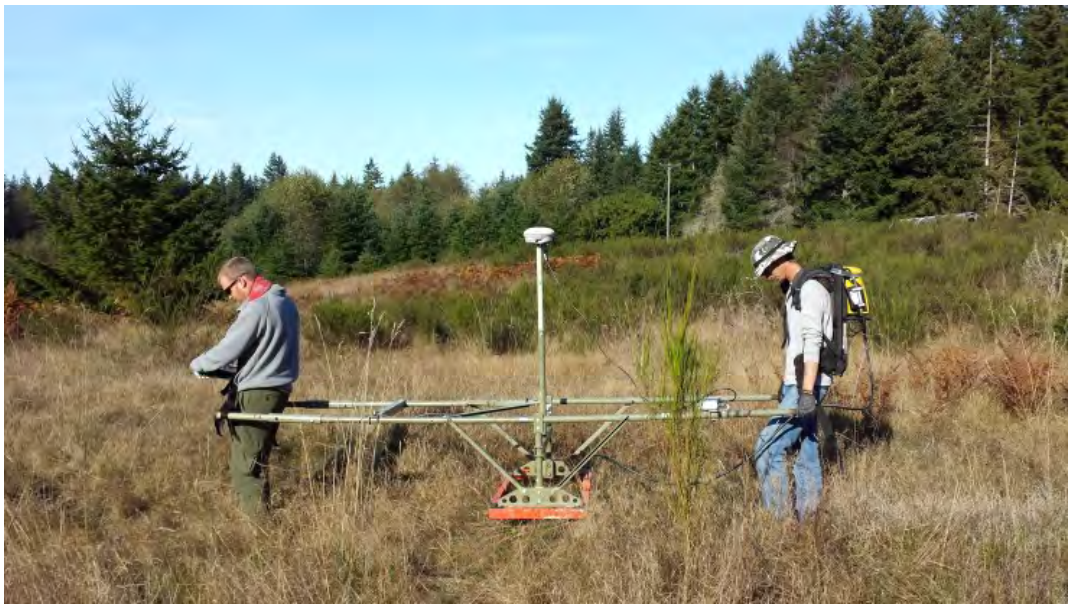
USACE OESS:	TBD	**USACE PM**:	Mirek Towster
PM:	Larry deVries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	7	
Byron Cook	UXOQC/SO	HDR	7	
Jon Jacobson	Geo Field Lead	HDR	7	
Matt Reece	UXO Tech III	HDR	0	
Rob Nelson	UXO Tech II	HDR	7	

PHOTOGRAPHIC LOG

Photo No.	Date:
3	10/19/13

Description:
Collecting EM61 data over the proposed IVS location.



PHOTOGRAPHIC LOG

Photo No.	Date:

Description:

Date: 10/19/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 002
USACE Safety Specialist: 1T	**Project Manager**: Larry deVries
SUXOX: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: 1T	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments: Acquired additional safety supplies and equipment. The GPS unit was setup and the locations of the survey control points were verified. An area approximately 5x20 meters was swept with a schonstedt for the Instrument Verification Strip (IVS). EM61 data was collected with the litter over the area proposed for the IVS. Anomalies identified by the EM61 and Schonstedt were investigated, anomalies included wire, nails and small scrap metal from cans. After the metallic anomalies were removed from the proposed IVS additional EM61 data was collected to check the suitability. The EM61 data are being processed to verify the IVS location is appropriate.

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	N/A	N/A	Yes	N/A	N/A	N/A
Record Sensor Position	N/A	N/A	Yes	N/A	N/A	N/A
Personnel Test	N/A	N/A	Yes	N/A	N/A	N/A
Cable Shake Test	N/A	N/A	Yes	N/A	N/A	N/A
Static/Spike	N/A	N/A	Yes	N/A	N/A	N/A
Point Position/Control Point Check	N/A	N/A	Yes	N/A	N/A	N/A
IVS	N/A	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: Morning and evening cals. Full coverage survey over potential IVS area. Analyzed data to identify clean area for IVS and noise strip.

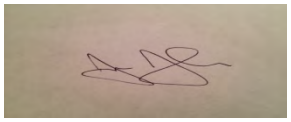
Comments for Visual Survey Activities:

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



10/19/2013

1T

1T

Bryon Cook, UXOQCS



10/19/2013

Project Name: Port Angeles Combat Range		Report No: 002
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 10/19/2013

I. Site Safety Brief Topics:

Driving, slips, trips, and falls, weather, Personal Protection Equipment (PPE)

II. Safety Inspections:

Verified PPE adequacy and implementation.

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

Acquired additional safety supplies and equipment. The GPS unit was setup and the locations of the survey control points were verified. An area approximately 5x20 meters was swept with a schonstedt for the Instrument Verification Strip (IVS). EM61 data was collected with the litter over the area proposed for the IVS. Anomalies identified by the EM61 and Schonstedt were investigated, anomalies included wire, nails and small scrap metal from cans. After the metallic anomalies were removed from the proposed IVS additional EM61 data was collected to check the suitability. The EM61 data are being processed to verify the IVS location is appropriate.

VII. Visitors

None

VIII. Approval

	Date: 10/19/2013
Byron D. Loud	

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 003 **Day/Date:** 10/21/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 9

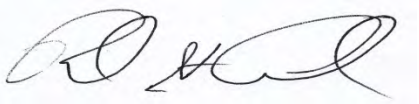
Activities Conducted: (Include location of work performed including equipment used): Took delivery of a rental skid steer and removed the berm blocking the road to the magazine area. After the berm was removed the dirt was used to level the road for safe access. Five more anomalies were dug and removed from the IVS lane. Six inert 37mm projectiles were placed as IVS items. Four of these were for use by the EM61 and the Schonstedt and two were for the Schonstedt only (items placed at 18").

Munitions and Other Items Found Today: (Include location of the items found):None

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): There were firmware issues with the Trimble GPS unit. After time spent trouble-shooting the problem, The Trimble vendor recommended reinstalling the firmware which required the purchase of a cable located in the City of Port Angeles which resulted in a delay.

Other comments or additional information: Weather was generally sunny with a high in the mid 50's.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 10/21/2013
	

USACE OESS:	TBD	**USACE PM**:	Mirek Towster
PM:	Larry deVries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	9	
Byron Cook	UXOQC/SO	HDR	9	
Jon Jacobson	Geo Field Lead	HDR	9	
Matt Reece	UXO Tech III	HDR	9	
Rob Nelson	UXO Tech II	HDR	9	

PHOTOGRAPHIC LOG

Photo No.	Date:
1	10/21/13

Description:
Skid steer removing the berm.



PHOTOGRAPHIC LOG

Photo No.	Date:
2	10/21/13

Description:
Previously cut cable blocking the road to the magazine area.



PHOTOGRAPHIC LOG

Photo No.	Date:
3	10/21/13

Description:
Placing seeds in the IVS.



Date: 10/21/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058 **Report #**: 003
USACE Safety Specialist: Choose USACE Safety Specialist.	**Project Manager**: Larry deVries
SUXOX: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: Choose MC Sampling Lead	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments: IVS installed IAW Table 3-4 of PACR FUDS RI Work Plan

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	N/A	N/A	Yes	Yes	N/A	N/A
Record Sensor Position	N/A	N/A	Yes	Yes	N/A	N/A
Personnel Test	N/A	N/A	Yes	Yes	N/A	N/A
Cable Shake Test	N/A	N/A	Yes	Yes	N/A	N/A
Static/Spike	N/A	N/A	Yes	Yes	N/A	N/A
Point Position/Control Point Check	N/A	N/A	Yes	Yes	N/A	N/A
IVS	N/A	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: Beginning and end calibrations for two litter systems. Full coverage survey over potential IVS area. Analyzed data to identify clean area for IVS and noise strip. Collected litter EM61 data for IVS memo with 2 litter systems. Trouble-shooting R8; receiver in monitor mode requiring purchase of serial to usb cable for reinstallation of firmware.

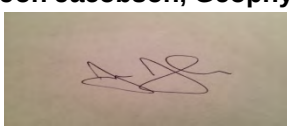
Comments for Visual Survey Activities:

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



10/21/2013

Choose an MC Sampling Lead

Click here to enter a date.

Bryon Cook, UXOQCS



10/21/2013

Project Name: Port Angeles Combat Range		Report No: 003
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 10/21/2013

I. Site Safety Brief Topics:

Driving, slips, trips, and falls, weather, PPE, heavy equipment safety

II. Safety Inspections:

Observed EMM operation to remove berm; road to site for temporary explosives magazine is now accessible

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

Installation of IVS completed

VII. Visitors

None

VIII. Approval

	Date: 10/21/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): PACR		**Area:**
Required PPE: Leather boots work gloves eye protection	**Wind Direction:** Variable	**Supervisor of Work:** St. Amand
	Evacuation Route: Back to trucks	**Safety Brief Prepared By:** Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** Trucks	**Are other crews in area?**

Comments:
Drivers, UXO/MEC, Heavy equipment (skid steer), slips/trips/falls, PPE, EZ209', First Aid, Fire safety

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location PACK

Date: 21 Oct 2013

SSHO: Byron Cook

Name	Position	Employer	Signature
Jan Jacobson	Field Geo	HDR	
Rick St. Amand	SUXOS	HDR	
Rob Nelson	Tech 2	HDR	
Matt Reece	Tech 3	HDR	
Kim Hawkins	Tech 2	HDR	

Daily Tailgate/Safety Sign-In

Location of Job (Unit/Location on Project): PALR	**Team Number:** 1	**Area:** Mag location
Required PPE: Gloves, Glasses, Boots, Vests	**Wind Direction:** Variable	Supervisor of Work: Reece
	Evacuation Route: Vehicle	JSA Prepared By and Date: Reece 10/21/13
Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** Vehicle	Are other crews in area? Traffic

Job Task (What are you doing?) Burm Repair	Audit the Job **Audit Time:**
Potential Hazards Traffic, Heavy Equipment, Slips, trips and falls	**Senior UXO Supervisors Comments:**
Recommended Action or Procedure Wear Safety vests, PPE, Watch for traffic, Watch Skid steer, watch footing, Hydrate, wear Sun Screen Bug Spray as it applies.	**Senior UXO Supervisors Initials:**

Name/Signature	Crew Name Signature
Team Leader: Reece /	
Alternate Team Leader: Kim Hankins /	

Daily Tailgate/Safety Sign-In

Consider the following and check the items that apply to the job, and then review with the work crew.

Permits
- ___ Required
- ___ Cold Work
- ___ Hot Work
- ___ Entry Permit
- ___ All Conditions Met
- ___ Signed off when complete
- ___ UNCC Permit (Dig Safe)

Personal Protective Equipment (PPE)

Type of Gloves
- I Leather Work Gloves
- ___ Special Purpose Gloves
- ___ Tyvek Suit
- ___ Hard Hat
- I Safety Glasses
- I Work Boots
- ___ Face Shield
- ___ Respirator
- ___ Nomex Suit
- ___ Ear Protection
- I Class 3 Safety Vest

Tools
- ___ Current Inspection
- ___ Proper Tools for the Job
- ___ Good Tool Condition
- ___ Qualifications
- ___ Other

Emergency Equipment
- I Fire Extinguishers
- I Eye Wash
- I Evaluation Route
- ___ BBP Kit
- I First Aid Kit
- ___ Burn Kit
- ___ Spill Kit

Access
- ___ Ladder (Tied off)
- ___ Operator Training
- ___ Other
- ___ Other

Welding
- ___ Flash Burns
- ___ Combustibles
- ___ Shields
- ___ Grounding
- ___ Water Hose
- ___ Fire Extinguisher
- ___ Fire Blanket
- ___ Fire Watch
- ___ Sewer Covers
- ___ Other

Overhead Work
- ___ Barricades
- ___ Signs
- ___ Hole Cover
- ___ Handrail
- ___ Other

Electrical
- ___ Locked & Tagged Out
- ___ Try Start/Stop Switch
- ___ GFCI Test
- ___ Assured Grounding
- ___ Extension Cord Inspection
- ___ Other

Lifting
- ___ Forklift
- ___ Manual Lifting
- ___ Condition of Equipment
- ___ Operator Certificate

Required Protection
- ___ Administrative Controls
- ___ Qualified for Task
- ___ Contingency Plans

Hazards (Environmental)
- ___ Explosive
- I Rough Terrain
- ___ Struck By/Against Weather
- ___ Pinch Points
- ___ Electrical Shocks
- ___ Heat Stress
- ___ Heavy Objects
- ___ Hot/Cold Surface or Material
- ___ Inadequate Lighting
- ___ Repetitive Motion
- ___ Noise
- ___ Poor Access/Egress
- ___ Sharp Objects
- ___ Other

Hazards (Chemical)
- ___ Chemical Burn Skin/Eyes
- ___ Flammable
- ___ Ingestion
- ___ Inhalation
- ___ Skin Contamination

Hazards (Body)
- I Fall Protection
- I Pinch Points
- I Slip/Trip Potential
- ___ Other

Other Work In Area
- I Others Working in Area
- ___ Type Work Others Doing
- I Requirements due to others
- ___ Other

Contingency Plans
- I Emergency Signals Known
- I Eye/Hand Wash Location
- I First Aid Kit Location
- I Fire Extinguisher Location
- I Severe Weather Procedures
- I Evacuation Routes

Demolition/Explosive Hazards
- ___ Premature Detonation of UXO
- ___ Static Electricity Hazard
- ___ Minimum Required Personnel
- ___ Blasting Cap Precautions
- ___ Specialized Protective Equipment
- ___ Frag Hazard Mitigation

UXO Tasks
- ___ Underwater Dive Operations
- ___ Vegetation Removal Activities
- ___ Demolition Activities
- ___ MEC Clearance Operations (Non-Intrusive)
- ___ MEC Clearance Operations (Intrusive)
- ___ Construction Support

Marine Tasks
- ___ Mag Operations
- ___ Boating Operations
- ___ Side Scan Sonar Operations
- ___ ROV Operations

GEO Tasks
- ___ GPS Base Station Set-UP/Breakdown
- ___ DATA Acquisition
- ___ Target Reacquire

I = Initial	A = Added	D = Deleted

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 004 **Day/Date:** 10/22/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 4

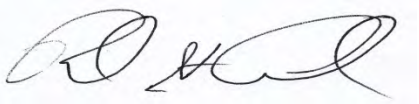
Activities Conducted: (Include location of work performed including equipment used): Day boxes were delivered. Work plan and safety plan was reviewed by all personnel. General safety and operations brief was given. Training was conducted in the MRS. Hospital route was driven.

Munitions and Other Items Found Today: (Include location of the items found):None

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today):None

Other comments or additional information: Weather was generally sunny with a high in the mid 50's.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 10/22/2013
	

USACE OESS:	TBD	**USACE PM**:	Mirek Towster
PM:	Larry deVries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St. Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St. Amand	SUXOS	HDR	4	
Byron Cook	UXOQC/SO	HDR	4	
Jon Jacobson	Geo Field Lead	HDR	4	
Matt Reece	UXO Tech III	HDR	4	
Rob Nelson	UXO Tech II	HDR	4	
Neil Roulier	UXO Tech III	HDR	4	
Kim Hawkins	UXO Tech II	HDR	4	
D.A. Gordon	UXO Tech III	HDR	4	
Chuck Dunmire	UXO Tech II	HDR	4	
Jeff Rueter	General Technician II	HDR	4	

Port Angeles Combat Range

PHOTOGRAPHIC LOG

Photo No.	**Date:**
8	10/22/13

Description:
Training being conducted on the MRS.



PHOTOGRAPHIC LOG

Photo No.	**Date:**

Description:

Date: 10/22/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 004
USACE Safety Specialist: TBD	**Project Manager**: Larry deVries
SUXOX: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection: Preparatory Phase Inspection of DFWs Assisted Visual Surveys and Digital Geophysical Mapping/IVS were conducted. Applicable sections of the PACR FUDS RI Work Plan were reviewed by the team members, as well as the APP/SSHP. Field equipment was inventoried and inspected and work responsibilities assigned. All team members are qualified and necessary certifications were checked and are available.

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments:

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	N/A	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	N/A	N/A	N/A	N/A	N/A	N/A
Personnel Test	N/A	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	N/A	N/A	N/A	N/A	N/A	N/A
Static/Spike	N/A	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	N/A	N/A	N/A	N/A	N/A	N/A
IVS	N/A	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: Statistics generated for IVS memo.

Comments for Visual Survey Activities: Conducted Trimble Geo XH training of all field personnel

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



10/22/2013

Choose an MC Sampling Lead

Click here to enter a date.

Bryon Cook, UXOQCS



10/22/2013

Project Name: Port Angeles Combat Range		Report No: 004
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 10/22/2013

I. Site Safety Brief Topics:

Driving, slips, trips, and falls, weather, PPE, UXO/MEC

II. Safety Inspections:

Site vehicles prepared IAW APP/SSHP

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

Field training of the Trimble Geo XH given by Jeff Rueter to team; In-brief given covering APP/SSHP, the three technical approaches that must be performed to complete the project, expected munitions and greatest item of concern, emergency contact numbers and evacuation route, daily site operations, and reporting requirements. 3-day OSHA OJT/Observation begins for field team.

VII. Visitors

None

VIII. Approval

	Date: 10/22/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:** Tech Approach Area 2
Required PPE: Modified Level D	**Wind Direction:** N/A	**Supervisor of Work:** Rick St. Amand
	Evacuation Route: Trucks. See Map	**Safety Brief Prepared By:** Jeff Rueter
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** Trucks	**Are other crews in area?** No

Comments:

- Doing GPS training on Trimble XH devices and Cameras.
- Walking practice transects to Mimic real production work.

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry Devries

Project Task Order # DO 06

Project Location Port Angeles Combat Range

Date: 10-22-13

SSHO: Byron Cook

Name	Position	Employer	Signature
Jon Jacobson	Field Geo	HDR	
D. Gordon	UXO Tech III	HDR	
C Donnier	UXO TECH II	HDR	
R Nelson	UXO TECH II	HDR	
M. Reese	UXO II	HDR	
Kim Hawkins	UXO Tech II	HDR	
N Bowman	Tech III	HDR	
Larry Devries	PM	HDR	

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 005 **Day/Date:** 10/23/2013 **Contract #:**W9128F-10-D-0058 Delivery Order 006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): Two portable magazines were delivered to the site by Austin Powder Co. The Clallam County electrical inspector arrived onsite and concluded that a permit was not required due to the temporary nature of the site, the lack of electrical service to the magazines, and that they were under the 400 sq ft minimum for a Clallam County permit. Four EM61 litter transects approximately 10m long were collected adjacent to eastern limits of open area to verify any noise that may affect the DGM system. The Draft Instrument Verification Strip memo was prepared. Two teams conducted assisted visual surveys. Team Lima surveys in Tech Approach Area 1 starting on the east side of the area and moving west. Team November conducted surveys in Tech Approach Area 3 starting on the east side of the area and moving west.

Munitions and Other Items Found Today: (Include location of the items found):
One piece of HE frag (MD)

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today):
The magazines were delivered by a truck and trailer that could not drop the magazines at the location approved in the Explsoives Site Plan (ESP) due to a narrow road and the inability to turn around. Evergreen towing was contacted who was able to move the magazines to the approved location.

Other comments or additional information: Weather was generally sunny with a high in the mid 50's.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

Rick St. Amand, SUXOS	**Date**: 10/23/2013
	

USACE OESS:	TBD	**USACE PM**:	Mirek Towster
PM:	Larry deVries	**UXOQCS**:	Bryon Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Bryon Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St. Amand	SUXOS	HDR	10	
Bryon Cook	UXOQCS/SO	HDR	10	
Jon Jacobson	Field Geophysycist	HDR	10	
Matt Reece	UXO Tech III	HDR	10	Lima
Rob Nelson	UXO Tech II	HDR	10	Lima
Neil Roulier	UXO Tech III	HDR	10	
Kim Hawkins	UXO Tech II	HDR	10	
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Jeff Rueter	Field Tech III	HDR	10	Lima

PACR **PHOTOGRAPHIC LOG**

Photo No.	Date:
1	10/23/13

Description:
Portable explosives storage magazines at the approved ESP location



PACR **PHOTOGRAPHIC LOG**

Photo No.	Date:
2	10/23/13

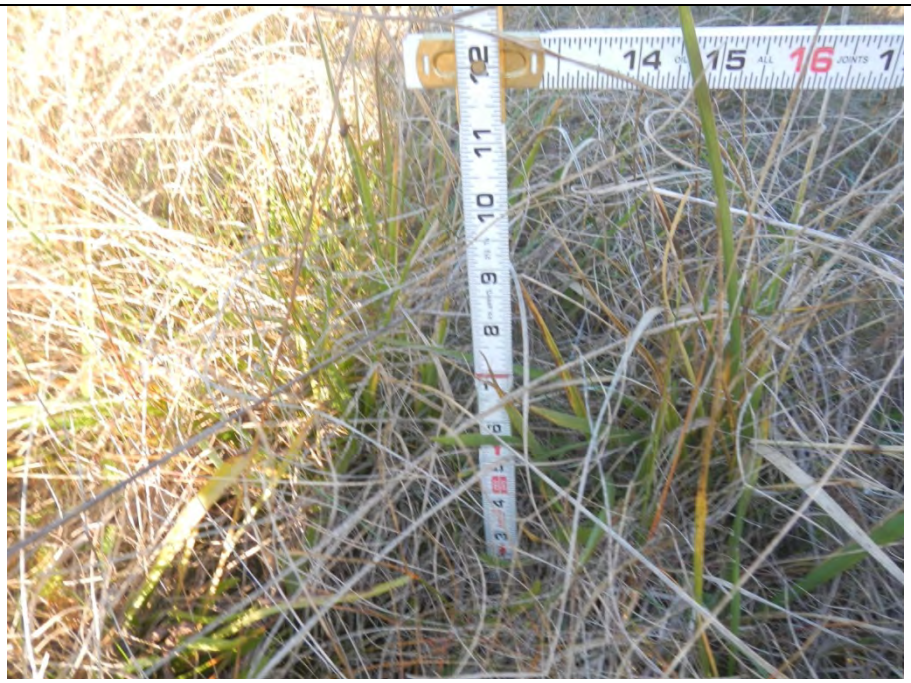
Description:
Chain placed across the road to restrict access to the explosives storage magazines



PACR **PHOTOGRAPHIC LOG**

Photo No.	Date:
3	10/23/13

Description:
Showing the depth of the matted grass which is averaging 4-6"



PACR **PHOTOGRAPHIC LOG**

Photo No.	Date:
4	10/23/13

Description:
Piece of HE frag



Date: 10/23/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 005
USACE Safety Specialist: TBD	**Project Manager**: Larry deVries
SUXOX: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection: Observed Team Lima conducting Assisted Visual Surveys in Tech Area 1
- Team followed planned transects loaded into a Trimble GeoXH GPS unit
- Team consisted of one UXO Tech III and one UXO Tech II
- Team used Schonstedt magnetometer and White All Metals detector to locate anomalies
- Team was aware of separation distance while investigating anomalies

Observed MD Handling, Storage, and Demilitarization
- MPPEH inspected by UXO Techs II and III and determined to be MDAS
- MDAS verified and secured by SUXOS

Follow-Up Phase Inspection:

Additional QC/QA Comments: Verified instrument check-out procedures at IVS at the start of the day

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	N/A	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	N/A	N/A	N/A	N/A	N/A	N/A
Personnel Test	N/A	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	N/A	N/A	N/A	N/A	N/A	N/A
Static/Spike	N/A	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	N/A	N/A	N/A	N/A	N/A	N/A
IVS	N/A	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: Four ten-meter lines collected with the litter adjacent to the open area to characterize site noise. Write-up of IVS memo.

Comments for Visual Survey Activities: Observed GeoXH Start of Day procedures; downloaded and QCed teams' transect data; no issues observed

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



10/23/2013

1T

1T

Bryon Cook, UXOQCS



10/23/2013

Project Name: Port Angeles Combat Range		Report No: 005
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 10/23/2013

I. Site Safety Brief Topics:

Driving, slips, trips, and falls, weather, Personal Protection Equipment (PPE), Unexploded Ordnance (UXO)/Munitions and Explosives of Concern (MEC), hydration, field sanitation/hygiene, review Material Safety Data Sheets (MSDS) for marking paint, Exclusion Zone (EZ) of 209 ft/ 43 ft.

II. Safety Inspections:

Insured teams were equipped with hand cleaner and first aid kits for field operations.

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

HDR Project Manager (PM) on-site to observe beginning of field operations and to assist in selecting control points. PM and surveyor were given site safety brief and escorted by UXOSO.

VII. Visitors

James Wengler, surveyor, Wengler Surveying & Mapping

VIII. Approval

	Date: 10/23/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): PACR		**Area:**
Required PPE: Leather boots gloves safety glasses	**Wind Direction:** Variable	**Supervisor of Work:** Sf. Amund
	Evacuation Route: back to trucks	**Safety Brief Prepared By:** Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** trucks	**Are other crews in area?**

Comments:

PPE; UXO/MEC; slips/trips/falls; EZ (209'); hydrate; dress appropriately; MSDS for marking chalk; field hygiene; first aid; evacuation

weather cool/foggy casing to sunny / 58-60° afternoon

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry Davies

Project Task Order # W9128F-10-D-0058

Project Location PACR

Date: 23 Oct 13

SSHO: Byron Cook

Name	Position	Employer	Signature
Robert Nelson	UXO TECH II	HDR	
Jon Jacobson	Field Geo	HDR	
N Rouillard	UXO III	HDR	
D. Gordon	UXO III	HDR	
M. Reed	UXO III	HDR	
C Dunmire	UXO II	HDR	
Jeff Rueter	Field Geo	HDR	Jeff
James Wenglein	Surveyor	Wenglein	
Larry Davies	PM	HDR	

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☐	☐
Trimble	3975		☐	☐
Trimble	3693	Jeff R	☒	☐
Trimble	3974		☒	☐
Trimble	3661		☐	☐
Camera	3088		☐	☐
Camera	3083		☐	☐
Camera	3084		☒	☐
Camera	3963	Jeff	☒	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104		☑	☐
Schostedt	1636		☐	☐
Schostedt	3658		☐	☐
Schostedt	3105		☐	☐
Schostedt	3885		☑	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Gordon	☑	☐
Garmin	3679	M. Hua	☑	☐
Garmin	3680		☑	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685		☐	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 006 **Day/Date:** 10/24/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

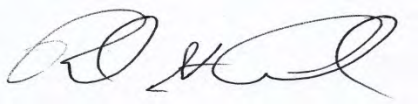
Activities Conducted: (Include location of work performed including equipment used): Two teams conducted assisted visual surveys today. Team Lima conducted visual surveys in Tech Approach Area 1 staring on the west side of the area and moving east. The area had rough terrain that made visual surveys difficult and access to the area was difficult as well. Team November conducted visual surveys in Tech Approach Area 3 starting where the team left off 10/23/13 and moving west. An electrician from Olympic Electric was on site to ground the two portable explosives magazines. An UXO escort was provided. Two UXO escorts were provided for the surveyors while control points are being established.

Munitions and Other Items Found Today: (Include location of the items found):None

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): Difficult terrain and dense undergrowth made access to Team Lima's transects difficult. Lima was able to survey approximately one mile today.

Other comments or additional information: Weather was generally sunny with a high in the mid 50's.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 10/24/2013
	

USACE OESS:	TBD	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
Jon Jacobson	Field Geophysycist	HDR	10	
Matt Reece	UXO Tech III	HDR	10	Lima
Rob Nelson	UXO Tech II	HDR	10	Lima
Neil Roulier	UXO Tech III	HDR	10	
Kim Hawkins	UXO Tech II	HDR	10	
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Jeff Reuter	Field Tech III	HDR	10	Lima

PHOTOGRAPHIC LOG

Photo No.	Date:
1	10/24/13

Description:
UXO escort and Land Surveyor



PHOTOGRAPHIC LOG

Photo No.	Date:
2	10/24/13

Description:
View of canopy from Survey Control Point 6



PHOTOGRAPHIC LOG

Photo No.	Date:
3	10/24/13

Description:
Magazine grounded IAW NFPA 780



PHOTOGRAPHIC LOG

Photo No.	Date:

Date: 10/24/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 006
USACE Safety Specialist: TBD	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection: Initial observation of Team November conducting Assisted Visual Surveys in Tech Area 3
- Team followed planned transects loaded into a Trimble GeoXH GPS unit
- Team consisted of one UXO Tech III and one UXO Tech II
- Team used Schonstedt magnetometer to locate anomalies
- Team was aware of separation distance while investigating anomalies

Follow-Up Phase Inspection:

Additional QC/QA Comments: Observed Schonstedt check-out at the IVS
Lightning protection for 2 each, ATF Approved Type II Portable Explosive Storage Magazines was conducted IAW DA PAM 385-64 Table 17-1, Grounding System Inspection and Test Requirements, and NFPA 780 Section 8.7.5 Metal Portable Magazines
No MPPEH located today
Local Washington State surveyors on site establishing control points

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	N/A	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	N/A	N/A	N/A	N/A	N/A	N/A
Personnel Test	N/A	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	N/A	N/A	N/A	N/A	N/A	N/A
Static/Spike	N/A	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	N/A	N/A	N/A	N/A	N/A	N/A
IVS	N/A	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: IVS memo submitted

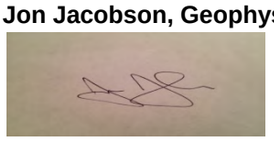
Comments for Visual Survey Activities: Start of Day features were observed by Jeff Rueter and passed QC requirements. Visual Survey data was downloaded and QCed.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



10/24/2013

1T

1T

Bryon Cook, UXOQCS



10/24/2013

Project Name: Port Angeles Combat Range		Report No: 006
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 10/24/2013

I. Site Safety Brief Topics:

Driving, Personal Protection Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance (UXO)/Munitions and Explosives of Concern (MEC), hydration, field sanitation/hygiene, Exclusion Zone (209 ft/ 43 ft), first aid.

II. Safety Inspections:

Observed UXO Escorts; escorts gave a safety brief to surveyors, visually inspected routes to proposed control points, and checked for anomalies prior to surveyors setting markers in the ground.

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

An electrician from Olympic Electric was on site to ground the portable magazines. He was given a safety brief and provided an escort. Surveyors from Wengler Surveying & Mapping were on site to establish control points. They were given a safety brief and provided UXO escorts.

VII. Visitors

James Wengler, Bill Vernon, Jeff Heistand, surveyors, Wengler Surveying & Mapping
Ryan Johnson , electrician, Olympic Electric

VIII. Approval

	Date: 10/24/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Fort Angeles Combat Range		**Area:**
Required PPE: leather boots work gloves safety glasses weather & work appropriate clothing	**Wind Direction:** Variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. your staged vehicles 2. staging/prove-out area	**Are other crews in area?** Yes

Comments:

PPE; Driving; First aid; Field sanitation/hygeine; slips/trips/falls; UXO/MEC; EZ (209/43)

weather; cool/humid warming to 58 & sunny

Daily Safety Brief and Sign-In Sheet

HDR

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058 DO 0006

Project Location IACR, WA

Date: 10/24/2013

SSHO: Byron Cook

Name	Position	Employer	Signature
Ryan Johnson	Electrician	Bly Elec	
Charles Dunmire	UXO TECH II	HDR	
N Rollier	UXO III	HDR	
D. Gordon	UXO III	HDR	
M. Reece	UXO III	HDR	
Robert Nelson	UXO II	HDR	
Jeff Ryeter	Field Geo	HDR	
Kim Hankins	UXO II	HDR	
JAMES WENGLER	SURVEYOR	WENGLER	
Bill Vernon	SURVEYOR	WENGLER	
Jeff HEISTAND	SURVEYOR	WENGLER	
Visitors			

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date: 24 OCT 13
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660	RAULIER	☒	☐
Trimble	3975		☐	☐
Trimble	3693	Jeff R	☒	☐
Trimble	3974		☒	☐
Trimble	3661		☐	☐
Camera	3088		☐	☐
Camera	3083		☐	☐
Camera	3084	D. Hoxton	☒	☐
Camera	3963	Jeff R	☒	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date: 24 OCT 13
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Hoodson	☒	☐
Garmin	3679		☐	☐
Garmin	3680	Nelson	☒	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Rowlison	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date: 24 OCT 13
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104	Ross	☐	☐
Schostedt	1636		☐	☐
Schostedt	3658	Rollier	☒	☐
Schostedt	3105		☐	☐
Schostedt	3885	D. Hudson	☒	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 007 **Day/Date:** 10/25/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

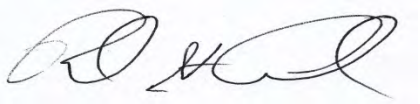
Activities Conducted: (Include location of work performed including equipment used): Two teams conducted assisted visual surveys today. Team Lima conducted visual surveys in Tech Approach Area 1 starting where the team left off on 10/24/13 and continuing east. The area had rough terrain that made visual surveys difficult and access to the area was difficult as well. Team Lima also investigated roads and trails in the Morse Creek drainage for access during future surveys in Tech Approach Area 1. Team November conducted visual surveys in Tech Approach Area 3 starting where the team left off 10/24/13 and moving west. Two UXO escorts were provided for the surveyors while control points were being established.

Munitions and Other Items Found Today: (Include location of the items found):None

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): Difficult terrain and dense undergrowth made access to Team Lima's transects difficult. Lima was able to survey approximately one mile today.

Other comments or additional information: Weather was generally cloudy with a high in the near 50.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 10/25/2013
	

USACE OESS:	TBD	**USACE PM**:	Mirek Towster
PM:	Larry deVries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
Jon Jacobson	Field Geophysycist	HDR	10	
Matt Reece	UXO Tech III	HDR	10	Lima
Rob Nelson	UXO Tech II	HDR	10	Lima
Neil Roulier	UXO Tech III	HDR	10	
Kim Hawkins	UXO Tech II	HDR	10	
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Jeff Reuter	Field Tech III	HDR	10	Lima

PHOTOGRAPHIC LOG

Photo No.	Date:
1	10/25/13

Description:
Terrain documentation photo of Tech Approach Area 1



PHOTOGRAPHIC LOG

Photo No.	Date:
2	10/25/13

Description:
Terrain documentation photo of Tech Approach Area 1



Date: 10/25/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 007
USACE Safety Specialist: TBD	**Project Manager**: Larry deVries
SUXOX: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments: Observed VS teams and UXO escorts check instruments at the IVS
No MPPEH located today
Local Washington State surveyors on site establishing control points
Observed vehicle safety inspections

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	N/A	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	N/A	N/A	N/A	N/A	N/A	N/A
Personnel Test	N/A	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	N/A	N/A	N/A	N/A	N/A	N/A
Static/Spike	N/A	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	N/A	N/A	N/A	N/A	N/A	N/A
IVS	N/A	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any:

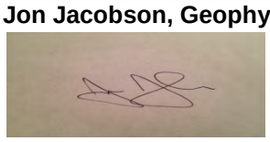
Comments for Visual Survey Activities: Start of Day features were observed by Jeff Rueter and passed QC requirements. Visual Survey data was downloaded and QCed.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



10/25/2013

1T

1T

Bryon Cook, UXOQCS



10/25/2013

Project Name: Port Angeles Combat Range		Report No: 007
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 10/25/2013

I. Site Safety Brief Topics:

Driving, Personal Protection Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance(UXO)/Munitions and Explosives of Concern(MEC, hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid

II. Safety Inspections:

Observed site vehicle safety inspections; primary first aid kits are still sealed

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

Surveyors from Wengler Surveying & Mapping were on site to establish control points. They were given a safety brief and provided escorts.

VII. Visitors

Bill Vernon, Jeff Heistand, surveyors, Wengler Surveying & Mapping

VIII. Approval

	Date: 10/25/2013
	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 25 Oct 2013

SSHO: Byron Cook

Name	Position	Employer	Signature
Robert Nelson	UXO II	HDR	
M. Reece	UXO III	HDR	
D GORDON	UXO III	HDR	
Jon Jacobson	Field Geo	HDR	
Jeff Ruter	Field Geo	HDR	
[illegible]	UXO III	HDR	
[illegible]	UXO II	HDR	
C. DUNMIRE	UXO II	HDR	
[illegible]	SUPOS	HDR	
Bill Vernon	SURVEYOR	WENGLER	
JEFF HEISTAND	SURVEYOR	WENGLER	
Visitors			

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☐	☐
Trimble	3975		☐	☐
Trimble	3693	Jeff R	☒	☐
Trimble	3974		☒	☐
Trimble	~~3661~~ 3965 NIKON		☐	☐
Camera	~~3088~~ 3964		☐	☐
Camera	3083		☐	☐
Camera	~~3084~~ 3064 NIKON		☑	☐
Camera	3963	Jeff R	☒	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Gordon	☒	☐
Garmin	3679	M Vhe	☒	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685		☐	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name:	PACR RI
Date:	
Contract/Delivery Order:	W9128F-10-D-0058
Project Manager	Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104	[signature]	☒	☐
Schostedt	1636		☐	☐
Schostedt	3658		☐	☐
Schostedt	3105		☐	☐
Schostedt	3885	D. Goodwin	☒	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

Vehicle Inspection Checklist and Report Form

Couliers Suburban

HDR | ONE COMPANY | Many Solutions

Site Name/Location: PACR

Site Supervisor: St. Amand

Vehicle: Project Rental #2 / Project # 206945
(Make and License Plate Number)

Date Inspected: 10/25/13 Mileage: 5913

Owner: ____
(Rental, SKY, Contract)

Item Description	Monday			Tuesday			Wednesday			Thursday			Friday		
	Pass			Pass			Pass			Pass			Pass		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Registration and License Plate	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Insurance	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Emergency Route Map/Phone #s	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
2 Tires:															
Pressure	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Condition	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
3 Equipment:															
Fire Extinguishers	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
First Aid/CPR/Burn Kits	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Blood Borne Pathogen Kit	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Eyewash Kits	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Spare Tire	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Tire Changing Equipment	☐	☐	☐	☑	☐	☐	☐	☐	☐	☑	☐	☐	☑	☐	☐
Tie Downs*	☐	☐	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑
Chocks*	☐	☐	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑
Placards*	☐	☐	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4. Brakes															
Hand/Emergency	☐	☐	☐	☑	☐	☐	☑	☑	☐	☑	☐	☐	☑	☐	☐
Service	☐	☐	☐	☑	☐	☐	☑	☑	☐	☑	☐	☐	☑	☐	☐
5. Belts															
Proper Tension	☐	☐	☐	☑	☐	☐	☑	☑	☐	☑	☐	☐	☑	☐	☐
Condition	☐	☐	☐	☐	☐	☐	☑	☑	☐	☑	☐	☐	☑	☐	☐
6. General:															
Windshield	☐	☐	☐	☑	☐	☐	☑	☑	☐	☑	☐	☐	☑	☐	☐
Windshield Wipers	☐	☐	☐	☑	☐	☐	☑	☑	☐	☑	☐	☐	☑	☐	☐
Windows (Condition/Operation)	☐	☐	☐	☑	☐	☐	☑	☑	☐	☑	☐	☐	☑	☐	☐
Seat Belts	☐	☐	☐	☑	☐	☐	☑	☑	☐	☑	☐	☐	☑	☐	☐
Steering	☐	☐	☐	☑	☐	☐	☑	☑	☐	☑	☐	☐	☑	☐	☐
Horn	☐	☐	☐	☑	☐	☐	☑	☑	☐	☑	☐	☐	☑	☐	☐
Gas Cap	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Mirrors	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Door/Window Handles/Latches	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Cleanliness	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Exhaust System	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
7. Lights:															
Headlights (High/Low)	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Brake Lights	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Parking	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Back-up	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Turn Signals	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Emergency Flashers	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Interior Lights	☐	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐

Vehicle Inspection Checklist and Report Form

Jacobsen's Suburban

HDR ONE COMPANY | Many Solutions

Site Name/Location: PACR

Site Supervisor: St. Amand

Vehicle: Project Rental #2 / Project # 206945
(Make and License Plate Number)

Date Inspected: 10/25/13

Mileage: _____

Owner: Enterprise
(Rental, SKV, Contract)

Item Description	Monday			Tuesday			Wednesday			Thursday			Friday		
	Pass			Pass			Pass			Pass			Pass		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Registration and License Plate	✓			✓			✓			✓			✓		
Insurance	✓			✓			✓			✓			✓		
Emergency Route Map/Phone #s	✓			✓			✓			✓			✓		
2 Tires:															
Pressure	✓			✓			✓			✓			✓		
Condition	✓			✓			✓			✓			✓		
3 Equipment:															
Fire Extinguishers	✓			✓			✓			✓			✓		
First Aid/CPR/Burn Kits	✓			✓			✓			✓			✓		
Blood Borne Pathogen Kit															
Eyewash Kits	✓			✓			✓			✓			✓		
Spare Tire	✓			✓			✓			✓			✓		
Tire Changing Equipment	✓			✓			✓			✓			✓		
Tie Downs*															
Chocks*															
Placards*															
Other:															
Other:															
4. Brakes															
Hand/Emergency	✓			✓			✓			✓			✓		
Service	✓			✓			✓			✓			✓		
5. Belts															
Proper Tension															
Condition															
6. General:															
Windshield	✓			✓			✓			✓			✓		
Windshield Wipers	✓			✓			✓			✓			✓		
Windows (Condition/Operation)	✓			✓			✓			✓			✓		
Seat Belts	✓			✓			✓			✓			✓		
Steering	✓			✓			✓			✓			✓		
Horn	✓			✓			✓			✓			✓		
Gas Cap	✓			✓			✓			✓			✓		
Mirrors	✓			✓			✓			✓			✓		
Door/Window Handles/Latches	✓			✓			✓			✓			✓		
Cleanliness	✓			✓			✓			✓			✓		
Exhaust System	✓			✓			✓			✓			✓		
7. Lights:															
Headlights (High/Low)	✓			✓			✓			✓			✓		
Brake Lights	✓			✓			✓			✓			✓		
Parking	✓			✓			✓			✓			✓		
Back-up	✓			✓			✓			✓			✓		
Turn Signals	✓			✓			✓			✓			✓		
Emergency Flashers	✓			✓			✓			✓			✓		
Interior Lights	✓			✓			✓			✓			✓		

Vehicle Inspection Checklist and Report Form

HDR ONE COMPANY | Many Solutions

Dodge

Site Name/Location: PACR

Site Supervisor: 5th Amend

Vehicle: 2012 Dodge Ram 2500
(Make and License Plate Number) ZCM-9703-PENN

Date Inspected: 10/25/13

Mileage: _____

Owner: Lease-Express Car & Truck Rental
(Rental, [redacted] Contract)

Item Description	Monday			Tuesday			Wednesday			Thursday			Friday		
	Pass			Pass			Pass			Pass			Pass		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Registration and License Plate	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Insurance	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Emergency Route Map/Phone #s	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
2 Tires:															
Pressure	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Condition	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
3 Equipment:															
Fire Extinguishers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
First Aid/CPR/Burn Kits	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Blood Borne Pathogen Kit	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Eyewash Kits	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Spare Tire	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Tire Changing Equipment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Tie Downs*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Chocks*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Placards*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4. Brakes															
Hand/Emergency	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Service	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
5. Belts															
Proper Tension	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Condition	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
6. General:															
Windshield	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Windshield Wipers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Windows (Condition/Operation)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Seat Belts	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Steering	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Horn	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Gas Cap	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Mirrors	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Door/Window Handles/Latches	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Cleanliness	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Exhaust System	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
7. Lights:															
Headlights (High/Low)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Brake Lights	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Parking	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Back-up	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Turn Signals	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Emergency Flashers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Interior Lights	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 28 Oct 13

SSHO: Byron Cook

Name	Position	Employer	Signature
Rick St Germain	SUXOS	HDR	
Jeff Rucker	Field Geo	HDR	
M. Reed	UXO III	HDR	
Jon Jacobson	Field Geo	HDR	
N Rowman	UXO III	HDR	
D. Gordon	UXO III	HDR	
C DUNMIRE	UXO II	HDR	
R. Nelson	UXO II	HDR	
Visitors			

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☐	☐
Trimble	3975		☐	☐
Trimble	3693	Jeff R	☒	☐
Trimble	3974		☒	☐
Trimble	~~3661~~ 3965 NIKON		☐	☐
Camera	~~3088~~ 3964		☐	☐
Camera	3083		☐	☐
Camera	~~3084~~ 3064 NIKON		☑	☐
Camera	3963	Jeff R	☒	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Gordon	☒	☐
Garmin	3679	M Vhe	☒	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685		☐	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104	M/	☒	☐
Schostedt	1636		☐	☐
Schostedt	3658		☐	☐
Schostedt	3105		☐	☐
Schostedt	3885	D. Goodwin	☒	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 009 **Day/Date:** 10/29/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): Two teams conducted assisted visual surveys today. Team Lima conducted visual surveys in Tech Approach Area 2 and were followed by the DGM Team. Teams India and November conducted visual surveys in Tech Approach Area 3. Both teams ended in unsurveyable areas to the west and south respectively. Team November finished the day trying to find access to the 75 foot transect lines in Technical Approach Area 3 from the North East.

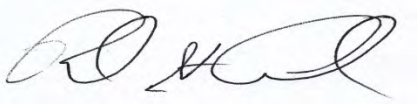
Munitions and Other Items Found Today: (Include location of the items found):None

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today):

Other comments or additional information: Weather was cold with frost in the morning then sunny and clear with a high in the near 50.

Schedule: Production is currently on pace to meet the goal of demobilization prior to 11-28-2013 (Thanksgiving). Contingency plan is in place for additional personnel if required.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 10/29/2013
	

USACE OESS:	Webster Keller (offsite)	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	9.5	
Byron Cook	UXOQC/SO	HDR	9.5	
Jon Jacobson	Field Geophysicist	HDR	9.5	DGM
Matt Reece	UXO Tech III	HDR	9.5	Lima
Rob Nelson	UXO Tech II	HDR	9.5	DGM
Neil Roulier	UXO Tech III	HDR	9.5	India
Kim Hawkins	UXO Tech II	HDR	9.5	India
D.A. Gordon	UXO Tech III	HDR	9.5	November
Chuck Dunmire	UXO Tech II	HDR	9.5	November
Jeff Reuter	Field Tech III	HDR	9.5	Lima

PHOTOGRAPHIC LOG

Photo No.	**Date:**
1	10/29/13

Description: Surface metal debris (non-munitions related) found and recorded by team Lima within Technical Approach Area 2



PHOTOGRAPHIC LOG

Photo No.	**Date:**
2	10/29/13

Description: Team India team member performing Schonstedt assisted visual survey within Technical Approach Area 3



PHOTOGRAPHIC LOG

Photo No.	**Date:**
3	10/29/13

Description: Cliff face blocking access to 75-foot transects from the southern portion of the MRS in Technical Approach Area 3. Recorded by SUXOS and UXOSO/QCS during site evaluation



PHOTOGRAPHIC LOG

Photo No.	**Date:**

Date: 10/29/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 009
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments: Observed Schonstedt and EM-61 verification
No MPPEH located today
Clallam County Fire District 2 was notified in writing of the location and contents of the portable explosives magazines
Performed site evaluation with SUXOS to try to find access to 75-foot transects in Area 3 from the southern approach; could not access due to terrain

DGM Daily Quality	DGM Activities Today (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	Yes	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	Yes	N/A	N/A	N/A	N/A	N/A
Personnel Test	Yes	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	Yes	N/A	N/A	N/A	N/A	N/A
Static/Spike	Yes	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	Yes	N/A	N/A	N/A	N/A	N/A
IVS	Yes	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: Performed start and end of day standardization tests. Collected EM61 data along 75-foot-spaced DGM transects with litter in area east of open area. Data was uploaded for QC and target picking.

Comments for Visual Survey Activities: Start of Day features were observed by Jeff Rueter and passed QC requirements. Visual Survey data was downloaded and QCed.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



10/29/2013

1T

1T

Bryon Cook, UXOQCS



10/29/2013

Project Name:	Port Angeles Combat Range		Report No: 009
Project No:	W9128F-10-D-0058	Location: Port Angeles, WA	Date: 10/29/2013

I. Site Safety Brief Topics:

Driving, Personal Protective Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC), hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid

II. Safety Inspections:

Performed site evaluation with SUXOS to find access to 75-foot transects in area 3; could not access from the south due to terrain. Recommending to teams operating in that area to mark off as unsurveyable due to physical safety concerns.

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

Notified Clallam County Fire District 2 of location and contents of portable explosives magazines

VII. Visitors

None

VIII. Approval

	Date: 10/29/2013
	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

High ~ 52° Sunny

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 29 Oct 13

SSHO: Byron Cook

Name	Position	Employer	Signature
Rick St. Amand	SUXOS	HDR	
D. Gordon	UXO III	HDR	D. Gordon
Jeff Rueter	Field Geo	HDR	
C. DUNMIRE	UXO II	HDR	
M Rousseau	UXO III	HDR	
K Hawkins	UXO II	HDR	
R Nelson	UXO II	HDR	
Jon Jacobson	Geo	HDR	
M. Reece	Tech III	HDR	
Visitors			

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104	[signature]	☒	☐
Schostedt	1636	[signature]	☒	☐
Schostedt	3658		☐	☐
Schostedt	3105		☐	☐
Schostedt	3885	[signature]	☒	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
SCHOSTEDT	K634	ON-OFF SWITCH BROKEN

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Boynton	☒	☐
Garmin	3679	M Klm	☒	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Roulier	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660	HAWKINS	☒	☐
Trimble	3975		☐	☐
Trimble	3693	JEFF R	☒	☐
Trimble	3974	C D	☒	☐
Trimble	3661		☐	☐
Camera	3088		☐	☐
Camera	3083		☐	☐
Camera	~~3084~~ 3064 NIKON		☒	☐
Camera	3963	Jeff R	☒	☐
CAMGRIT	10021	ROLLICK	X	

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 010 **Day/Date:** 10/30/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): Team Lima conducted visual surveys in Technical Approach Area 2 on 75 foot transects, starting on the east side of the area and working south, working around the area containing 35 foot transects. The DGM team collected data immediately behind team Lima.

Teams India and November conducted assisted visual surveys within Technical Approach Area 3. Team November spent the day in the southwest portion of the area and Team India started transects in the 75 foot transect area (anticipated mortar impact area).

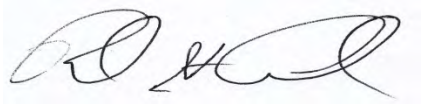
Munitions and Other Items Found Today: (Include location of the items found):None

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): Teams are encountering steeply graded terrain and thick undergrowth. Several areas have difficult access resulting in unsurveyable transects.

Other comments or additional information: Weather was mild in the morning then overcast with a high near 50. Showers began at the end of the work day.

Schedule: Production is currently on pace to meet the goal of demobilization prior to 11-28-2013 (Thanksgiving). Contingency plan is in place for additional personnel if required.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 10/30/2013
	

USACE OESS:	TBD	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
Jon Jacobson	Field Geophysycist	HDR	10	DGM
Matt Reece	UXO Tech III	HDR	10	Lima
Rob Nelson	UXO Tech II	HDR	10	DGM
Neil Roulier	UXO Tech III	HDR	10	India
Kim Hawkins	UXO Tech II	HDR	10	India
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Jeff Reuter	Field Tech III	HDR	10	Lima

PHOTOGRAPHIC LOG

Photo No.	**Date:**
1	10/30/13

Description: SUXOS behind a screen of vegetation, blocking DGM from further progress on this transect within Technical Approach Area 2



PHOTOGRAPHIC LOG

Photo No.	**Date:**
2	10/30/13

Description: Team November shows steep terrain in Technical Approach Area 3



PHOTOGRAPHIC LOG

Photo No.	Date:
3	10/30/13

Description: Site characterization photo provided by Team India within Technical Approach Area 2



PHOTOGRAPHIC LOG

Photo No.	Date:
4	10/30/13

Description: DGM Team surveying through difficult terrain with Technical Approach Area 2



Date: 10/30/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 010
USACE Safety Specialist: TBD	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection: Observed DGM Team conduct calibrations; equipment passed and Team began transects. Team Lima continues to lead, performing visual surveys ahead of DGM. Several transects were interrupted with terrain and vegetation impassible for the litter and annotated as non-surveyable. A seed was placed within a transect line as a QA measure, per para. 3.4.6.1 of the work plan.

Additional QC/QA Comments: Observed survey operators test Schonstedts along the Instrument Verification Strip (IVS)
Placed a 37mm seed in a transect line for DGM verification, recorded by DGM QC
No MPPEH located today

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	Yes	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	Yes	N/A	N/A	N/A	N/A	N/A
Personnel Test	Yes	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	Yes	N/A	N/A	N/A	N/A	N/A
Static/Spike	Yes	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	Yes	N/A	N/A	N/A	N/A	N/A
IVS	Yes	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: QC seed placement, Respond to IVS memo DQCR, review accuracy of DGM positions, litter survey in 75-foot-spacing transects

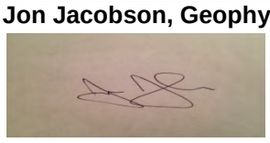
Comments for Visual Survey Activities: All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, data was looked at for appropriate delineation of unsurveyable areas and accuracy. All teams measured the Schreiner control point at the start of the day to ensure positional accuracy and duplicate results. All start of day features were observed by Jeff Rueter and pass all QC requirements.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



10/30/2013

1T

1T

Bryon Cook, UXOQCS



10/30/2013

Project Name: Port Angeles Combat Range		Report No: 010
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 10/30/2013

I. Site Safety Brief Topics:

Driving, Personal Protective Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC), hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid

II. Safety Inspections:

Ensured teams still had adequate field hygiene supplies

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

No additional comments

VII. Visitors

None

VIII. Approval

	Date: 10/30/2013
	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable **Evacuation Route:** toward the assembly point	**Supervisor of Work:** SUXOS Rick St. Amand **Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

High 50° PC/C 20% chance rain

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 30 Oct 13

SSHO: Byron Cook

Name	Position	Employer	Signature
N Rouleau	UXO III	HDR	
Jeff Ruetter	Field Geo	HDR	
C Dunmire	UXO II	HDR	
M. Reece	UXO III	HDR	
D. Gordon	UXO III	HDR	
Jon Jacobson	Geo	HDR	
Robert Nelson	UXO II	HDR	
Rick St. Amand	SUXOS	HDR	
Kim Heal C.G.S	UXO II	HDR	

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660	Rollidge	☒	☐
Trimble	3975		☐	☐
Trimble	3693	Jeff Fr	☒	☐
Trimble	3974	CD	☒	☐
Trimble	3661		☐	☐
Camera	3088		☐	☐
Camera	~~3083~~ 3965		☐	☐
Camera	~~3084~~ 3064		☒	☐
Camera	3963	Jeff Fr	☒	☐
CAMERA	1004	ROLLIDGE	↗	

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104	[signature]	☒	☐
Schostedt	1636 Broken		☐	☒
Schostedt	3658		☐	☐
Schostedt	3105	[signature]	☒	☐
Schostedt	3885	[signature]	☒	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name:	PACR RI
Date:	
Contract/Delivery Order:	W9128F-10-D-0058
Project Manager	Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Gould	☒	☐
Garmin	3679	M Vue	☒	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	N Rouille	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 011 **Day/Date:** 10/31/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): Two teams conducted assisted visual surveys today. Team Lima conducted visual surveys in Technical Approach Area 2 within the area containing 35 foot transects and were followed by the DGM Team. Teams India and November conducted visual surveys in Technical Approach Area 3. Team November spent the day in the far southeast corner and Team India continued transects in the 75 foot transect area (anticipated mortar impact area). Team November found four anomalies. All were non-munitions related metallic debris on the surface. Team India found four subsurface anomalies that were all non-munitions related metallic debris. They found ten surface anomalies that were also non-munitions related metallic debris.
QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

Munitions and Other Items Found Today: (Include location of the items found):None

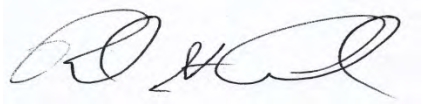
Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today):
Extremely challenging terrain limited team November's production.

Team November inadvertently accessed the southern portion of the MRS through the State of Washington Department of Natural Resources parcel for which we do not have an approved Right-Of-Entry (ROE).

Other comments or additional information: Weather started cloudy and became clear until early afternoon. The day ended as overcast with a high in the near 50.

Schedule: Production is currently on pace to meet the goal of demobilization prior to 11-28-2013 (Thanksgiving). Contingency plan is in place for additional personnel if required.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 10/31/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
Jon Jacobson	Field Geophysycist	HDR	10	DGM
Matt Reece	UXO Tech III	HDR	10	Lima
Rob Nelson	UXO Tech II	HDR	10	DGM
Neil Roulier	UXO Tech III	HDR	10	India
Kim Hawkins	UXO Tech II	HDR	10	India
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Jeff Reuter	Field Tech III	HDR	10	Lima

PHOTOGRAPHIC LOG

Photo No.	**Date:**
1	10/31/13

Description: Survey traverse point found and recorded by Team Lima in Tech Approach Area 2



PHOTOGRAPHIC LOG

Photo No.	**Date:**
2	10/31/13

Description: Site Characterization photo by Team November in Tech Approach Area 3



PHOTOGRAPHIC LOG

Photo No.	**Date:**
3	10/31/13

Description: Non-munitions related metallic debris; a pile of old steel cans located by Team India in Tech Approach Area 3



Date: 10/31/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 011
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection: Observed Assisted Visual Search Team India
Team consisted of two UXO qualified personnel
Team used Trimble GeoXH to navigate, record path, and record items of interest
Team used a Schonstedt to locate anomalies
Team followed proper procedures while investigating anomalies

Additional QC/QA Comments: Observed Schonstedt operators sweep the test strip to determine proper functioning
No MPPEH located today

DGM Daily Quality	DGM Activities Today (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	Yes	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	Yes	N/A	N/A	N/A	N/A	N/A
Personnel Test	Yes	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	Yes	N/A	N/A	N/A	N/A	N/A
Static/Spike	Yes	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	Yes	N/A	N/A	N/A	N/A	N/A
IVS	Yes	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: QC seed placement. Responding to request for comments for IVS memo. Litter survey in 35-foot spaced transects.

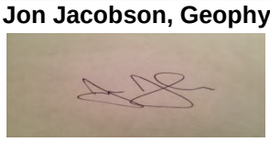
Comments for Visual Survey Activities: All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, and data was looked for overall accuracy. All teams measured the Schreiner control point at the start of the day to ensure positional accuracy and duplicate results. All start of day features were observed by Jeff Rueter and pass all QC requirements.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



10/31/2013

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Bryon Cook, UXOQCS



10/31/2013

Project Name: Port Angeles Combat Range		Report No: 011
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 10/31/2013

I. Site Safety Brief Topics:

Driving, Personal Protective Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC), hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid

II. Safety Inspections:

Observed Team India's anomaly investigation procedures; no deficiencies noticed

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

No additional comments

VII. Visitors

None

VIII. Approval

	Date: 10/31/2013
	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 10/31/2013

SSHO: Byron Cook

Name	Position	Employer	Signature
M. Reece	UXO III	HDR	
Jeff Rueter	Field Geo	HDR	
Kim Hawkins	~~Field~~ UXO II	HDR	
C Dunmire	TECH II	HDR	
D. Gordon	TECH III	HDR	
R Nelson	UXO II	HDR	
Jon Jacobson	Geo	HDR	
Rick St. Amand	UXO3	HDR	
Visitors			

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Hawkins	☒	☐
Garmin	3679		☒	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685		☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104		☒	☐
Schostedt	1636		☐	☐
Schostedt	3658		☐	☐
Schostedt	3105		☒	☐
Schostedt	3885		☒	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☒	☐
Trimble	3975		☐	☐
Trimble	3693		☒	☐
Trimble	3974		☒	☐
Trimble	3661		☐	☐
Camera	3088		☐	☐
Camera	3083		☐	☐
Camera	~~3084~~ 3964		☒	☐
Camera	3963		☒	☐
	1004		☒	

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 012 **Day/Date:** 11/1/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): Three teams conducted assisted visual surveys today. Team Lima conducted visual surveys in Technical Approach Area 2 within the 75 foot transects and were followed by the DGM Team. Team India and November conducted visual surveys in Technical Approach Area 3. Team November spent the day in the far southeast corner and Team India continued transects in the 75 foot transect area (likely impact area). Team November found three surface anomalies. All were non munitions related debris on the surface. Team India found four subsurface surface anomalies that were all non munitions related debris. QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

Munitions and Other Items Found Today: (Include location of the items found):None

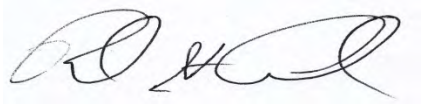
Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today):

Team November inadvertently accessed the southern portion of the MRS through the State of Washington Department of Natural Resources parcel for which we do not have an approved Right-Of-Entry (ROE). Access to the southern portion of the MRS will not occur through parcels that we do not have an ROE for.

Other comments or additional information: Weather was cloudy in the morning then sunny and becoming overcast with a high in the low 50's.

Schedule: Production is currently on pace to meet the goal of demobilization prior to 11-28-2013 (Thanksgiving). Contingency plan is in place for additional personnel if required.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/1/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	9	
Byron Cook	UXOQC/SO	HDR	9	
Jon Jacobson	Field Geophysycist	HDR	9	DGM
Matt Reece	UXO Tech III	HDR	9	Lima
Rob Nelson	UXO Tech II	HDR	9	DGM
Neil Roulier	UXO Tech III	HDR	9	India
Kim Hawkins	UXO Tech II	HDR	9	India
D.A. Gordon	UXO Tech III	HDR	9	November
Chuck Dunmire	UXO Tech II	HDR	9	November
Jeff Reuter	Field Tech III	HDR	9	Lima

PHOTOGRAPHIC LOG

Photo No.	Date:
1	11/01/13

Description: An unsurveyable point documented by Team India in Technical Approach Area 3



PHOTOGRAPHIC LOG

Photo No.	Date:
2	11/01/13

Description: General site photo taken by Team Lima in Technical Approach Area 2



PHOTOGRAPHIC LOG

Photo No.	**Date:**
3	11/01/13

Description: An unsurveyable point documented by Team November in Technical Approach Area 3



Date: 11/1/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 012
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments: Observed Schonstedt operators sweep the test strip to determine proper functioning
Checked daily inventory sheet to verify equipment going into the field was signed for; updated inventory to reflect a broken Schonstedt and new cameras
Observed vehicle safety inspection, field equipment inventory, safety equipment inspection/inventory
Inspected magazines with SUXOS; no evidence of tampering, magazines are secure
Conducted key inventory; assigned keys are in the possession of the proper personnel
No MPPEH located today

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	Yes	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	Yes	N/A	N/A	N/A	N/A	N/A
Personnel Test	Yes	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	Yes	N/A	N/A	N/A	N/A	N/A
Static/Spike	Yes	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	Yes	N/A	N/A	N/A	N/A	N/A
IVS	Yes	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: QC seed placement. Litter survey in 75-foot spaced transects.

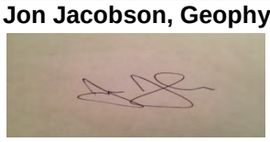
Comments for Visual Survey Activities: All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, and data was looked for overall accuracy and quality. All teams measured the Schreiner control point at the start of the day to ensure positional accuracy and duplicate results. All start of day features were observed by Jeff Rueter and pass all QC requirements.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



11/1/2013

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Bryon Cook, UXOQCS



11/1/2013

Project Name: Port Angeles Combat Range		Report No: 012
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/1/2013

I. Site Safety Brief Topics:

Driving, Personal Protective Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC), hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid

II. Safety Inspections:

Observed vehicle inspections; ensured fire extinguishers were inspected and initialed, first aid kits inspected for seal

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

UXOSO/QCS and SUXOS inspected magazine area; chain/locks limiting access are still intact, no signs magazines have been tampered with. Key inventory was conducted; all issued keys were in proper possession.

VII. Visitors

None

VIII. Approval

	Date: 11/1/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 11/1/2013

SSHO: Byron Cook

Name	Position	Employer	Signature
M. Reece	UXO III	HDR	
D. Gordon	UXO III	HDR	
Jon Jacobson	Geo	HDR	
[illegible] Jeff Rueter	UXO II Geo	HDR	
C DUNMIRE	UXO II	HDR	
B Nelson	UXO II	HDR	
R St-Amand	SUXOS	HDR	
Roulion	UXO III	HDR	
Visitors			

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date: 11/1/2013
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☒	☐
Trimble	3975		☐	☐
Trimble	3693		☒	☐
Trimble	3974		☒	☐
Trimble	3661		☐	☐
Camera	~~3088~~ ~~3090~~ 20130901004		☒	☐
Camera	3083		☐	☐
Camera	~~3084~~ 3964		☒	☐
Camera	3963		☒	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date: 11/1/2013
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Gordon	☑	☐
Garmin	3679	MW	☑	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	R. Gordon	☑	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date: 11/1/2013
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104		☒	☐
Schostedt	1636		☐	☐
Schostedt	3658		☐	☐
Schostedt	3105		☒	☐
Schostedt	3885		☒	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

Vehicle Inspection Checklist and Report Form

HDR ONE COMPANY | Many Solutions

Site Name/Location: PACR

Site Supervisor: St Amand

Vehicle: 2012 Dodge Ram 2500
(Make and License Plate Number) ZCM-9703-PENN

Date Inspected: 11/1/13

Mileage: 15112

Owner: Lease-Express Car & Truck Rental
(Rental, [redacted] Contract)

Item Description	Monday Pass			Tuesday Pass			Wednesday Pass			Thursday Pass			Friday Pass		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Registration and License Plate	X			X			X			X			X		
Insurance															
Emergency Route Map/Phone #s															
2 Tires:															
Pressure															
Condition															
3 Equipment:															
Fire Extinguishers															
First Aid/CPR/Burn Kits															
Blood Borne Pathogen Kit															
Eyewash Kits															
Spare Tire															
Tire Changing Equipment															
Tie Downs*															
Chocks*															
Placards*															
Other:															
Other:															
4. Brakes															
Hand/Emergency	X			X			X			X			X		
Service															
5. Belts															
Proper Tension															
Condition															
6. General:															
Windshield															
Windshield Wipers															
Windows (Condition/Operation)															
Seat Belts															
Steering															
Horn															
Gas Cap															
Mirrors															
Door/Window Handles/Latches															
Cleanliness															
Exhaust System															
7. Lights:															
Headlights (High/Low)															
Brake Lights															
Parking															
Back-up															
Turn Signals															
Emergency Flashers															
Interior Lights															

Contract No.: W9128F-10-D-0058
Delivery Order 0006

Vehicle Inspection Checklist and Report Form

HDR ONE COMPANY | Many Solutions

Site Name/Location: PACR

Site Supervisor: _____

Vehicle: Project Rental #2 / Project # 206945
(Make and License Plate Number)

Date Inspected: _____ Mileage: _____ Owner: _____
(Rental, SKY, Contract)

Item Description	Monday Pass			Tuesday Pass			Wednesday Pass			Thursday Pass			Friday Pass		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Registration and License Plate	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Insurance	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Emergency Route Map/Phone #s	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
2 Tires:															
Pressure	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Condition	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
3 Equipment:															
Fire Extinguishers	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
First Aid/CPR/Burn Kits	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Blood Borne Pathogen Kit	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑
Eyewash Kits	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Spare Tire	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Tire Changing Equipment	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Tie Downs*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Chocks*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Placards*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4. Brakes															
Hand/Emergency	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Service	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
5. Belts															
Proper Tension	☑	☐	☐	☑	☐	☑*	☑	☐	☐	☑	☐	☐	☑	☐	☐
Condition	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
6. General:															
Windshield	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Windshield Wipers	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Windows (Condition/Operation)	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Seat Belts	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Steering	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Horn	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Gas Cap	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Mirrors	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Door/Window Handles/Latches	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Cleanliness	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Exhaust System	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
7. Lights:															
Headlights (High/Low)	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Brake Lights	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Parking	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Back-up	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Turn Signals	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Emergency Flashers	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Interior Lights	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐

Vehicle Inspection Checklist and Report Form

HDR ONE COMPANY | Many Solutions

Site Name/Location: PAGR

Site Supervisor: SIAMAND

Vehicle: Project Rental - #1 / Project # 206945
(Make and License Plate Number)

Date Inspected: 2NOV13

Mileage: ____

Owner: ____
(Rental, SKY Contract)

Item Description	Monday			Tuesday			Wednesday			Thursday			Friday		
	Pass			Pass			Pass			Pass			Pass		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Registration and License Plate	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Insurance	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Emergency Route Map/Phone #s	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
2 Tires:															
Pressure	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Condition	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
3 Equipment:															
Fire Extinguishers	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
First Aid/CPR/Burn Kits	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Blood Borne Pathogen Kit	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Eyewash Kits	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Spare Tire	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Tire Changing Equipment	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Tie Downs*	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Chocks*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Placards*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4. Brakes															
Hand/Emergency	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Service	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
5. Belts															
Proper Tension	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Condition	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
6. General:															
Windshield	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Windshield Wipers	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Windows (Condition/Operation)	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Seat Belts	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Steering	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Horn	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Gas Cap	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Mirrors	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Door/Window Handles/Latches	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Cleanliness	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Exhaust System	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
7. Lights:															
Headlights (High/Low)	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Brake Lights	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Parking	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Back-up	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Turn Signals	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Emergency Flashers	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Interior Lights	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐

Contract W912PL-08-D-0028F-10-D-0058
Delivery Order 0006

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 013 **Day/Date:** 11/4/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): Two teams conducted assisted visual surveys today. Team Lima conducted visual surveys in Tech Approach Area 2 on 35 and 75 foot transects and was followed by the DGM Team. Teams India and November conducted visual surveys in Tech Approach Area 3. Team November spent the day in the far west on 150-foot spaced transects and Team India continued transects in the 75 foot transect area. Team November found three anomalies. All were non munitions related debris on the surface. Team India found seven surface anomalies that were all non munitions related debris.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

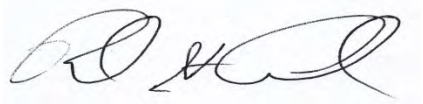
Munitions and Other Items Found Today: (Include location of the items found):None

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today):

Other comments or additional information: Weather was cool with frost in the morning then sunny and becoming overcast with a high in the upper 40's.

Schedule: Production is currently on pace to meet the goal of demobilization prior to 11-28-2013 (Thanksgiving). Contingency plan is in place for additional personnel if required.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/4/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
Jon Jacobson	Field Geophysicist	HDR	10	DGM
Matt Reece	UXO Tech III	HDR	10	Lima
Rob Nelson	UXO Tech II	HDR	10	DGM
Neil Roulier	UXO Tech III	HDR	10	India
Kim Hawkins	UXO Tech II	HDR	10	India
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Jeff Reuter	Field Tech III	HDR	10	Lima

PHOTOGRAPHIC LOG

Photo No.	**Date:**
1	11/04/13

Description: Lima documented an old road/trail in Tech Approach Area 2.



PHOTOGRAPHIC LOG

Photo No.	**Date:**
2	11/04/13

Description: General site photo in Tech Approach Area 3 by Team November.



PHOTOGRAPHIC LOG

Photo No.	**Date:**
3	11/04/13

Description: An unsurveyable transect in Tech Approach Area 3 by Team India.



Date: 11/4/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 013
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection: Observed Visual Survey and DGM
Teams followed pre-planned transects loaded into Trimble GeoXH
Teams annotated unsurveyable areas

Additional QC/QA Comments: Observed Schonstedt operators sweep the test strip to determine proper functioning
Checked daily inventory sheet to verify equipment going into the field was signed for
OESS arrived on-site; was shown magazines, overview of site, walked Area 2 w/ Team Lima and DGM
No MPPEH located today

DGM Daily Quality	DGM Activities Today (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	Yes	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	Yes	N/A	N/A	N/A	N/A	N/A
Personnel Test	Yes	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	Yes	N/A	N/A	N/A	N/A	N/A
Static/Spike	Yes	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	Yes	N/A	N/A	N/A	N/A	N/A
IVS	Yes	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: QC seed placement. DGM EM61 litter transects in 35-foot spaced and 75-foot spaced transects. Recon of steep and difficult terrain.

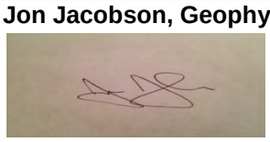
Comments for Visual Survey Activities: All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, and data was looked for overall accuracy and quality. All teams measured the Schreiner control point at the start of the day to ensure positional accuracy and duplicate results. All start of day features were observed by Jeff Rueter and pass all QC requirements.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



11/4/2013

1T

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Bryon Cook, UXOQCS



11/4/2013

Project Name: Port Angeles Combat Range		Report No: 013
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/4/2013

I. Site Safety Brief Topics:

Driving, Personal Protective Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC), hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid

II. Safety Inspections:

Observed Teams Lima and DGM; teams wore proper PPE for tasks being performed

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

OESS on-site; was shown/ inspected magazines, observed Visual Survey and DGM operations in Area 2

VII. Visitors

None

VIII. Approval

	Date: 11/4/2013
	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes
Comments: Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather		

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 4 Nov 13

SSHO: Byron Cook

Name	Position	Employer	Signature
St. Amand	SUXOS	HDR	
B Nelson	UXO II	HDR	
Jon Jacobson	Geo	HDR	
M. Kane	UXO III	HDR	
Jeff Rueter	Geo	HDR	
Rawson	UXO III	HDR	
CDUNMIRE	UXO II	HDR	
D. Gordon	UXO III	HDR	
R Thomas	UXO II	HDR	
WEBB Kellar		USACE	
Visitors			

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Daily Equipment Log
Revision 1.0

Project Name:	PACR RI
Date:	
Contract/Delivery Order:	W9128F-10-D-0058
Project Manager	Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Gordon	☒	☐
Garmin	3679	[illegible]	☒	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Rouillon	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660	Rowlon	☒	☐
Trimble	3975		☐	☐
Trimble	3693	Jeff R	☒	☐
Trimble	3974	Cleb	☒	☐
Trimble	3661		☐	☐
Camera	3090		☐	☐
Camera	3964	Cleb	☒	☐
Camera	10021	Rowlon	☒	☐
Camera	3963	Jeff R	X	

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schonstedt	3104		☒	☐
Schonstedt	1636		☐	☒
Schonstedt	3658		☐	☐
Schonstedt	3105		☒	☐
Schonstedt	3885		☒	☐
Schonstedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Schonstedt	1636	On/Off switch broken

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☒

Adequate equipment on-site

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 014 **Day/Date:** 11/5/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): Two teams conducted assisted visual surveys today. Team Lima conducted visual surveys in Tech Approach Area 2 on 75 foot transect and were followed by the DGM Team. Teams India and November conducted visual surveys in Tech Approach Area 3. Team November spent the day in the far west and Team India continued transects in the 75 foot transect area. Team November found three surface anomalies. All were non munitions related debris on the surface. Team India found seven surface anomalies and three subsurface anomalies that were all non munitions related debris.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

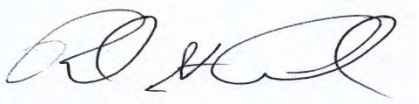
Munitions and Other Items Found Today: (Include location of the items found):None

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): The AVS teams continue to look for access to the south central range area. As yet satisfactory access has not been located. Unsurveyable areas identified by LIDAR tend to be steep and dangerous to cross.

Other comments or additional information: Weather was cloudy with fog in the morning then sunny and becoming overcast with a high in the low 50's.

Schedule: Production is currently on pace to meet the goal of demobilization prior to 11-28-2013 (Thanksgiving). Contingency plan is in place for additional personnel if required.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/5/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
Jon Jacobson	Field Geophysycist	HDR	10	DGM
Matt Reece	UXO Tech III	HDR	10	Lima
Rob Nelson	UXO Tech II	HDR	10	DGM
Neil Roulier	UXO Tech III	HDR	10	India
Kim Hawkins	UXO Tech II	HDR	10	India
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Jeff Reuter	Field Tech III	HDR	10	Lima

PHOTOGRAPHIC LOG

Photo No.	Date:
1	11/05/13

Description: Team Lima in an unsurveyable area showing the dense vegetation in Tech Approach Area 2.



PHOTOGRAPHIC LOG

Photo No.	Date:
2	11/05/13

Description: Team November is showing an unsurveyable area in Tech Approach Area 3.



PHOTOGRAPHIC LOG

Photo No.	Date:
3	11/05/13

Description: Team India showing a marsh/wetland/bog in Tech Approach Area 3.



PHOTOGRAPHIC LOG

Photo No.	Date:
4	11/05/13

Description: DGM Team pushing through undergrowth in Tech Approach Area 2.



Date: 11/5/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 014
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments: Installed a second analog test strip near the western entrance to the MRS; test strip was approved by OESS and USACE PM. The test strip is comprised of two inert 37mm buried horizontally at .5ft and 1ft. This allows a team to start its day by testing its Schonstedt prior to transects, rather than starting at the IVS and then being transported to the west side. Observed Team November test its Schonstedt and perform start of day with its Trimble.
OESS performed QA checklist; results will be forwarded later
No MPPEH located today

DGM Daily Quality	DGM Activities Today (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	Yes	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	Yes	N/A	N/A	N/A	N/A	N/A
Personnel Test	Yes	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	Yes	N/A	N/A	N/A	N/A	N/A
Static/Spike	Yes	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	Yes	N/A	N/A	N/A	N/A	N/A
IVS	Yes	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: Seed placement. EM61 litter data collection in 75-foot spaced transects.

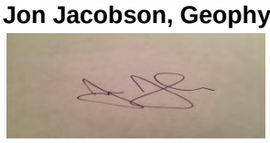
Comments for Visual Survey Activities: All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, and data was looked for overall accuracy and quality. Two teams measured the Schreiner control point at the start of the day to ensure positional accuracy and duplicate results. All start of day features were observed by Jeff Rueter and pass all QC requirements.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



11/5/2013

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Bryon Cook, UXOQCS



11/5/2013

Project Name:	Port Angeles Combat Range		Report No: 014
Project No:	W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/5/2013

I. Site Safety Brief Topics:

Driving, Personal Protective Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC), hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid.

II. Safety Inspections:

OESS performed QA checklist; work site vehicles were inspected for safety equipment. All necessary fire extinguishers are present and inspection tags current, first aid kits are present and sealed, emergency evacuation maps and contact numbers are present in all vehicles.

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

OESS recommends providing personal eye wash for teams operating remotely from vehicles

VII. Visitors

None

VIII. Approval

	Date: 11/5/2013
	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

High ~48° 30% rain after 1300

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 11/5/2013

SSHO: Byron Cook

Name	Position	Employer	Signature
Kim Hawkins	UXO II	HDR	
M. Reece	UXO II	HDR	
C. DUNMIRE	UXO II	HDR	
D. Gordon	UXO III	HDR	
Jeff Rueter	Geo	HDR	
Jon Jacobson	Geo	HDR	
Robert Nelson	UXO II	HDR	
Rick St. Amand	GUXOS	HDR	
[illegible]		USACE	
[illegible]	[illegible]	HDR	
Visitors			

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☑	☐
Trimble	3975		☐	☐
Trimble	3693		☒	☐
Trimble	3974		☒	☐
Trimble	3661		☐	☐
Camera	3090		☐	☐
Camera	3964		☒	☐
Camera	3963		☒	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678		☑	☐
Garmin	3679		☑	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685		☑	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schonstedt	3104		☒	☐
Schonstedt	1636		☐	☒
Schonstedt	3658		☐	☐
Schonstedt	3105		☒	☐
Schonstedt	3885		☒	☐
Schonstedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Schonstedt	1636	On/Off switch broken
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☒
Adequate equipment on-site		

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 015 **Day/Date:** 11/6/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): Two teams conducted assisted visual surveys today. Team Lima conducted visual surveys in Tech Approach Area 2 on the remaining 35 foot transects at the southern edge of the open field and were followed by the DGM Team. Teams India and November conducted visual surveys in Tech Approach Area 3. Team November spent the day in the south west and Team India continued transects in the 75 foot transect area. Team November found two surface anomalies. All were non munitions related debris on the surface. Team India found 14 surface anomalies and two subsurface anomalies that were all non munitions related debris.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

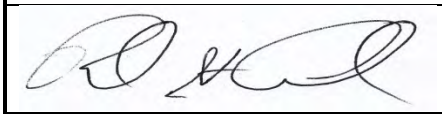
Munitions and Other Items Found Today: (Include location of the items found):None

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today):

Other comments or additional information: Weather was mostly cloudy becoming overcast with light rain and a high in the high 40's.

Schedule: Production is currently on pace to meet the goal of demobilization prior to 11-28-2013 (Thanksgiving). Contingency plan is in place for additional personnel if required.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/6/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
Jon Jacobson	Field Geophysycist	HDR	10	DGM
Matt Reece	UXO Tech III	HDR	10	Lima
Rob Nelson	UXO Tech II	HDR	10	DGM
Neil Roulier	UXO Tech III	HDR	10	India
Kim Hawkins	UXO Tech II	HDR	10	India
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Jeff Reuter	Field Tech III	HDR	10	Lima

PHOTOGRAPHIC LOG

Photo No.	Date:
1	11/0613

Description: General site photo of the area Team Lima is currently working in Tech Approach Area 2



PHOTOGRAPHIC LOG

Photo No.	Date:
2	11/06/13

Description: Team November recording an unsurveyable area due to dense vegetation in Tech Approach Area 3.



PHOTOGRAPHIC LOG

Photo No.	Date:
3	11/06/13

Description: Team India showing non-munitions related debris, a metal cable, found in Tech Approach Area 3.



PHOTOGRAPHIC LOG

Photo No.	Date:	

Date: 11/6/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 015
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments:
Observed Teams Lima and India test their Schonstedts prior to commencing Assisted Visual Surveys
Redacted Social Security Numbers noticed on some certifications during QA inspection
Participated in weekly status call, commented on draft minutes
OESS to comment on QA checklist that Notice to Proceed 'slipped through the cracks' due to government shutdown
No MPPEH located today

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	Yes	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	Yes	N/A	N/A	N/A	N/A	N/A
Personnel Test	Yes	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	Yes	N/A	N/A	N/A	N/A	N/A
Static/Spike	Yes	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	Yes	N/A	N/A	N/A	N/A	N/A
IVS	Yes	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: Trouble-shooting faulty litter component – EM61 coil was replaced with backup coil. Seed placement. EM61 litter data collection in 35-foot spaced transects. Weekly status call. Coordinating with Omaha geophysicist. Assessment of difficult terrain.

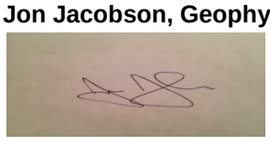
Comments for Visual Survey Activities: All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, and data was looked for overall accuracy and quality. Teams Lima and India measured the Schreiner control point at the start of the day to ensure positional accuracy and duplicate results. Teams Lima and November did start of day features at the same location to ensure positional accuracy and duplicate results. All start of day features were observed by Jeff Rueter and pass all QC requirements.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



11/6/2013

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Bryon Cook, UXOQCS



11/6/2013

Project Name: Port Angeles Combat Range		Report No: 015
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/6/2013

I. Site Safety Brief Topics:

Driving, Personal Protective Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC), hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid

II. Safety Inspections:

Provided eye wash to the teams; checked teams for first aid and hygiene supplies

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

No additional comments

VII. Visitors

None

VIII. Approval

	Date: 11/6/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

High ~47° Chance of rain after 1/1 increasing to 50-60% after 6 PM

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 6 Nov 13

SSHO: Byron Cook

Name	Position	Employer	Signature
Robert Nelson	UXO III	HDR	
C DUNMIRE	UXO II	HDR	
D. GORDON	UXO III	HDR	D. Gordon
M. Rice	UXO III	HDR	
M Bowman	UXO III	HDR	
Kim Hawkins	UXO II	HDR	
Jeff Ruter	Geo	HDR	
Jon Jacobson	Geo	HDR	
Rick St. Amant	SUXOS	HDR	

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date: 6 Nov 13
Contract/Delivery Order: W9128F-10-D-0058
Project Manager Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working Yes	Equipment Working No
Garmin	3678	D. Gordon	☒	☐
Garmin	3679	[illegible]	☒	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Rouliver	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date: 6/16/13
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☒	☐
Trimble	3975		☐	☐
Trimble	3693		☒	☐
Trimble	3974		☒	☐
Trimble	3661		☐	☐
Camera	3090		☐	☐
Camera	3964		☒	☐
Camera	1004		☒	☐
	3963		X	

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date: 6 Nov 13
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schonstedt	3104		☒	☐
Schonstedt	1636		☐	☒
Schonstedt	3658		☐	☐
Schonstedt	3105		☒	☐
Schonstedt	3885		☒	☐
Schonstedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Schonstedt	1636	On/Off switch broken

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☒

Adequate equipment on-site

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 016 **Day/Date:** 11/7/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): Three teams conducted assisted visual surveys today. Team Lima conducted visual surveys in Tech Approach Area 1. The team found one subsurface anomaly. Teams India and November conducted visual surveys in Tech Approach Area 3. Team November spent the day in the south west and Team India continued transects in the 75 foot transect area. Team November found two surface anomalies. Team India found three surface anomalies. The SUXOS and UXOQC/SO conducted a QC in the 75 foot transect area that Team India had previously surveyed. Nine anomalies were found, seven were subsurface. All anomalies found were non munitions related debris.
QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

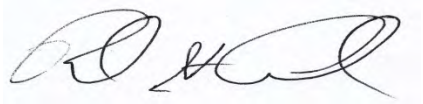
Munitions and Other Items Found Today: (Include location of the items found):None

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today):

Other comments or additional information: Weather was mostly cloudy becoming overcast with light rain and a high in the high 40's.

Schedule: Production is currently on pace to meet the goal of demobilization prior to 11-28-2013 (Thanksgiving). Contingency plan is in place for additional personnel if required.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/7/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
Jon Jacobson	Field Geophysycist	HDR	10	
Matt Reece	UXO Tech III	HDR	10	Lima
Rob Nelson	UXO Tech II	HDR	10	Lima
Neil Roulier	UXO Tech III	HDR	10	India
Kim Hawkins	UXO Tech II	HDR	10	India
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Jeff Reuter	Field Tech III	HDR	10	Lima

PHOTOGRAPHIC LOG

Photo No.	Date:
1	11/07/13

Description: Team Lima logged an unsurveyable point due to the dense vegetation in a logged area in Tech Approach Area 1.



PHOTOGRAPHIC LOG

Photo No.	Date:
2	11/07/13

Description: Team November logged an unsurveyable point, showing dense vegetation in Tech Approach Area 3.



PHOTOGRAPHIC LOG

Photo No.	**Date:**
3	11/07/13

Description: Team India's general site photo of a river in Tech Approach Area 3.



PHOTOGRAPHIC LOG

Photo No.	**Date:**

Date: 11/7/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 016
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments:
Observed Teams Lima and India test their Schonstedts prior to commencing Assisted Visual Surveys (AVS)

UXOSO/QCS and SUXOS QC'ed the eastern and northern portions of the 75-foot spaced transects in Tech Approach Area 3. UXOSO/QCS and SUXOS walked along selected transect lines, between transects, and across (roughly perpendicular to) the transect lines; tracks were recorded on Trimble GeoXH HDR asset no. 3975 and Garmin eTrex HDR asset no. 3680. This method was selected to QC not only the diligence of the AVS teams, but also to QC the methodology selected for sampling the area due to the lack of munitions/munitions related debris being found. Seven subsurface anomalies were investigated, as well as two surface anomalies. All were non-munitions related debris.

Forwarded letter from electrician re: grounding magazines IAW NFPA 780 and e-mail chain describing work plan approval to OESS to fill QA checklist deficiencies

No MPPEH located today

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	N/A	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	N/A	N/A	N/A	N/A	N/A	N/A
Personnel Test	N/A	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	N/A	N/A	N/A	N/A	N/A	N/A
Static/Spike	N/A	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	N/A	N/A	N/A	N/A	N/A	N/A
IVS	N/A	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: No DGM survey activities today. Data completeness for open areas reviewed. Target picks QC'd and submitted for density analysis.

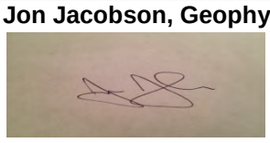
Comments for Visual Survey Activities: All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, and data was looked for overall accuracy and quality. Teams Lima, India, and Oscar measured the Schreiner control point at the start of the day to ensure positional accuracy and duplicate results. Teams Lima and November did start of day features at the same location to ensure positional accuracy and duplicate results. All start of day features were observed by Jeff Rueter and pass all QC requirements.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



11/7/2013

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Bryon Cook, UXOQCS



11/7/2013

Project Name: Port Angeles Combat Range		Report No: 016
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/7/2013

I. Site Safety Brief Topics:

Driving, Personal Protective Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC), hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid

II. Safety Inspections:

Observed teams for wear of proper PPE for tasks performed

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

No additional comments

VII. Visitors

None

VIII. Approval

	Date: 11/7/2013
	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: Nov 7, 2013

SSHO: Byron Cook

Name	Position	Employer	Signature
M. Kaeu	TECH III	HDR	
D. Gordon	TECH III	HDR	
C DUNMIRE	UXO II	HDR	
Robert Nelson	UXO II	HDR	
W Rourke	UXO TECH II	HDR	
St [illegible]	UXO S	HDR	
P Hawkins	UXO II	HDR	
[illegible]	GEO	HDR	
Jon Jacobson	Geo	HDR	

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date: 7 Nov
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660	Rourke	☒	☐
Trimble	3975	Byron D. Cook	☒	☐
Trimble	3693	Jeff R	☒	☐
Trimble	3974	[signature]	☒	☐
Trimble	3661		☐	☐
Camera	~~3090~~ 3965	Byron D. Cook	☒	☐
Camera	3964	[signature]	☒	☐
Camera	1004	Rourke	☒	☐
	3963	Jeff R	X	

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date: 7 Nov
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schonstedt	3104		☒	☐
Schonstedt	1636		☐	☒
Schonstedt	3658		☒	☐
Schonstedt	3105		☒	☐
Schonstedt	3885		☒	☐
Schonstedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Schonstedt	1636	On/Off switch broken

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☒

Adequate equipment on-site

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Daily Equipment Log
Revision 1.0

Project Name:	PACR RI
Date:	7 Nov
Contract/Delivery Order:	W9128F-10-D-0058
Project Manager	Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. [illegible]	☒	☐
Garmin	3679	M [illegible]	☒	☐
Garmin	3680	[illegible]	☒	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Rouleau	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 017 **Day/Date:** 11/8/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 8

Activities Conducted: (Include location of work performed including equipment used): Teams India and November conducted visual surveys in Tech Approach Area 3. Team November spent the day in the south west and Team India continued transects in the 75 foot transect area. Team November found two surface anomalies and four subsurface anomalies. Team India found one surface and one subsurface anomaly. All anomalies found were non munitions related debris. Team Lima conducted DGM assessment. Team Lima scouted areas and transects that could be surveyed by the DGM crew with the litter on the western side of Tech Approach Area 2.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

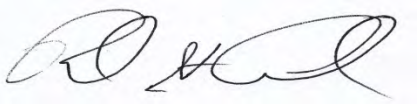
Munitions and Other Items Found Today: (Include location of the items found):None

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today):

Other comments or additional information: Weather was mostly cloudy becoming overcast with light rain and a high in the high 40's.

Schedule: Production is currently on pace to meet the goal of demobilization prior to 11-28-2013 (Thanksgiving). Contingency plan is in place for additional personnel if required.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/8/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	8	
Byron Cook	UXOQC/SO	HDR	8	
Jon Jacobson	Field Geophysycist	HDR	8	DGM
Matt Reece	UXO Tech III	HDR	8	Lima
Rob Nelson	UXO Tech II	HDR	8	DGM
Neil Roulier	UXO Tech III	HDR	8	India
Kim Hawkins	UXO Tech II	HDR	8	India
D.A. Gordon	UXO Tech III	HDR	8	November
Chuck Dunmire	UXO Tech II	HDR	8	November
Jeff Reuter	Field Tech III	HDR	8	Lima

PHOTOGRAPHIC LOG

Photo No.	Date:
1	11/08/13

Description: A general site photo by Team Lima showing the dense vegetation in Tech Approach Area 2.



PHOTOGRAPHIC LOG

Photo No.	Date:
2	11/08/13

Description: A photo by Team November after subsurface anomaly investigation in Tech Approach Area 3.



PHOTOGRAPHIC LOG

Photo No.	**Date:**
3	11/08/13

Description: An unsurveyable area recorded by Team India due to dense vegetation and a wetland in Tech Approach Area 3.



PHOTOGRAPHIC LOG

Photo No.	**Date:**

Date: 11/8/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 017
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection: Assisted Visual Surveys- Observed Team November
Schonstedt function was checked prior to entering work area
Trimble GeoXH start of day procedure completed at duplicable point
Team walked pre-planned transect routes within tolerance, adjusting due to terrain and/or vegetation
Vegetation is thick in much of the survey area, reducing and sometimes obstructing the 'visual' aspect of the survey. Reliance on the Schonstedt was necessary in these areas. The team did a good job expanding its survey in the more open/accessible areas along its transects. Areas where vegetation was too thick to pass through or terrain too steep to safely navigate were marked as unsurveyable if the team had to travel outside of tolerance to go around or could not find a way around. None of the anomalies investigated resulted in MEC/MD.

Additional QC/QA Comments: OESS walked in Tech Approach Area 3 with Team November during the morning; no issues with approach or team's execution
No MPPEH located today

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	N/A	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	N/A	N/A	N/A	N/A	N/A	N/A
Personnel Test	N/A	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	N/A	N/A	N/A	N/A	N/A	N/A
Static/Spike	N/A	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	N/A	N/A	N/A	N/A	N/A	N/A
IVS	N/A	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: Remaining DGM areas in Tech Area 2 were investigated to determine access and surveyability. Obstacles and conditions were documented.

Comments for Visual Survey Activities: All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, and data was looked for overall accuracy and quality. Teams Lima and India measured the Schreiner control point at the start of the day to ensure positional accuracy and duplicate results. Teams Lima and November did start of day features at the same location to ensure positional accuracy and duplicate results. All start of day features were observed by Jeff Rueter and pass all QC requirements.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II

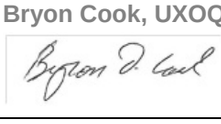


11/8/2013

1T

1T

Bryon Cook, UXOQCS



11/8/2013

Project Name: Port Angeles Combat Range		Report No: 017
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/8/2013

I. Site Safety Brief Topics:

Driving, Personal Protective Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC), hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid

II. Safety Inspections:

Observed Team November's anomaly investigation procedures; no deficiencies noted

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

No additional comments

VII. Visitors

None

VIII. Approval

	Date: 11/8/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 3 Nov 13

SSHO: Byron Cook

Name	Position	Employer	Signature
Kim Hawkins	UXO Tech II	HDR	
Jon Jacobson	Geo	HDR	
M. Reese	UXO III	HDR	
D. Gordon	UXO III	HDR	
R. Loucier	UXO III	HDR	
Jeff Rueter	Geo	HDR	
C DUNMIRE	UXO II	HDR	
Robert Nelson	UXO II	HDR	
Rick St. Amand	SUXOS	HDR	
Webster Kellum	OESS	USACE	
Visitors			

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660	Loulier	☐	☐
Trimble	3975		☐	☐
Trimble	3693	Jeff R	☒	☐
Trimble	3974		☒	☐
Trimble	3661		☐	☐
Camera	3090		☒	☐
Camera	3964		☒	☐
Camera	10041	Roulier	☒	☐
	3963	Jeff R	X	

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schonstedt	3104		☒	☐
Schonstedt	1636		☐	☒
Schonstedt	3658		☐	☐
Schonstedt	3105		☒	☐
Schonstedt	3885		☒	☐
Schonstedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Schonstedt	1636	On/Off switch broken

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☒

Adequate equipment on-site

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Hanson	☑	☐
Garmin	3679	[signature]	☒	☐
Garmin	3680	Byron D. Cook	☒	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Rourke	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

Vehicle Inspection Checklist and Report Form

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Site Name/Location: PACR

Site Supervisor: St. Amand

Vehicle: Project Rental - #1 / Project #206945
(Make and License Plate Number)

Date Inspected: 11/8/13

Mileage: 6472

Owner: ____
(Rental, SKY Contract)

Item Description	Monday Pass			Tuesday Pass			Wednesday Pass			Thursday Pass			Friday Pass		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Registration and License Plate	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Insurance	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Emergency Route Map/Phone #s	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
2 Tires:															
Pressure	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Condition	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
3 Equipment:															
Fire Extinguishers	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
First Aid/CPR/Burn Kits	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Blood Borne Pathogen Kit	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Eyewash Kits	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Spare Tire	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Tire Changing Equipment	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Tie Downs*	☐	☐	☑	☐	☐	☑	☑	☐	☑	☐	☐	☑	☐	☐	☑
Chocks*	☐	☐	☑	☐	☐	☑	☑	☐	☑	☐	☐	☑	☐	☐	☑
Placards*	☐	☐	☑	☐	☐	☑	☑	☐	☑	☐	☐	☑	☐	☐	☑
Other:	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐
4. Brakes															
Hand/Emergency	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Service	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
5. Belts															
Proper Tension	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Condition	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
6. General:															
Windshield	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Windshield Wipers	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Windows (Condition/Operation)	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Seat Belts	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Steering	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Horn	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Gas Cap	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Mirrors	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Door/Window Handles/Latches	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Cleanliness	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Exhaust System	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
7. Lights:															
Headlights (High/Low)	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Brake Lights	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Parking	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Back-up	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Turn Signals	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Emergency Flashers	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Interior Lights	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 018 **Day/Date:** 11/11/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): One team conducted visual surveys and the DGM team followed in a small number of transects in Area 2. Two teams conducted assisted visual surveys today. Teams India and November conducted visual surveys in Tech Approach Area 3. Team November spent the day in the south west and Team India continued transects in the 75 foot transect area. Team November found two surface anomalies. Team India found two subsurface anomalies. All anomalies found were non munitions related debris.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

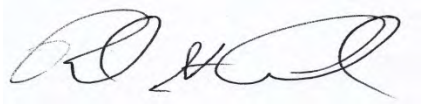
Munitions and Other Items Found Today: (Include location of the items found):None

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today):

Other comments or additional information: Weather was partly cloudy becoming overcast with a high near 50.

Schedule: Production is currently on pace to meet the goal of demobilization prior to 11-28-2013 (Thanksgiving). Contingency plan is in place for additional personnel if required.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/11/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
Jon Jacobson	Field Geophysycist	HDR	10	DGM
Matt Reece	UXO Tech III	HDR	10	Lima
Rob Nelson	UXO Tech II	HDR	10	DGM
Neil Roulier	UXO Tech III	HDR	10	India
Kim Hawkins	UXO Tech II	HDR	10	India
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Jeff Reuter	Field Tech III	HDR	10	Lima

PHOTOGRAPHIC LOG

Photo No.	**Date:**
1	11/11/13

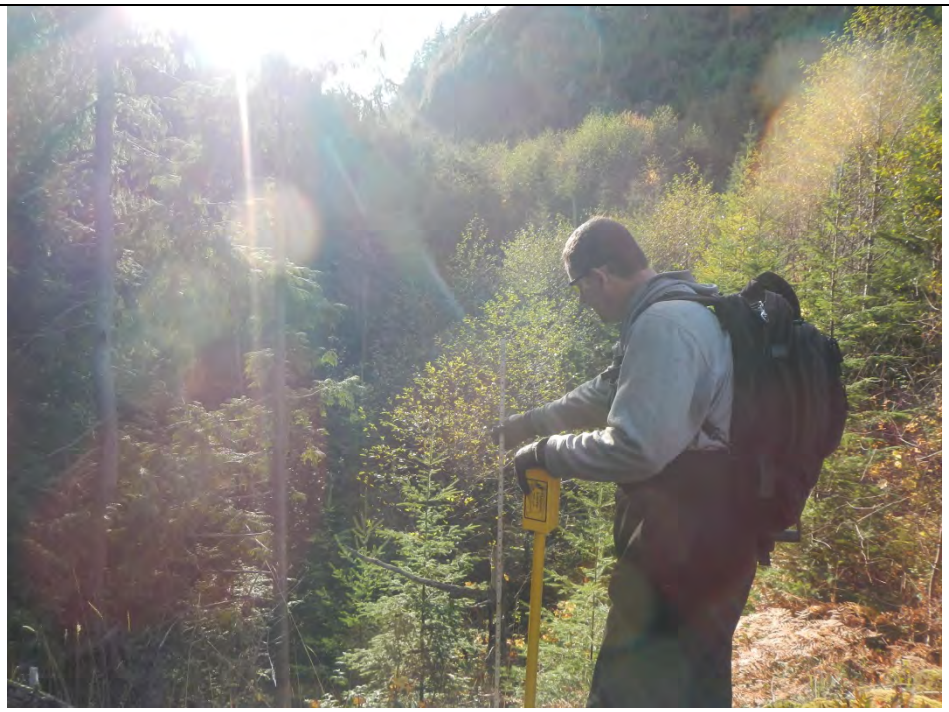
Description: An unsurveyable area recorded by Team Lima due to dense vegetation in Tech Approach Area 2.



PHOTOGRAPHIC LOG

Photo No.	**Date:**
2	11/11/13

Description: Team November showing an unsurveyable area due to dense vegetation and steep terrain in Tech Approach Area 3.



PHOTOGRAPHIC LOG

Photo No.	**Date:**
3	11/11/13

Description: Non-munitions related debris-metal cable found in Tech Approach Area 3 by Team India.



PHOTOGRAPHIC LOG

Photo No.	**Date:**

Date: 11/11/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 018
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection: Non-Intrusive Assisted Visual Survey (AVS) and Digital Geophysical Mapping (DGM) Survey conducted in Tech Approach Area 2

Observed Team Lima test Schonstedt for functionality

Observed Start of Day procedure for Lima's Trimble

Observed EM-61/litter assembly Instrument Validation; calibrations check passed and teams were able to begin surveys

Team Lima performed AVS and led the DGM team on pre-planned 75-foot spaced transects; teams attempted to stay within tolerance of transect lines, adjusting for terrain and vegetation/litter. Areas that took them out of tolerance were recorded as unsurveyable. During observation, Team Lima outpaced the DGM team due to the litter assembly getting caught up in undergrowth or low hanging branches and the team's slower pace from stepping over tree litter or having to avoid areas of dense vegetation. Twice Team Lima had to be stopped or called back to keep the DGM team on transect. Adjustments were advised and corrections made.

In-transect seeding was not incorporated during this time due to lack of positional accuracy. According to DGM DQO, accuracy was within work tolerance, but not cm tolerance required for recording and identifying the seed.

Observed second set of IVS data collected after day's completion of transects.

Additional QC/QA Comments:

Observed Team India test Schonstedt for functionality and Trimble Start of Day procedures

No MPPEH located today

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	Yes	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	Yes	N/A	N/A	N/A	N/A	N/A
Personnel Test	Yes	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	Yes	N/A	N/A	N/A	N/A	N/A
Static/Spike	Yes	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	Yes	N/A	N/A	N/A	N/A	N/A
IVS	Yes	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: DGM collection along 75-foot spaced transects in south portion of Tech approach 2 area

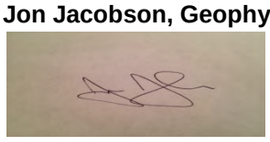
Comments for Visual Survey Activities: All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, and data was looked for overall accuracy and quality. Teams Lima and India measured the Schreiner control point at the start of the day to ensure positional accuracy and duplicate results. Teams Lima and November did start of day features at the same location to ensure positional accuracy and duplicate results. All start of day features were observed by Jeff Rueter and pass all QC requirements.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



11/11/2013

Byron Cook, UXOQCS



11/11/2013

Project Name: Port Angeles Combat Range		Report No: 018
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/11/2013

I. Site Safety Brief Topics:

Driving, Personal Protective Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC), hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid

II. Safety Inspections:

Made observation of teams' Lima and DGM use of PPE during field operations; PPE was present, in use, and serviceable

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

Decision was made to allow the pre-paid service for the satellite phone to expire. No work area encountered has been outside of radio or cell phone coverage.

VII. Visitors

None

VIII. Approval

	Date: 11/11/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 11 Nov 2013

SSHO: Byron Cook

Name	Position	Employer	Signature
Jeff Rulter	Geo	HDR	Jeff R
C DUNMIRE	UXO Tech II	HDR	
Robert Nelson	UXO Tech II	HDR	
Jon Jacobson	Geo	HDR	
Rowena	UXO III	HDR	
Kim Jenkins	UXO II	HDR	
Matt Reed	UXO II	HDR	
D. GORDON	UXO III	HDR	
Rick St AMAND	SUXOS	HDR	

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Gordon	☐	☐
Garmin	3679	M [illegible]	☒	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Rouillier	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schonstedt	3104		☒	☐
Schonstedt	1636		☐	☒
Schonstedt	3658		☐	☐
Schonstedt	3105		☑	☐
Schonstedt	3885		☒	☐
Schonstedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Schonstedt	1636	On/Off switch broken

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☒

Adequate equipment on-site

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660	Rollier	☒	☐
Trimble	3975		☐	☐
Trimble	3693	Jeff	☒	☐
Trimble	3974		☒	☐
Trimble	3661		☐	☐
Camera	3963	Jeff	☒	☐
Camera	3964		☒	☐
Camera	20130901004	Rollier	☒	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 19 **Day/Date:** 11/12/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): One team conducted visual surveys and the DGM team followed in the remaining transects in Area 2 that can be surveyed. Two teams conducted assisted visual surveys today. Teams India and November conducted visual surveys in Tech Approach Area 3. Team November spent the day in the south west and Team India continued transects in the 75 foot transect area. Team November found two surface anomalies. Team India found one subsurface anomaly. The UXOQC/SO and the USACE OESS conducted a QC check in the 75 foot transect area of Area 3 and found 18 anomalies. Ten were surface and eight were subsurface. All anomalies found were non munitions related debris.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

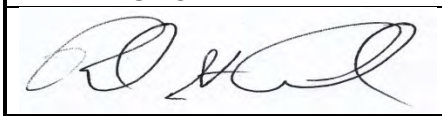
Munitions and Other Items Found Today: (Include location of the items found):None

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today):

Other comments or additional information: Weather was partly cloudy with in the mid 50's.

Schedule: Production is currently on pace to meet the goal of demobilization prior to 11-28-2013 (Thanksgiving). Contingency plan is in place for additional personnel if required.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/12/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
Jon Jacobson	Field Geophysycist	HDR	10	DGM
Matt Reece	UXO Tech III	HDR	10	Lima
Rob Nelson	UXO Tech II	HDR	10	DGM
Neil Roulier	UXO Tech III	HDR	10	India
Kim Hawkins	UXO Tech II	HDR	10	India
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Jeff Reuter	Field Tech III	HDR	10	Lima

PHOTOGRAPHIC LOG

Photo No.	Date:
1	11/12/13

Description: Dense vegetation in Tech Approach Area 2. Team Lima recorded this point as unsurveyable.



PHOTOGRAPHIC LOG

Photo No.	Date:
2	11/12/13

Description: Team November recorded an unsurveyable point due to dense vegetation in Tech Approach Area 3.



PHOTOGRAPHIC LOG

Photo No.	Date:
3	11/12/13

Description: Team India found a non-munitions related metal cable in Tech Approach Area 3.



PHOTOGRAPHIC LOG

Photo No.	Date:	

Date: 11/12/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 019
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments:

Observed Teams India and Lima check Schonstedts for functionality and Trimble Start of Day procedures

Verified assigned equipment was signed out on the daily inventory logs

OESS QA checklist/inspection completed and finalized; results forwarded to HDR PM and UXO Quality Manager

UXOSO/QCS and OESS performed Assisted Visual Survey QC of eastern/north-eastern portion of 75-foot spaced transects in Tech Approach Area 3. No specific transects were walked; tracks were recorded on Trimble GeoXH HDR asset #3975. Tracks were dissimilar to the tracks walked by UXOSO/QCS and SUXOS on 11/07/2013 and an additional 18 anomalies were investigated- eight subsurface and 10 surface. All anomalies investigated were non-munitions related debris: discarded materials and 'hot' rock. OESS commented that he's satisfied with the process and the teams' execution thus far. Based on having observed the teams and two QC inspections of an area behind the teams, the QC role should move back to observing the teams and ensuring they are performing to the work plan to the best of their abilities given conditions, rather than QC inspections of areas.

No MPPEH located today

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	Yes	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	Yes	N/A	N/A	N/A	N/A	N/A
Personnel Test	Yes	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	Yes	N/A	N/A	N/A	N/A	N/A
Static/Spike	Yes	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	Yes	N/A	N/A	N/A	N/A	N/A
IVS	Yes	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: Seed placement, DGM survey with EM61 litter over transects in open and wooded area.

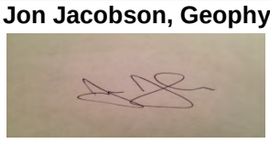
Comments for Visual Survey Activities: All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, and data was looked for overall accuracy and quality. Teams Lima, India, and Oscar measured the Schreiner control point at the start of the day to ensure positional accuracy and duplicate results. Teams Lima and November did start of day features at the same location to ensure positional accuracy and duplicate results. All start of day features were checked by Jeff Rueter and pass all QC requirements.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



11/12/2013

Byron Cook, UXOQCS



11/12/2013

Project Name: Port Angeles Combat Range		Report No: 019
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/12/2013

I. Site Safety Brief Topics:

Driving, Personal Protective Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC), hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid

II. Safety Inspections:

Observed teams' pre-work tool inventory/inspection; tools and equipment taken into the field were in good repair

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

No additional comments

VII. Visitors

None

VIII. Approval

	Date: 11/12/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 12 Nov 13

SSHO: Byron Cook

Name	Position	Employer	Signature
Robert Nelson	UXO II	HDR	
Kim Hawkins	UXO II	HDR	
Matt Rice	UXO III	HDR	
Jon Jacobson	Geo	HDR	
Rollins	UXO III	HDR	
Gordon, D	UXO III	HDR	
Jeff Ruder	Geo	HDR	
Rick St. Amand	SUXOS	HDR	
C DUNMIRE	UXO II	HDR	

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schonstedt	3104		☒	☐
Schonstedt	1636		☐	☒
Schonstedt	3658		☒	☐
Schonstedt	3105		☒	☐
Schonstedt	3885		☒	☐
Schonstedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Schonstedt	1636	On/Off switch broken

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☒

Adequate equipment on-site

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Gordon	☒	☐
Garmin	3679	M Mn	☒	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Rourion	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660	Rourke	☒	☐
Trimble	3975	[illegible]	☒	☐
Trimble	3693	Jeff R	☒	☐
Trimble	3974	[illegible]	☒	☐
Trimble	3661		☐	☐
Camera	3963	Jeff R	☒	☐
Camera	3964	[illegible]	☒	☐
Camera	20130901004	Rourke	☒	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 20 **Day/Date:** 11/13/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): One team conducted visual surveys in Area 1 then conducted assisted visual surveys in Area 2 and found no anomalies. Teams India and November conducted visual surveys in Tech Approach Area 3. Team November spent the day in the southwest and Team India continued transects in the 75 foot transect area. Team November found two surface anomalies. Team India found one surface anomaly. All anomalies found were non munitions related debris.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

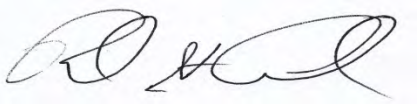
Munitions and Other Items Found Today: (Include location of the items found):None

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today):

Other comments or additional information: Weather was partly cloudy becoming mostly cloudy with in the mid 50's.

Schedule: Production is currently on pace to meet the goal of demobilization prior to 11-28-2013 (Thanksgiving). Contingency plan is in place for additional personnel if required.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/13/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
Jon Jacobson	Field Geophysycist	HDR	10	
Matt Reece	UXO Tech III	HDR	10	Lima
Rob Nelson	UXO Tech II	HDR	10	Lima
Neil Roulier	UXO Tech III	HDR	10	India
Kim Hawkins	UXO Tech II	HDR	10	India
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Jeff Reuter	Field Tech III	HDR	10	Lima

PHOTOGRAPHIC LOG

Photo No.	Date:
1	11/13/13

Description: Team Lima recorded an unsurveyable area due to the dense vegetation and steep terrain in Tech Approach Area 1.



PHOTOGRAPHIC LOG

Photo No.	Date:
2	11/13/13

Description: Team November recorded an unsurveyable area, showing dense vegetation in Tech Approach Area 3.



PHOTOGRAPHIC LOG

Photo No.	Date:
3	11/13/13

Description: Team India anomaly: a magnetic/hot rock found in Tech Approach Area 3.



PHOTOGRAPHIC LOG

Photo No.	Date:	

Date: 11/13/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 020
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

In-situ XRF sampling as a sub-task of Environmental Media Sampling, IDW Handling and Disposal

SUXOS and Field Technician comprised team; reviewed work plan regarding media sampling, specifically those parts referring to XRF and IDW (3.1.4 Investigative Strategy for Technical Approach 1, 3.1.11.2 Munitions Constituents Lead Sampling-Soil, and 3.7 Investigative Derived Waste Plan)

Team inventoried equipment, identified and filled deficiencies

Field Tech provided class on XRF and demonstrated proficiency

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments:

Observed Teams India and Lima check Schonstedts for functionality and Trimble Start of Day procedures

Verified assigned equipment was signed out on the daily inventory logs

UXOSO/QCS, OESS, SUXOS, and magazine custodian inspected magazines; all key holders had assigned keys

No MPPEH located today

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	N/A	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	N/A	N/A	N/A	N/A	N/A	N/A
Personnel Test	N/A	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	N/A	N/A	N/A	N/A	N/A	N/A
Static/Spike	N/A	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	N/A	N/A	N/A	N/A	N/A	N/A
IVS	N/A	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: No DGM data collection was performed today.

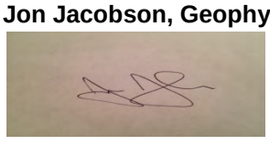
Comments for Visual Survey Activities: All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, and data was looked for overall accuracy and quality. Teams Lima and India measured the Schreiner control point at the start of the day to ensure positional accuracy and duplicate results. Teams Lima and November did start of day features at the same location to ensure positional accuracy and duplicate results. All start of day features were checked by Jeff Rueter and pass all QC requirements.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



11/13/2013

Byron Cook, UXOQCS



11/13/2013

Project Name: Port Angeles Combat Range		Report No: 020
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/13/2013

I. Site Safety Brief Topics:

Driving, Personal Protective Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC), hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid

II. Safety Inspections:

OESS, SUXOS, UXOSO/QCS, and magazine custodian conducted inspection of portable explosives magazines; magazines appear to be in good repair and have not been tampered with. The chain restricting access from Deer Park Road is still up/intact.

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

No additional comments

VII. Visitors

None

VIII. Approval

	Date: 11/13/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 11/13/13

SSHO: Byron Cook

Name	Position	Employer	Signature
R. GORDON	Tech III	HDR	
M. [illegible]	UXO III	HDR	
[illegible]	UXO III	HDR	
Kim Hawkins	UXO II	HDR	
C DUNMIRE	UXO II	HDR	
Jeff Ruder	Geo	HDR	
Robert Nelson	UXO II	HDR	
Jon Jacobson	Geo	HDR	
Rick St. Amand	GUXOS	HDR	
Visitors			

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schonstedt	3104		☒	☐
Schonstedt	1636		☐	☒
Schonstedt	3658		☐	☐
Schonstedt	3105		☒	☐
Schonstedt	3885		☒	☐
Schonstedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Schonstedt	1636	On/Off switch broken

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☒

Adequate equipment on-site

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☐	☐
Trimble	3975		☐	☐
Trimble	3693	Jeff H	☒	☐
Trimble	3974		☒	☐
Trimble	3661	Rollier	☒	☐
Camera	3963		☒	☐
Camera	3964		☒	☐
Camera	20130901004	Rollier	☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	O. Gordon	☒	☐
Garmin	3679	M Mn	☒	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Rollin	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 21 **Day/Date:** 11/14/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): One team conducted XRF sampling in Area one. One team conducted mag and dig in L 04. Teams India and November conducted assisted visual surveys. Team November spent the day in the south west of Tech Area 3 and Team India continued transects in the 75 foot transect area of Tech Area 2 (bordered with Tech Area 3). Team November also surveyed 150-foot spaced transects in Tech Area 1. Tech Area 1 may now be completed due to remaining transects being unsurveyable or inaccessible. Team November found one surface and one subsurface anomaly. Team India found one surface anomaly. All anomalies found during the assisted visual surveys were non munitions related debris.
QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

Munitions and Other Items Found Today: (Include location of the items found): Team Lima recovered 15 pieces of MD, including an M51 37mm APC, and seven small arms projectiles (.50 cal) and five 0.50 cal links. Items were discovered at depths ranging from on the surface to 16 inches for the greatest depth. Most items were found around a 6-8 inch depth.

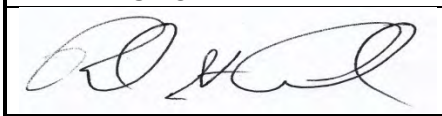
Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today):

Other comments or additional information: Weather was partly cloudy becoming mostly sunny with in near 50.

Schedule: Production is currently on pace to meet the goal of demobilization prior to 11-28-2013 (Thanksgiving).

Five additional field personnel will be mobilized on 11-17-2013 and report to the project site for an in-brief. The five additional personnel will support the mag and dig operation.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/14/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	XRF
Byron Cook	UXOQC/SO	HDR	10	
Jon Jacobson	Field Geophysycist	HDR	10	
Matt Reece	UXO Tech III	HDR	10	Lima
Rob Nelson	UXO Tech II	HDR	10	Lima
Neil Roulier	UXO Tech III	HDR	10	India
Kim Hawkins	UXO Tech II	HDR	10	India
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Jeff Reuter	Field Tech III	HDR	10	XRF

PHOTOGRAPHIC LOG

Photo No.	Date:
1	11/14/13

Description: Small Arms and MD found in L-4 by Team Lima during the mag and dig in Tech Approach Area 2.



PHOTOGRAPHIC LOG

Photo No.	Date:
2	11/14/13

Description:
Unsurveyable point recorded by Team November in Tech Area 3.



PHOTOGRAPHIC LOG

Photo No.	Date:
3	11/14/13

Description: Non-munitions related debris: a metal cable found by Team India in Tech Area 1.



PHOTOGRAPHIC LOG

Photo no.	Date:
4	11/14/13

Description: Photo showing the In-Situ XRF screening in Tech Approach Area 1 by Team Oscar.



Date: 11/14/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 021
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection: Subsurface Investigations (3.1.7 Intrusive Investigation)

Team Lima selected to begin subsurface investigations; team reviewed work plan and density map derived from DGM survey, loaded grid corners into GPS, inventoried and inspected equipment, and reviewed operational procedures with SUXOS

Initial Phase Inspection: Subsurface Investigations began after Preparatory Inspection

Observed Team Lima establish grid corners in a priority area (K-3, K-4, L-3, L-4). Team used grade stakes to mark corners after checking that the ground was clear of anomalies. Team established lanes with rope, investigating the grid at 50-foot intervals. Sweep speed was appropriate for terrain and vegetation. Anomalies were investigated properly and munitions related items were managed appropriately.

In-Situ XRF as a sub-task to Environmental Media Sampling and IDW Handling and Disposal

At PM's request, XRF screening was conducted on a slope in Tech Approach 1 that, from overhead, appeared to be a 'natural berm (3.1.4 Investigative Strategy, technical approach for area 1 and 3.1.11.2 Munitions Constituents Lead Sampling- Soil).' No small arms debris was located during Assisted Visual Survey and the area is out of line of the ASR firing point (no firing platform indicated) (3.1.11.2, four general situations that are encountered during field operations that would be evaluated to determine if lead sampling and laboratory analysis is required). Forty-seven samples were taken. None exceeded action level. Expendable waste debris was therefore considered non-contaminated and disposed of as trash.

Follow-Up Phase Inspection:

MD Handling, Storage, and Demilitarization (3.6.6 Material Potentially Presenting an Explosive Hazard)

Team Lima UXO Techs II and III performed independent inspections of MPPEH, determining items recovered from the grid to be MD. Items determined to be MD were verified MDAS by the SUXOS and stored in a lockable container.

Additional QC/QA Comments:

Observed Teams India and Lima check Schonstedts for functionality and Trimble Start of Day procedures
Verified assigned equipment was signed out on the daily inventory logs
MD was found by Team Lima in grid L-4; Handling and Storage procedures were followed

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	N/A	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	N/A	N/A	N/A	N/A	N/A	N/A
Personnel Test	N/A	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	N/A	N/A	N/A	N/A	N/A	N/A
Static/Spike	N/A	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	N/A	N/A	N/A	N/A	N/A	N/A
IVS	N/A	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: No DGM data collection was performed today.

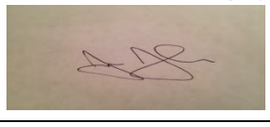
Comments for Visual Survey Activities: All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, and data was looked for overall accuracy and quality. Teams Lima and India measured the Schreiner control point at the start of the day to ensure positional accuracy and duplicate results. Teams Lima and November did start of day features at the same location to ensure positional accuracy and duplicate results. All start of day features were checked by Jeff Rueter and pass all QC requirements.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



11/14/2013

Byron Cook, UXOQCS



11/14/2013

Project Name: Port Angeles Combat Range		Report No: 021
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/14/2013

I. Site Safety Brief Topics:

Driving, Personal Protective Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC), hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid

II. Safety Inspections:

Observed Team Lima conducting Mag & Dig operations (DFW Subsurface Investigations); team wore prescribed PPE, followed proper anomaly investigation procedures, and handled MD IAW WP and SUXOS guidance

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

Team Lima was given a review of mag & dig procedures in preparation for Subsurface Investigations. Applicable portions of the work plan were reviewed as well as the APP/SSHP and Appendix G: Ordnance Technical Data Sheets. Team Leader was provided a copy of Appendix G.

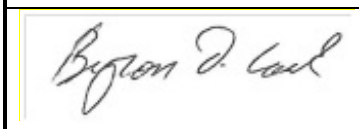
Observed XRF In-situ data collection; no health and safety concerns noted

Project Geophysicist and Field Tech assisted locating grid corners for subsurface investigation phase. MEC avoidance was practiced, with Team Lima checking for anomalies in the vicinity of the proposed corners prior to driving grade stakes into the ground.

VII. Visitors

None

VIII. Approval

	Date: 11/14/2013
	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Daily Safety Brief and Sign-In Sheet

HDR

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 11/14/13

SSHO: Byron Cook

Name	Position	Employer	Signature
Kim Hawkins	UXO Tech II	HDR	
D. GORDON	UXO Tech III	HDR	
M. Kane	UXO III	HDR	
Rauzier	UXO III	HDR	
C DUNMIRE	UXO II	HDR	
Jeff Rueter	GEO	HDR	
Robert Nelson	UXO II	HDR	
Jon Jacobsen	GEO	HDR	
Rick Ot Thomas	SUBO	HDR	
MARK MURPHY	USACE NWS FM	USACE	

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schonstedt	3104		☒	☐
Schonstedt	1636		☐	☒
Schonstedt	3658		☐	☐
Schonstedt	3105		☒	☐
Schonstedt	3885		☒	☐
Schonstedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Schonstedt	1636	On/Off switch broken

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☒

Adequate equipment on-site

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660	Rowlon	☒	☐
Trimble	3975	Jeff R	☒	☐
Trimble	3693		☐	☐
Trimble	3974	Cell	☒	☐
Trimble	3661	~~Rowlon~~	☐	☐
Camera	3963		☐	☐
Camera	3964	Cell	☒	☐
Camera	20130901004	Rowlon	☒	☐
Camera	3965	Jeff R	X	

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

XRF 2750 Jeff R X

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Gordon	☒	☐
Garmin	3679		☒	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Rowlon	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 22 **Day/Date:** 11/15/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 9

Activities Conducted: (Include location of work performed including equipment used): One team completed mag and dig in M 04 and K 04 and began in K 03. Teams November conducted visual surveys in Tech Approach Area 3. Team November spent the day in the south west and Team India continued transects in the 75 foot transect area of Tech Area 2. Team India also did visual surveys on the 150 foot transects in Tech Approach Area 1. Team November had no anomalies. Team India found one subsurface anomaly. All anomalies found during the assisted visual surveys were non munitions related debris. Explosives inventory was conducted by the SUXOS, UXOQC/SO, and custodian. Site visit by Mark Murphy USACE NWS Regional Project Lead.
QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

Munitions and Other Items Found Today: (Include location of the items found):14 pieces of MDAS including 81mm mortar fin, an M 51 37mm APC, and 5 small arms (.50 cal).

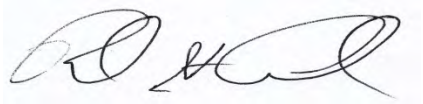
Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): 19 pounds of NMRD found in K 04.

Other comments or additional information: Weather was overcast and occasional rain with in the mid 40's.

Schedule: Production has slowed due to the remote areas. It takes approximately 2 hours to access the remote areas before visual surveys can commence.

An additional five personnel, two UXO Technician IIIs and three UXO Technician II's will be on-site 11-18-2013.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/15/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	9	
Byron Cook	UXOQC/SO	HDR	9	
Jon Jacobson	Field Geophysycist	HDR	9	
Matt Reece	UXO Tech III	HDR	9	Mag and Dig
Rob Nelson	UXO Tech II	HDR	9	Mag and Dig
Neil Roulier	UXO Tech III	HDR	9	India
Kim Hawkins	UXO Tech II	HDR	9	India
D.A. Gordon	UXO Tech III	HDR	9	November
Chuck Dunmire	UXO Tech II	HDR	9	November
Jeff Reuter	Field Tech III	HDR	9	

PHOTOGRAPHIC LOG

Photo No.	Date:
1	11/15/13

Description: Munitions and Small Arms debris found during the mag and dig in Tech Approach Area 2 (grid K-4).



PHOTOGRAPHIC LOG

Photo No.	Date:
2	11/15/13

Description: Team November recorded an unsurveyable point due to dense vegetation in Tech Approach Area 3.



PHOTOGRAPHIC LOG

Photo No.	Date:
3	11/15/13

Description: Team India found non-munitions related debris, a metal cable, in Tech Approach Area 1.



PHOTOGRAPHIC LOG

Photo No.	Date:	

Date: 11/15/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 022
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection: Subsurface Investigations (3.1.7 Intrusive Investigation)
Observed Team Lima establish a grid, designate lanes at the proper spacing, locate and investigate anomalies, and inspect MD. All subtasks performed satisfactorily and IAW WP.

MD Handling, Storage, and Demilitarization (3.6.6 Material Potentially Presenting an Explosive Hazard)
Team Lima UXO Techs II and III performed independent inspections of MPPEH, determining items recovered from the grid to be MD. Items determined to be MD were verified MDAS by the SUXOS and stored in a lockable container.

Additional QC/QA Comments:
Observed Teams India and Lima check Schonstedts for functionality and Trimble Start of Day procedures
Verified assigned equipment was signed out on the daily inventory logs
Mark Murphy, USACE NWS Regional Project Lead, on site, inspected open area and DGM unsurveyable areas in Technical Approach Area 2
SUXOS, UXOQCS, and magazine custodian conducted monthly explosives inventory; no discrepancies
MD was found by Team Lima; Handling and Storage procedures were followed
Weekly equipment inspection and inventory and vehicle safety inspections conducted
Due to consistent rain today, media sampling was not initiated in grids where small arms debris was found

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	N/A	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	N/A	N/A	N/A	N/A	N/A	N/A
Personnel Test	N/A	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	N/A	N/A	N/A	N/A	N/A	N/A
Static/Spike	N/A	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	N/A	N/A	N/A	N/A	N/A	N/A
IVS	N/A	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: No DGM data collection was performed today.

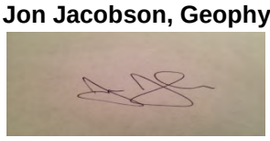
Comments for Visual Survey Activities: All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, and data was looked for overall accuracy and quality. Teams Lima and India measured the Schreiner control point at the start of the day to ensure positional accuracy and duplicate results. Team November did the start of day feature at the same location to ensure positional accuracy and duplicate results compared to previous day's results. All start of day features were checked by Jeff Rueter and pass all QC requirements.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



11/15/2013

Byron Cook, UXOQCS



11/15/2013

Project Name: Port Angeles Combat Range		Report No: 022
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/15/2013

I. Site Safety Brief Topics:

Driving, Personal Protective Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC), hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid

II. Safety Inspections:

Equipment and vehicle safety inspections conducted

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

Site visit by Mark Murphy USACE NWS Regional Project Lead; safety brief conducted, escorted by SUXOS and OESS

Monthly explosives inventory conducted

VII. Visitors

None

VIII. Approval

	Date: 11/15/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes
Comments: Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather		

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 15 Nov 2013

SSHO: Byron Cook

Name	Position	Employer	Signature
Jon Jacobson	Geo	HDR	
Jeff Ructer	Geo	HDR	Jeff R
C DUNMIRE	TECH II	HDR	
D. GORDON	TECH III	HDR	
[illegible]	TECH III	HDR	
[illegible]	Tech II	HDR	
Robert Nelson	UXO II	HDR	
M. [illegible]	UXO III	HDR	
[illegible]	SUXOS	HDR	
Visitors			

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schonstedt	3104		☒	☐
Schonstedt	1636		☐	☒
Schonstedt	3658		☐	☐
Schonstedt	3105		☒	☐
Schonstedt	3885		☒	☐
Schonstedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Schonstedt	1636	On/Off switch broken
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☒
Adequate equipment on-site		

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660	Rollier	☒	☐
Trimble	3975	Jeff	☒	☐
Trimble	3693		☑	☐
Trimble	3974		☒	☐
Trimble	3661		☐	☐
Camera	3963		☒	☐
Camera	3964		☒	☐
Camera	20130901004	Rollier	☒	☐
Camera	3965	Jeff	x	

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Gordon	☒	☐
Garmin	3679		☐	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Rollins	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

Vehicle Inspection Checklist and Report Form

HDR ONE COMPANY | Many Solutions

Site Name/Location: PACR

Site Supervisor: _____ Vehicle: Project Rental #2 / Project # 206945
(Make and License Plate Number)

Date Inspected: _____ Mileage: _____ Owner: _____
(Rental, SKY, Contract)

Item Description	Monday			Tuesday			Wednesday			Thursday			Friday		
	Pass			Pass			Pass			Pass			Pass		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Registration and License Plate	✓			✓			✓			✓			✓		
Insurance	✓			✓			✓			✓			✓		
Emergency Route Map/Phone #s	✓			✓			✓			✓			✓		
2 Tires:															
Pressure	✓			✓			✓			✓			✓		
Condition	✓			✓			✓			✓			✓		
3 Equipment:															
Fire Extinguishers	✓			✓			✓			✓			✓		
First Aid/CPR/Burn Kits	✓			✓			✓			✓			✓		
Blood Borne Pathogen Kit			✓			✓			✓			✓			✓
Eyewash Kits	✓			✓			✓			✓			✓		
Spare Tire	✓			✓			✓			✓			✓		
Tire Changing Equipment	✓			✓			✓			✓			✓		
Tie Downs*			✓			✓			✓			✓			✓
Chocks*			✓			✓			✓			✓			✓
Placards*			✓			✓			✓			✓			✓
Other:															
Other:															
4. Brakes															
Hand/Emergency	✓			✓			✓			✓			✓		
Service	✓			✓			✓			✓			✓		
5. Belts															
Proper Tension	✓			✓			✓			✓			✓		
Condition	✓			✓			✓			✓			✓		
6. General:															
Windshield	✓			✓			✓			✓			✓		
Windshield Wipers	✓			✓			✓			✓			✓		
Windows (Condition/Operation)	✓			✓			✓			✓			✓		
Seat Belts	✓			✓			✓			✓			✓		
Steering	✓			✓			✓			✓			✓		
Horn	✓			✓			✓			✓			✓		
Gas Cap	✓			✓			✓			✓			✓		
Mirrors	✓			✓			✓			✓			✓		
Door/Window Handles/Latches	✓			✓			✓			✓			✓		
Cleanliness	✓			✓			✓			✓			✓		
Exhaust System	✓			✓			✓			✓			✓		
7. Lights:															
Headlights (High/Low)	✓			✓			✓			✓			✓		
Brake Lights	✓			✓			✓			✓			✓		
Parking	✓			✓			✓			✓			✓		
Back-up	✓			✓			✓			✓			✓		
Turn Signals	✓			✓			✓			✓			✓		
Emergency Flashers	✓			✓			✓			✓			✓		
Interior Lights	✓			✓			✓			✓			✓		

Vehicle Inspection Checklist and Report Form

HDR ONE COMPANY | Many Solutions

Site Name/Location: PACR

Site Supervisor: St. Amand

Vehicle: Project Rental - #1 / Project #206945
(Make and License Plate Number)

Date Inspected: 11/15/13

Mileage: 6560

Owner: ____
(Rental, SKY Contract)

Item Description	Monday			Tuesday			Wednesday			Thursday			Friday		
	Pass			Pass			Pass			Pass			Pass		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Registration and License Plate	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Insurance	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Emergency Route Map/Phone #s	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
2 Tires:															
Pressure	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Condition	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
3 Equipment:															
Fire Extinguishers	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
First Aid/CPR/Burn Kits	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Blood Borne Pathogen Kit	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Eyewash Kits	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Spare Tire	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Tire Changing Equipment	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Tie Downs*	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑
Chocks*	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑
Placards*	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
4. Brakes															
Hand/Emergency	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Service	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
5. Belts															
Proper Tension	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Condition	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
6. General:															
Windshield	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Windshield Wipers	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Windows (Condition/Operation)	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Seat Belts	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Steering	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Horn	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Gas Cap	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Mirrors	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Door/Window Handles/Latches	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Cleanliness	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Exhaust System	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
7. Lights:															
Headlights (High/Low)	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Brake Lights	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Parking	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Back-up	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Turn Signals	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Emergency Flashers	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Interior Lights	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 23 **Day/Date:** 11/18/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): Two teams completed mag and dig in K 03, L 03, L02, K 02, N 02, N 03, N04. Team November conducted visual surveys in Tech Approach Area 3. Team November spent the day in the south west and found one surface anomaly that was non-munitions related debris. Team India was used for demolition operations

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

Munitions and Other Items Found Today: (Include location of the items found): Four each Projectile, 37mm, M63 HE. 45 pieces of MDAS including 81mm mortar fin, two 81mm mortar bases, two M 51 37mm armor piercing projectiles, and eight small arms (.50 cal).

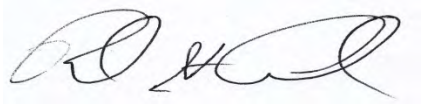
Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): 75 pieces weighing over 100 pounds of Non-Munitions Related Debris (NMRD) found today which slowed the teams down during the mag and dig activities.

Other comments or additional information: Weather was constant rain with in the mid 40's.

Schedule: Production has slowed due to the remote areas. It takes approximately 2 hours to access the remote areas before visual surveys can commence.

An additional five personnel, two UXO Technician IIIs and three UXO Technician II's will were on-site 11-18-2013 to expedite field operations.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/18/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
John Brunkhorst	UXO Tech III	HDR	10	Mag and Dig
Matt Reece	UXO Tech III	HDR	10	Mag and Dig
Rob Nelson	UXO Tech II	HDR	10	Mag and Dig
Neil Roulier	UXO Tech III	HDR	10	Demo
Kim Hawkins	UXO Tech II	HDR	10	Demo
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Jeff Reuter	Field Tech III	HDR	10	
Josh Gullickson	UXO Tech II	HDR	10	Mag and Dig
Frank Czajkowski	UXO Tech II	Versar	10	Mag and Dig
Edward Coughlin	UXO Tech II	Versar	10	Mag and Dig
Jeff Massie	UXO Tech II	Versar	10	Mag and Dig

PHOTOGRAPHIC LOG

Photo No.	Date:
1	11/18/13

Description: Team November at an unsurveyable point showing dense vegetation in Tech Approach Area 3



PHOTOGRAPHIC LOG

Photo No.	Date:
2	11/18/13

Description: Team Oscar's 'mag and dig completed' photo showing the munitions debris found in Grid N-03, Tech Approach Area 2 in the open field



PHOTOGRAPHIC LOG

Photo No.	Date:
3	11/18/13

Description: An M63 HE 37mm projectile (MEC) found by Team Lima in Grid K-03, Tech Approach Area 2 in the open field.



PHOTOGRAPHIC LOG

Photo No.	Date:

Date: 11/18/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 023
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection: Subsurface Investigations (3.1.7 Intrusive Investigation)
Five additional personnel were added to the site and designated for mag & dig operations. Qualifications were checked and personnel briefed on procedures, anticipated ordnance items, and reporting requirements. Equipment was inspected and prepared for operation.

MD Handling, Storage, and Demilitarization (3.6.6 Material Potentially Presenting an Explosive Hazard)
New personnel were briefed on MD handling and storage requirements and procedures

MEC Disposal by Detonation (3.6.5 Demolition Procedures)
Personnel designated for demolitions operations reviewed demo procedures, inspected equipment, and had tasks assigned

Initial Phase Inspection: Subsurface Investigations (3.1.7 Intrusive Investigation)
Newly assigned personnel were immediately integrated into intrusive investigations following site indoctrination and Preparatory Phase Inspection. Grid set-up, anomaly investigation, and MD handling procedures were observed. No deficiencies were noted.

MD Handling, Storage, and Demilitarization (3.6.6 Material Potentially Presenting an Explosive Hazard)
No deficiencies noted

MEC Disposal by Detonation (3.6.5 Demolition Procedures)
MEC Disposal was initiated following Preparatory Phase. Clallam County dispatch was notified, designated personnel drew explosives and walked them to the disposal site, SUXOS and UXOSO/QCS identified MEC items found in K-3 and agreed they were safe to move. MEC items were transported by hand to the disposal site. Demolition procedures as outlined in the work plan, EM 385-1-97, and 60A-1-1-31 were adhered to. OESS observed operations.

Follow-Up Phase Inspection:

Additional QC/QA Comments:
Five new personnel were added to the site. Personnel received indoctrination and training. OSHA 3-day OJT and observation begins today.
Schonstedts used in the field were tested at the IVS; all Schonstedts were functioning properly
MD found today inspected by SUXOS and designated as MDAS, stored in a lockable container. MD handling and storage procedures completed
Due to consistent rain today, media sampling was not initiated in grids where small arms debris was found
No means of weighing MD and Non-Munitions Related Debris (NMRD) given to second mag & dig team; team is estimating weights. The second mag and dig team will have a scale available on 11-19-2013.

DGM Daily Quality	**DGM Activities Today** (According to Work Plan)					
Standardization Test	**LA 1**	**LA 2**	**PC 1**	**PC 2**	**RCQ 1**	**RCQ 2**
Equipment Warm Up	N/A	N/A	N/A	N/A	N/A	N/A
Record Sensor Position	N/A	N/A	N/A	N/A	N/A	N/A
Personnel Test	N/A	N/A	N/A	N/A	N/A	N/A
Cable Shake Test	N/A	N/A	N/A	N/A	N/A	N/A
Static/Spike	N/A	N/A	N/A	N/A	N/A	N/A
Point Position/Control Point Check	N/A	N/A	N/A	N/A	N/A	N/A
IVS	N/A	N/A	N/A	N/A	N/A	N/A

Comments for DGM Activities, if any: No DGM data collection was performed today.

Comments for Visual Survey Activities: All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, and data was looked for overall accuracy and quality. Teams Lima and Oscar measured the Schreiner control point at the start of the day to ensure positional accuracy and duplicate results. Team November did the start of day feature at the same location to ensure positional accuracy and duplicate results compared to previous day's results. All start of day features were checked by Jeff Rueter and pass all QC requirements.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	**Non-Compliant Items Corrected Today**
Two Versar personnel on site did not provide proof of qualifications. Personnel were allowed to work based on	

assurance from their PM and UXO Manager that they were qualified and certifications would be provided before start of work tomorrow.	

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Jon Jacobson, Geophysicist II



11/18/2013

Byron Cook, UXOQCS



11/18/2013

Project Name: Port Angeles Combat Range		Report No: 023
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/18/2013

I. Site Safety Brief Topics:

Driving, Personal Protective Equipment (PPE), slips, trips, and falls, weather, Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC), hydration, field sanitation/hygiene, Exclusion Zone (EZ) (209 ft/ 43 ft), first aid

II. Safety Inspections:

Observed SUXOS demo brief prior to demolition operations; observed demolitions procedures. Operations were performed safely and in accordance with applicable guidance

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

Five new members added to the site; personnel added reviewed APP/SSHP and were briefed site specific safety considerations, reviewed and given Appendix G: Ordnance Technical Data Sheets from the work plan for use in the field, daily operations, and emergency route and contact numbers

Vehicle added to the site was kitted with fire extinguisher, first aid kit, and vehicle book including proof of insurance and accident reporting procedures, inspection forms, and emergency route and contact numbers

Discussed with OESS requirement to investigate all contiguous grids to any containing MEC and agreed to drop grids from this requirement that lead into Surveyor Creek due to hazards posed by terrain (designated as unsurveyable slope from LiDAR data).

VII. Visitors

None

VIII. Approval

	Date: 11/18/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Daily Safety Brief and Sign-In Sheet

HDR

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 18 Nov 2013

SSHO: Byron Cook

Name	Position	Employer	Signature
C DUNMIRE	UXO II	HDR	[signature]
D GORDON	UXO III	HDR	D. Gordon
Robert Nelson	UXO II	HDR	[signature]
Jeff Rueter	Geo	HDR	Jeff R
John Brunkhorst	UXO III	HDR	John Brunkhorst
Josh Gelickson	UXO III	HDR	[signature]
M. Keele	UXO III	HDR	[signature]
Roulier	UXO III	HDR	[signature]
Kim Hawkins	UXO II	HDR	[signature]
Jeff Massie	UXO II	VERSAR	[signature]
Ed Coughlin	UXO II	Versar	[signature]
Frank Cea[illegible]	TECH	VERSAR	[signature]
Dick St. Amand	SUXOS	HDR	[signature]
[illegible]	OESS	COE	[signature]
Visitors			

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☐	☐
Trimble	3975		☐	☐
Trimble	3693		☐	☐
Trimble	3974	[signature]	☒	☐
Trimble	3661	[signature]	☒	☐
Camera	3088		☐	☐
Camera	3083		☐	☐
Camera	3084	[signature]	☒	☐
Camera	3963		☐	☐
	1004	[signature]	☒	

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678		☑	☐
Garmin	3679		☐	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685		☑	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104		☒	☐
Schostedt	1636		☐	☐
Schostedt	3658		☐	☐
Schostedt	3105		☒	☐
Schostedt	3885		☒	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 24 **Day/Date:** 11/19/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): Two teams completed mag and dig in grids L 00, L 01, M 00, M 01, M 02, M 03, N 00, N 01, N05, N 06, N 07, P 06, P 07, P 08, Q 07, Q 08, and R 08. Team November conducted visual surveys in Tech Approach Area 3. Team November spent the day in the south west and found one surface anomaly that was non-munitions related debris (NMRD). All accessible/surveyable transects in Tech Area 3 are complete.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

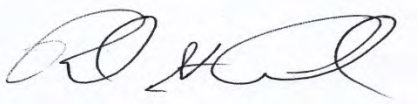
Munitions and Other Items Found Today: (Include location of the items found): 11 pieces of MDAS including 81mm mortar base (grid R 08), one practice 81mm mortar (grid M 03), two M 51 37mm armor piercing projectiles (grids N 07 and M 01).

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): Over 200 pieces weighing over 80 pounds of non munitions related debris were found today.

Other comments or additional information: Weather was partly cloudy with in the mid 40's.

Schedule: Production has slowed due to the remote areas. It takes approximately 2 hours to access the remote areas before visual surveys can commence.
An additional five personnel, two UXO Technician IIIs and three UXO Technician II's will were on-site 11-18-2013 to expedite field operations.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/19/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
John Brunkhorst	UXO Tech III	HDR	10	Mag and Dig
Matt Reece	UXO Tech III	HDR	10	Mag and Dig
Rob Nelson	UXO Tech II	HDR	10	Mag and Dig
Neil Roulier	UXO Tech III	HDR	10	Mag and Dig
Kim Hawkins	UXO Tech II	HDR	10	Mag and Dig
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Jeff Reuter	Field Tech III	HDR	10	
Josh Gullickson	UXO Tech II	HDR	10	Mag and Dig
Frank Czajkowski	UXO Tech II	Versar	10	Mag and Dig
Edward Coughlin	UXO Tech II	Versar	10	Mag and Dig
Jeff Massie	UXO Tech II	Versar	10	Mag and Dig

PHOTOGRAPHIC LOG

Photo No.	Date:
1	11/19/13

Description: Team November in Tech Approach Area 3. Transects East-Northeast of this point were inaccessible due to steep slope and thick vegetation.



PHOTOGRAPHIC LOG

Photo No.	Date:
2	11/19/13

Description: 37mm Projectile, APC M51 found during mag & dig



PHOTOGRAPHIC LOG

Photo No.	**Date:**
3	11/19/13

Description: 81mm mortar, Target Practice (wax filled) found in Grid M-03



PHOTOGRAPHIC LOG

Photo No.	**Date:**

Date: 11/19/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 024
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection: Subsurface Investigations (3.1.7 Intrusive Investigation)
Observed both mag & dig teams perform subsurface investigations: Teams located grid corners using Trimble GeoXH, checked for anomalies and marked out corners with grade stakes, and lay out lines to designate lanes at 50-ft spacing. Sweep speeds were appropriate and anomaly investigation was performed as applicable. Teams are relaying requested data back to SUXOS and storing on Trimble.

MD Handling, Storage, and Demilitarization (3.6.6 Material Potentially Presenting an Explosive Hazard)
A teams' Tech II and the Tech III are conducting independent inspections of MPPEH. MPPEH determined to be MD by both inspections are checked again by the SUXOS. MD determined to be MDAS was stored in a lockable container. Inspection process was completed.

Additional QC/QA Comments:
Versar supplied Schondtedts in support of their personnel on site. Versar personnel are maintaining their own equipment inventory but are otherwise integrated into existing teams. Schonstedts used in the field were tested at the IVS. All Schonstedts were functioning properly.
XRF sampling will be conducted Thursday (Nov 21, 2013) to allow the ground time to dry from recent rains
Second mag & dig team was provided a scale to measure MD weights per grid

Comments for DGM Activities, if any: No DGM data collection was performed today.

Comments for Visual Survey Activities: Team November was the only Visual Survey team today. All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, and data was looked for overall accuracy and quality. Team November did the start of day and point generic position check features at the same location to ensure positional accuracy and duplicate results. All start of day features were checked by Jeff Rueter and pass all QC requirements. All accessible/surveyable transects in Technical Approach Area 3 are completed at this time.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today
	All personnel qualifications/certifications have been provided and are available for inspection

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Byron Cook, UXOQCS



11/19/2013

Project Name: Port Angeles Combat Range		Report No: 024
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/19/2013

I. Site Safety Brief Topics:

- driving- beware of school buses and children on the sides of the road, observe posted speed limits
- Personal Protective Equipment (PPE)- covered requirements due to tasks
- slips, trips, and falls- take time and watch footing getting to and setting up grids
- Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC)- safe intrusive procedures
- hydration- status of site water supply
- field sanitation/hygiene- status of hygiene supplies
- Exclusion Zone (EZ) (209 ft/ 43 ft)- no visitors expected today, operational distance between teams to exceed EZ
- first aid- status of supplied team first aid
- weather- currently 28, expected high of 39, sunny and clear

II. Safety Inspections:

Observed Defined Feature of Work (DFW) Subsurface Investigations (3.1.7 Intrusive Investigation). Anomaly investigation was performed safely and appropriately.

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

No additional comments

VII. Visitors

None

VIII. Approval

	Date: 11/19/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 19 Nov 2013

SSHO: Byron Cook

Name	Position	Employer	Signature
F. Czaj Rowicki	T-2	[illegible]	
JEFF MASSIE	TECH II	Versar	
Ed Geoghan	T-II	Versar	
D. GORDON	Tech III	HDR	
M. Rice	Tech III	HDR	
Rouviere	Tech III	HDR	
[illegible]	Tech II	HDR	
Jeff Rueter	Geo	HDR	
C DUNMIRE	TECH II	HDR	
Robert Nelson	UXO II	HDR	
John Brunkhorst	UXO III	HDR	
Josh Gulickson	UXO III	HDR	
Rick St. Amand	SUXO S	HDR	
Visitors			

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☐	☐
Trimble	3975		☒	☐
Trimble	3693		☒	☐
Trimble	3974		☒	☐
Trimble	3661	Rollion	☒	☐
Camera	3088		☐	☐
Camera	~~3083~~ 3965		☒	☐
Camera	3084		☒	☐
Camera	3963		☒	☐
	10024	Rollion	X	

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Gordon	☑	☐
Garmin	3679		☐	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Rousson	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104		☐	☐
Schostedt	1636		☐	☐
Schostedt	3658		☐	☐
Schostedt	3105	R Rouliva	☒	☐
Schostedt	3885	D. Dawson	☑	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 25 **Day/Date:** 11/20/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): Two teams completed mag and dig in L 05, M 05, M 06, M 07, M 08, K 05, P 01, P 02, P 03, P 04, P 05, R 10, Q 09, Q 10, and R 09. Team India conducted visual surveys in Tech Approach Area 2. Team India spent the day in the south west part of the area and found nothing. This completes the surveyable and accessible transects in the MRS.
QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

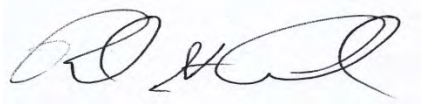
Munitions and Other Items Found Today: (Include location of the items found):P 02, 1 piece of frag .25 lb. P 03, one 81mm tail fin .5 lb. P 04, one piece of frag and one M51 37mm AP 1.25 lb. L 05, two pieces of frag and one M 51 37mm AP 1.5 lb. M 06, one piece of frag and the lower part of an M 57 81mm WP 3 lb. M 07, three pieces of frag .25 lb. M 08, one piece of frag and one M 51 37mm AP 1.25 lb. R 09, two piece of frag1 lb. R 10, one pieces of frag 1 lb. Q 10, eight pieces of frag 1 lb.

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): Over 250 pieces weighing over 250 pounds of non munitions related debris were found today.

Other comments or additional information: Weather was sunny with in the near 40.

Schedule: With the additional grids that need to be investigated the current projected completion is 20 December 2013.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/20/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
John Brunkhorst	UXO Tech III	HDR	10	Mag and Dig
Matt Reece	UXO Tech III	HDR	10	Mag and Dig
Rob Nelson	UXO Tech II	HDR	10	Mag and Dig
Neil Roulier	UXO Tech III	HDR	10	India
Kim Hawkins	UXO Tech II	HDR	10	India
D.A. Gordon	UXO Tech III	HDR	10	Mag and Dig
Chuck Dunmire	UXO Tech II	HDR	10	Mag and Dig
Jeff Reuter	Field Tech III	HDR	10	
Josh Gullickson	UXO Tech II	HDR	10	Mag and Dig
Frank Czajkowski	UXO Tech II	Versar	10	Mag and Dig
Edward Coughlin	UXO Tech II	Versar	10	Mag and Dig
Jeff Massie	UXO Tech II	Versar	10	Mag and Dig

PHOTOGRAPHIC LOG

Photo No.	Date:
1	11/20/13

Description: Team India recorded an unsurveyable area in Tech Approach Area 2.



PHOTOGRAPHIC LOG

Photo No.	Date:
2	11/20/13

Description: One of the 37mm AP bodies (MD) discovered during mag & dig in Tech Area 2



PHOTOGRAPHIC LOG

Photo No.	Date:
3	11/20/13

Description: Fragment of an M57 81mm white phosphorus (WP) mortar (MD) found during mag & dig in Tech Area 2



PHOTOGRAPHIC LOG

Photo No.	Date:
4	11/20/13

Description: MD found during mag & dig in Tech Area 2



Date: 11/20/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 025
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments:

Observed morning Schonstedt function test: all Schonstedts functioned properly.
Received Technical Approach Area 2 density maps: assisted SUXOS in estimating time required to finish project
Participated in weekly status call
XRF sampling will be conducted Thursday (Nov 21, 2013) to allow the ground time to dry from recent rains
Observed SUXOS inspection of MD collected by team leaders; MD was identified as MDAS and stored in a lockable container

Due to time estimated to finish the project after receiving density maps, the decision was made to demobilize the site for the Thanksgiving holiday. UXOSO/QCS assisted in making travel arrangements. Site personnel will begin demobilization activities Saturday, Nov 23, 2013. Site equipment will be downloaded from vehicles and stored in one maintained hotel room, allowing parking for the leased vehicle. Following equipment inventory, inspection, and storage personnel will be allowed to travel to Seattle for departure flights Sunday, Nov 24, 2013. SUXOS and UXOSO/QCS will stay an additional day to perform a weekly magazine inspection. Personnel are scheduled to return Monday, Dec 2, 2013 with field work beginning the afternoon of Tuesday, Dec 3, 2013.

Comments for DGM Activities, if any: DGM is complete

Comments for Visual Survey Activities: Team India was the only Visual Survey team today. All visual survey data was QC'd and looks good; pictures were checked to make sure they match the stored feature class, data was looked at to determine mileages, and data was looked for overall accuracy and quality. Team India measured the Schreiner control point at the start of the day to ensure positional accuracy and duplicate results. All start of day features were checked by Jeff Rueter and pass all QC requirements. All accessible/surveyable transects in Technical Approach Area 2 are completed at this time.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Byron Cook, UXOQCS



11/20/2013

Project Name: Port Angeles Combat Range		Report No: 025
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/20/2013

I. Site Safety Brief Topics:

- driving- pay attention to other drivers
- Personal Protective Equipment (PPE)- checked status of supply
- slips, trips, and falls- everyone's been on site and know what terrain they'll encounter; traverse appropriately
- Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC)- live items have been encountered, don't get complacent
- hydration- status of site water supply
- field sanitation/hygiene- status of hygiene supplies
- Exclusion Zone (EZ) (209 ft/ 43 ft)- visitors expected tomorrow, operational distance between teams to exceed EZ
- first aid- be sure to have minimum first aid supplies on hand per team
- weather- currently 23, expected high of 37, sunny and clear

II. Safety Inspections:

Observed teams negotiate difficult terrain while establishing grids. Personnel took precautions to avoid slip/trip/fall hazards. Some of the precautions observed include route planning, buddy-assistance, a slower pace, and/or shorter steps. Debris was removed from the path of travel where feasible.

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

No additional comments

VII. Visitors

None

VIII. Approval

	Date: 11/19/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes
Comments: Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather		

Daily Safety Brief and Sign-In Sheet

HDR

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 20 Nov 2013

SSHO: Byron Cook

Name	Position	Employer	Signature
M. Reece	Tech III	HDR	[illegible]
D. Gordon	Tech III	HDR	[illegible]
K Hawkins	Tech II	HDR	[illegible]
E Czajkowski	Tech II	VERSAR	[illegible]
E Coughlin	Tech II	Versar	[illegible]
JERK MASSIE	TECH II	VERSAR	[illegible]
JOHN BRUNKHORST	Tech III	HDR	[illegible]
JOSH GULLICKSON	TECH III	HDR	[illegible]
Jeff Rueter	Geo	HDR	Jeff R
C DUNMIRE	TECH II	HDR	[illegible]
Robert Nelson	UXO II	HDR	[illegible]
Roulier	TECH III	HDR	[illegible]
Rick St. Amand	SUXOS	HDR	[illegible]
Visitors			

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☒	☐
Trimble	3975		☑	☐
Trimble	3693		☒	☐
Trimble	3974		☑	☐
Trimble	3661		☐	☐
Camera	3088		☐	☐
Camera	~~3083~~ 3965		☑	☐
Camera	3084		☑	☐
Camera	3963		☒	☐
	1004	Rowlon	X	

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Hudson	☑	☐
Garmin	3679		☐	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Rollison	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104		☒	☐
Schostedt	1636		☐	☐
Schostedt	3658		☐	☐
Schostedt	3105		☒	☐
Schostedt	3885		☒	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 26 **Day/Date:** 11/21/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): Two teams completed mag and dig in R 11, Q 011, T 11, S 08, S 09, S 10, S 11, J 08, K 08, L 08, N 08, J 07, K 06, I 08, J 09, K 07, L 07 and L 06. XRF sampling was done on the berm like feature in the North East of the MRS. XRF sampling was also conducted in L 03, L 04, and K 04. The weekly magazine inspection was conducted by the SUXOS and the UXOQC/SO.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

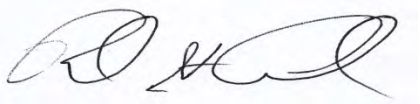
Munitions and Other Items Found Today: (Include location of the items found):Q 11, 14 pieces of frag 1 lb. S 11, two pieces of frag .5 lb. L 06, two pieces of frag and one M51 37mm AP 1.5 lb. N 08, two pieces of frag and two pieces from an 81mm HE projectile 2 lbs. K 08, two pieces of frag .25 lb. j 08, one piece of frag .25 lb. K 06, one piece of frag .25 lb. I 08, one piece of frag .25 lb. K 07, one piece of frag .25 lb.

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): Over 165 pieces weighing over 400 pounds of non munitions related debris were found today. J 10 is inaccessible for investigation. The five grids North, South, and West of I 08 are inaccessible for investigation.

Other comments or additional information: Weather was sunny with in the mid 30's.

Schedule: With the additional grids that need to be investigated the current projected completion is 20 December 2013.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/21/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	XRF
Byron Cook	UXOQC/SO	HDR	10	
John Brunkhorst	UXO Tech III	HDR	10	Mag and Dig
Matt Reece	UXO Tech III	HDR	10	Mag and Dig
Rob Nelson	UXO Tech II	HDR	10	Mag and Dig
Neil Roulier	UXO Tech III	HDR	10	Mag and Dig
Kim Hawkins	UXO Tech II	HDR	10	Mag and Dig
D.A. Gordon	UXO Tech III	HDR	10	Mag and Dig
Chuck Dunmire	UXO Tech II	HDR	10	Mag and Dig
Jeff Reuter	Field Tech III	HDR	10	XRF
Josh Gullickson	UXO Tech II	HDR	10	Mag and Dig
Frank Czajkowski	UXO Tech II	Versar	10	Mag and Dig
Edward Coughlin	UXO Tech II	Versar	10	Mag and Dig
Jeff Massie	UXO Tech II	Versar	10	Mag and Dig

PHOTOGRAPHIC LOG

Photo No.	Date:
1	11/21/13

Description: MD items found during mag & dig (grid N-08).



PHOTOGRAPHIC LOG

Photo No.	Date:
2	11/21/13

Description: MD items found during mag & dig (grid L-06).



PHOTOGRAPHIC LOG

Photo No.	Date:
3	11/21/13

Description: MD collected during mag & dig (grid Q-11).



PHOTOGRAPHIC LOG

Photo No.	Date:
4	11/21/13

Description: In-situ XRF sampling in Tech Approach Area 1.



Date: 11/21/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 026
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:
In-situ XRF sampling as a sub-task of Environmental Media Sampling, IDW Handling and Disposal (3.1.4 Investigative Strategy for Technical Approach 1, 3.1.11.2 Munitions Constituents Lead Sampling-Soil, and 3.7 Investigative Derived Waste Plan)

SUXOS and Field Technician comprised team
Anomaly avoidance was practiced
At PM's request, XRF screening was conducted on the slope in Tech Approach 1 opposite the slope sampled on Nov 14, 2013. The topography is more indicative of a 'natural berm,' with a sharp incline from the mean on the east, outside of the MRS, declining below the mean to meet its opposite at the creek. No small arms debris was located during Assisted Visual Survey and the area is out of line of the ASR firing point (no firing platform indicated) (3.1.11.2, four general situations that are encountered during field operations that would be evaluated to determine if lead sampling and laboratory analysis is required).
XRF screening was also started in the four grids (K-03, K-04, L-03, and L-04) where small arms (.50 caliber) debris was found. Sampling was not completed and will resume tomorrow (Nov 22, 2013).
All readings were below action level; expendable waste debris was therefore considered non-contaminated and disposed of as trash.

Additional QC/QA Comments:
Observed morning Schonstedt function test: all Schonstedts functioned properly.
Magazine inspection conducted: no evidence of tampering or vandalism, chain restricting access is still intact
Observed SUXOS inspection of MD collected by team leaders; MD was identified as MDAS and stored in a lockable container

Comments for DGM Activities, if any: DGM is complete

Comments for Visual Survey Activities: All accessible/surveyable transects are tentatively complete at this time

Comments for MC Sampling, if any: Thirty-three points were measured using In-situ XRF: none were above action level. More XRF sampling is planned, but no laboratory sampling is required at this time.

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Byron Cook, UXOQCS



11/21/2013

Project Name: Port Angeles Combat Range		Report No: 026
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/21/2013

I. Site Safety Brief Topics:

- driving- be aware of school buses and children on the sides of the road, observe posted speed limits
- Personal Protective Equipment (PPE)- checked condition of PPE
- slips, trips, and falls- be especially careful in undergrowth and litter now that teams are working under canopy
- Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC)- safe intrusive procedures
- hydration- status of site water supply
- field sanitation/hygiene- status of hygiene supplies
- Exclusion Zone (EZ) (209 ft/ 43 ft)- visitors expected tomorrow, operational distance between teams to exceed EZ
- first aid- status of supplied team first aid
- weather- currently 25, expected high of 39, sunny and clear

II. Safety Inspections:

SUXOS and UXOSO/QCS inspected the magazines:

- the chain reducing traffic to the magazine site is intact and appears to not have been tampered with
- the grounding is still in place
- doors and locks have not been tampered with
- no marks are present to indicate attempted access or vandalism

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

No additional comments

VII. Visitors

None

VIII. Approval

	Date: 11/21/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Daily Safety Brief and Sign-In Sheet

HDR

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 11/21/2013

SSHO: Byron Cook

Name	Position	Employer	Signature
Kim Hawkins	Tech II	HDR	[signature]
Roulion	Tech III	HDR	[signature]
M. Reece	Tech III	HDR	[signature]
D. Gordon	Tech III	HDR	[signature]
C Dunmire	Tech II	HDR	[signature]
Ed Coughlin	Tech II	Versar	[signature]
J. Gullickson	Tech III	HDR	[signature]
Jeff Massie	Tech II	Versar	[signature]
F. Czaskowski	T-2	Versar	[signature]
Rick St. Amand	SUXOS	HDR	[signature]
Jeff Rueter	Geo	HDR	[signature]
Robert Nelson	UXO II	HDR	[signature]
John Brunkhorst	UXO III	HDR	[signature]
Visitors			

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☐	☐
Trimble	3975		☒	☐
Trimble	3693		☒	☐
Trimble	3974		☐	☐
Trimble	3661		☐	☐
Camera	3088		☐	☐
Camera	~~3083~~ 3965		☒	☐
Camera	3084		☐	☐
Camera	3963		☒	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678		☐	☐
Garmin	3679		☐	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685		☐	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104	[signature]	☒	☐
Schostedt	1636		☐	☐
Schostedt	3658		☐	☐
Schostedt	3105		☐	☐
Schostedt	3885	D. Gordon	☒	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 27 **Day/Date:** 11/22/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): Two teams completed mag and dig in T 12, S 12, T 13, S 13, R 16, R 15, R 14, R 13, K 09,K 10, L 11, M 12, M 13, N 13, N 14, N 15 and N 16. XRF sampling conducted in L 03, L 04, K 03 and K 04. Mark Murphy and Ronnie Johnson, Washington Department of Ecology, conducted a site visit.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

Munitions and Other Items Found Today: (Include location of the items found): S 12, two pieces of frag .5 lb. K 09, one piece of frag .25 lb.

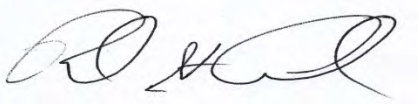
Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): Over 50 pieces weighing over 70 pounds of non munitions related debris were found today. K 11, L 12, L 13, M 14, M 15, and M 16 are inaccessible for investigation.

Other comments or additional information: Weather was sunny with in the low 40's.

Versar personnel demobilized following the conclusion of field activities

Schedule: With the additional grids that need to be investigated the current projected completion is 20 December 2013.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/22/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	XRF
Byron Cook	UXOQC/SO	HDR	10	
John Brunkhorst	UXO Tech III	HDR	10	Mag and Dig
Matt Reece	UXO Tech III	HDR	10	Mag and Dig
Rob Nelson	UXO Tech II	HDR	10	Mag and Dig
Neil Roulier	UXO Tech III	HDR	10	Mag and Dig
Kim Hawkins	UXO Tech II	HDR	10	Mag and Dig
D.A. Gordon	UXO Tech III	HDR	10	Mag and Dig
Chuck Dunmire	UXO Tech II	HDR	10	Mag and Dig
Jeff Reuter	Field Tech III	HDR	10	XRF
Josh Gullickson	UXO Tech II	HDR	10	Mag and Dig
Frank Czajkowski	UXO Tech II	Versar	10	Mag and Dig
Edward Coughlin	UXO Tech II	Versar	10	Mag and Dig
Jeff Massie	UXO Tech II	Versar	10	Mag and Dig

PHOTOGRAPHIC LOG

Photo No.	Date:
1	11/22/13

Description: A general site photo of grid N-13 in Tech Approach Area 2.



PHOTOGRAPHIC LOG

Photo No.	Date:
2	11/22/13

Description: MD items found in grid S-12 in Tech Approach Area 2.



PHOTOGRAPHIC LOG

Photo No.	Date:
3	11/22/13

Description: In-situ XRF being done in Tech Approach Area 2.



Date: 11/22/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 027
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:
In-situ XRF sampling as a sub-task of Environmental Media Sampling, IDW Handling and Disposal (3.1.4 Investigative Strategy for Technical Approach 1, 3.1.11.2 Munitions Constituents Lead Sampling-Soil, and 3.7 Investigative Derived Waste Plan)

SUXOS and Field Technician comprised XRF team
Anomaly avoidance was practiced
XRF screening was continued and completed in the four grids (K-03, K-04, L-03, and L-04) where small arms (.50 caliber) debris was found.
All readings were below action level; expendable waste debris was therefore considered non-contaminated and disposed of as trash. No laboratory samples are recommended at this time, due to XRF values.

Additional QC/QA Comments:
All Schonstedts taken into the field were signed for on the Daily Inventory Sheet and tested at the IVS. All Schonstedts used today were functioning properly.
Mark Murphy, USACE Regional Project Lead, and Ronnie Johnson, Washington Department of Ecology, conducted a site visit. UXOSO/QCS, OESS, and Field Technician III escorted them around the MRS. Areas of interest were: the grid where four MEC items were found, the area of the Swagerty incident, and the eastern edge of Surveyor Creek, marked off as unsurveyable. They were also shown the site where demolition operations were conducted to destroy the four MEC items.
Observed SUXOS inspection of MD collected by team leaders; MD was identified as MDAS and stored in a lockable container
Teams secured all site equipment in preparation for demobilization activities. The IVS, survey points, and laths and flagging marking them will remain during demobilization.
Versar personnel demobilized from the site at the conclusion of field activities.

Comments for DGM Activities, if any: DGM is complete

Comments for Visual Survey Activities: All accessible/surveyable transects are complete at this time

Comments for MC Sampling, if any: Thirty-two points were measured using In-situ XRF: none were above action level. No further sampling is planned at this time.

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Byron Cook, UXOQCS



11/22/2013

Project Name: Port Angeles Combat Range		Report No: 027
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/22/2013

I. Site Safety Brief Topics:

- driving- general 'drive safely,' be aware
- Personal Protective Equipment (PPE)- checked condition of PPE, status of PPE supply
- slips, trips, and falls- watch footing walking to/ setting up grids
- Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC)- dig to the side, control dirt/debris removal until anomaly is identified
- hydration- take adequate supply of water out to work areas
- field sanitation/hygiene- location and status of hygiene supplies; re-supplied one of the teams
- Exclusion Zone (EZ) (209 ft/ 43 ft)- visitors expected, be aware of EZ intrusion
- first aid- reminder to pack a minimum first aid and eye wash
- weather- currently 27, expected high of 43-46, sunny and clear, light breeze

II. Safety Inspections:

Observed XRF team: team wore appropriate PPE and practiced MEC avoidance during operation

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

No additional comments

VII. Visitors

None

VIII. Approval

	Date: 11/22/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable **Evacuation Route:** toward the assembly point	**Supervisor of Work:** SUXOS Rick St. Amand **Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

27° 43/46° S/Clear

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 22 Nov 2013

SSHO: Byron Cook

Name	Position	Employer	Signature
Robert Nelson	UXO II	HDR	
M. Reece	UXO III	HDR	
Kim Henderson	UXO III	HDR	
Rollier	UXO III	HDR	
D. Gordon	UXO III	HDR	
JOHN BRUNKHORST	UXO III	HDR	
F. CZAJKOWKI	T-2	VERSAR	
JESS MASSEE	TECH III	VERSAR	
JOSH GULLICKSON	TECH III	HDR	
Ed Coughlin	Tech II	Versar	
Jeff Rueter	GEO	HDR	
C. DUNMIRE	TECH II	HDR	
Rick St. Amand	GUXOS	HDR	
RONNIE JOHNSON	ECOLOGY UXO	Dept of Ecology	
MARK MURPHY	USACE PM	USACE	
Visitors			

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104	M M	☒	☐
Schostedt	1636		☐	☐
Schostedt	3658		☐	☐
Schostedt	3105	K Hawkins	☒	☐
Schostedt	3885	D. Graham	☒	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☐	☐
Trimble	3975		☒	☐
Trimble	3693		☒	☐
Trimble	3974		☐	☐
Trimble	3661		☐	☐
Camera	3088		☐	☐
Camera	~~3083~~ 3965		☒	☐
Camera	3084		☐	☐
Camera	3963		☒	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678		☐	☐
Garmin	3679		☐	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685		☐	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 28 **Day/Date:** 11/23/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 0

Activities Conducted: (Include location of work performed including equipment used): Unloaded all vehicles and conducted vehicle preventative maintenance.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

Munitions and Other Items Found Today: (Include location of the items found): None.

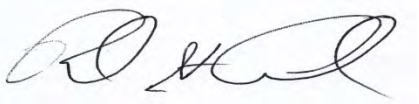
Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): None.

Other comments or additional information: Weather was sunny with in the low 40's.

Site demobilization began today. SUXOS and UXOSO/QCS remain to conduct weekly magazine inspection, all other site personnel departed.

Schedule: With the additional grids that need to be investigated the current projected completion is 20 December 2013.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/23/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	0	
Byron Cook	UXOQC/SO	HDR	0	
John Brunkhorst	UXO Tech III	HDR	0	
Matt Reece	UXO Tech III	HDR	0	
Rob Nelson	UXO Tech II	HDR	0	
Neil Roulier	UXO Tech III	HDR	0	
Kim Hawkins	UXO Tech II	HDR	0	
D.A. Gordon	UXO Tech III	HDR	0	
Chuck Dunmire	UXO Tech II	HDR	0	
Jeff Reuter	Field Tech III	HDR	0	
Josh Gullickson	UXO Tech II	HDR	0	

Date: 11/23/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 028
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments: Demobilization activities were conducted:
All site equipment was removed from vehicles, checked for condition, cleaned as necessary, inventoried, and stowed. One hotel room will be kept during demobilization to secure gear and allow for vehicle parking. The leased vehicle was given a safety inspection and will remain; rental vehicles will be returned. A safety briefing was conducted and included holiday safety topics. Magazine keys were inventoried and are in their proper possession. Upon completion of activities, personnel were released to travel to Seattle for outbound flights. UXOSO/QCS and SUXOS will remain one more day to conduct weekly magazine inspection and recover the magnetometer test strip items installed on the west side of the MRS.

Comments for DGM Activities, if any: DGM is complete

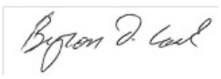
Comments for Visual Survey Activities: All accessible/surveyable transects are complete at this time

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Byron Cook, UXOQCS



11/23/2013

Project Name: Port Angeles Combat Range		Report No: 028
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/23/2013

I. Site Safety Brief Topics:

Driving safety/ extended driving and responsibility of 'shotgun' passenger, PPE requirements for demobilization activities, lifting safely, holiday safety tips and hazards of drinking and driving/ drunk drivers on the road

II. Safety Inspections:

Site equipment was checked for proper functioning

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

No additional comments

VII. Visitors

None

VIII. Approval

	Date: 11/23/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, ~~First aid, field~~ sanitation/ ~~hygiene~~, ~~slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather~~ lifting Holidays

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 11/23/2013

SSHO: Byron Cook

Name	Position	Employer	Signature
D. Gordon	Tech III	HDR	D. Gordon
C Dunmire	TECH II	HDR	
R St. Amand	UXO5	HDR	
Jim Hawkins	Tech II	HDR	
Josh Gullickson	Tech III	HDR	
Jeff Ruetes	Geo	HDR	
Nick Rollins	Tech III	HDR	
JOHN BRUNKHORST	TECH III	HDR	John Brunkhorst
Robert Nelson	UXO II	HDR	
M. Rice	UXO III	HDR	
Visitors			

Vehicle Inspection Checklist and Report Form

HDR ONE COMPANY | Many Solutions

Site Name/Location: PACR

Site Supervisor: R. STAMAND

Vehicle: 2012 Dodge Ram 2500
(Make and License Plate Number) ZCM-9703-PENN

Date Inspected: 11-23-13

Mileage: 16,062

Owner: Lease-Express Car & Truck Rental
(Rental, GKY Contract)

Item Description	Monday			Tuesday			Wednesday			Thursday			Friday		
	Pass			Pass			Pass			Pass			Pass		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Registration and License Plate	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Insurance	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Emergency Route Map/Phone #s	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
2 Tires:															
Pressure	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Condition	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
3 Equipment:															
Fire Extinguishers	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
First Aid/CPR/Burn Kits	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Blood Borne Pathogen Kit	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Eyewash Kits	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Spare Tire	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Tire Changing Equipment	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Tie Downs*	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
Chocks*	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
Placards*	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4. Brakes															
Hand/Emergency	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Service	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
5. Belts															
Proper Tension	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Condition	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
6. General:															
Windshield	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Windshield Wipers	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Windows (Condition/Operation)	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Seat Belts	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Steering	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Horn	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Gas Cap	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Mirrors	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Door/Window Handles/Latches	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Cleanliness	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Exhaust System	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
7. Lights:															
Headlights (High/Low)	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Brake Lights	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Parking	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Back-up	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Turn Signals	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Emergency Flashers	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Interior Lights	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐

Contract No. W912PL-08-D-0028F-10-D-0058
Delivery Order 0006
E-294

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 29 **Day/Date:** 11/24/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 3

Activities Conducted: (Include location of work performed including equipment used): Conducted magazine inspection and recovered seeds from Snow Ridge Road access to the West side of Area 3.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

Munitions and Other Items Found Today: (Include location of the items found): None.

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): None.

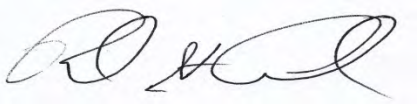
Other comments or additional information: Weather was sunny with in the mid 40's.

SUXOS and UXOSO/QCS demobilized following field activities.

This is the final Daily Site Report until field activities resume, Dec 3, 2013.

Schedule: With the additional grids that need to be investigated the current projected completion is 20 December 2013.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 11/24/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	3	
Byron Cook	UXOQC/SO	HDR	3	
John Brunkhorst	UXO Tech III	HDR	0	
Matt Reece	UXO Tech III	HDR	0	
Rob Nelson	UXO Tech II	HDR	0	
Neil Roulier	UXO Tech III	HDR	0	
Kim Hawkins	UXO Tech II	HDR	0	
D.A. Gordon	UXO Tech III	HDR	0	
Chuck Dunmire	UXO Tech II	HDR	0	
Jeff Reuter	Field Tech III	HDR	0	
Josh Gullickson	UXO Tech II	HDR	0	

Date: 11/24/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 029
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments: UXOSO/QCS and SUXOS conducted the weekly magazine inspection. There was no evidence of tampering or vandalism, the grounding wires and rods are still intact/ in place, and the chain blocking vehicular traffic to the magazine site is still intact/ in place.

The two inert 37mm projectiles used for instrument verification on the west side of the MRS were recovered and stowed with the rest of the site equipment. Hotel owners/ management were notified that company personnel would no longer be in the area and access to the room should not be allowed prior to returning Dec 2, 2013. Company leased vehicle was parked where directed and key secured.

UXOSO/QCS and SUXOS demobilized following field activities.

This is the final DQCR until field activities resume Dec 3, 2013

Comments for DGM Activities, if any: DGM is complete

Comments for Visual Survey Activities: All accessible/surveyable transects are complete at this time

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Byron Cook, UXOQCS



11/24/2013

Project Name: Port Angeles Combat Range		Report No: 029
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 11/24/2013

I. Site Safety Brief Topics:

Driving safety to/from MRS and during demobilization, slips/trips/falls while negotiating terrain, digging to recover test strip items

II. Safety Inspections:

Weekly explosives magazine inspection conducted: no evidence of tampering or vandalism, the chain limiting access is in place, the grounding rods and wire are still intact

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

This is the final Daily Safety Report until field activities resume Dec 3, 2013

VII. Visitors

None

VIII. Approval

	Date: 11/24/2013
Byron D. Loud	

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 30 **Day/Date:** 12/3/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 7

Activities Conducted: (Include location of work performed including equipment used): Conducted magazine inspection and secured explosives delivered by FEDEX. Completed mag and dig investigation of Q 01, Q 02, Q 03, R 01, R 02, R 03, S 02, Q 15, Q 16, P 16, N 17, P 17, and Q 17.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

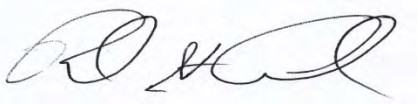
Munitions and Other Items Found Today: (Include location of the items found): P 16 M48 point detonating fuze (expended), 1 lb. Q 02 81mm mortar fin pieces .25 lb. R 03 1 piece of frag .25 lb.

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): Six grids were added due to MD in adjacent grids. 98 pieces of non munitions related debris weighing over 130 lbs were found.

Other comments or additional information: Weather was sunny and cool with a high near 30.

Schedule: With the additional grids that need to be investigated the current projected completion is 20 December 2013.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 12/3/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	7	
Byron Cook	UXOQC/SO	HDR	7	
John Brunkhorst	UXO Tech III	HDR	7	Mag & Dig
Pete Vallejo	UXO Tech II	HDR	7	Mag & Dig
Rob Nelson	UXO Tech II	HDR	7	Mag & Dig
Neil Roulier	UXO Tech III	HDR	7	Mag & Dig
Kim Hawkins	UXO Tech II	HDR	7	Mag & Dig
D.A. Gordon	UXO Tech III	HDR	7	Mag & Dig
Chuck Dunmire	UXO Tech II	HDR	7	Mag & Dig
Nick Inzinna	Field Tech III	HDR	7	
Ron Hetzel	UXO Tech II	HDR	7	Mag & Dig

PHOTOGRAPHIC LOG

Photo No.	Date:
1	12/03/13

Description: MD found in Grid R-03



PHOTOGRAPHIC LOG

Photo No.	Date:
2	12/03/13

Description: Site documentation photo of grid Q-03, observed from the north



PHOTOGRAPHIC LOG

Photo No.	Date:
3	12/03/13

Description: MD (M48 point detonating fuze (expended)) found in Grid P-16



PHOTOGRAPHIC LOG

Photo No.	Date:
4	12/03/13

Description:
Documentation of terrain from grid P-17



Date: 12/3/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 030
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:
Assisted Visual Surveys, Subsurface Investigations, MD Handling, Storage, and Demilitarization

Due to the holiday break, addition of two personnel to the project, and changes in team make-up, site personnel reviewed requirements and procedures for Definable Features of Work (DFWs) listed above. Personnel qualifications were reviewed by UXOSO/QCS and certifications are available for inspection. Personnel were divided into teams with responsibilities assigned and communicated. Equipment was inventoried, inspected, and divided between teams.

Initial Phase Inspection: Subsurface Investigations and MD Handling, Storage, and Demilitarization

Subsurface Investigations resumed following the Preparatory Phase Inspection. Personnel demonstrated proficiency in locating and establishing grids and survey lanes, surveyed the grids following the parameters established in the work plan, and safely investigated anomalies following established procedures. MD Handling procedures were followed and materials determined to be MDAS by the SUXOS's inspection were stored in a lockable container.

Follow-Up Phase Inspection:

Additional QC/QA Comments: Observed distribution of team equipment and vehicle load-out
Observed Schonstedt instrument checks
Reviewed documentation of explosives magazines inspection conducted 12/01/2013: no evidence of tampering or vandalism reported
Explosives were received and secured in the magazines; data cards were reviewed for accuracy. An inspection was conducted by the SUXOS, custodian, and UXOSO/QCS: magazines are secure with no evidence of tampering, grounding is still in place, and the chain restricting vehicular access is still intact.

Comments for DGM Activities, if any: DGM is complete

Comments for Visual Survey Activities: Access to the south-east and south-west corners of the MRS are being investigated

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Byron Cook, UXOQCS



12/3/2013

Project Name: Port Angeles Combat Range		Report No: 030
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 12/3/2013

I. Site Safety Brief Topics:

- Driving- be aware of possible icy roads
- Personal Protective Equipment (PPE)- reviewed PPE requirements; checked supply status
- slips, trips, and falls- watch footing walking to/ setting up grids
- Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC)- dig to the side, control dirt/debris removal until anomaly is identified
- hydration- take adequate supply of water out to work areas; checked water supply
- field sanitation/hygiene- pack out garbage; checked supply status
- Exclusion Zone (EZ) (209 ft/ 43 ft)- no visitors expected, teams operating on opposite ends of range
- first aid- reminder to pack a minimum first aid and eye wash
- weather- expected high of 27, sunny and clear, light breeze, daylight 0745-1621

II. Safety Inspections:

Observed teams' vehicle load-out; vehicles were equipped with essential safety gear

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

Due to the holiday break, the addition of two personnel to the project, and changes in team make-up, site personnel reviewed the APP/SSHP, the work plan regarding technical approaches and defined features of work, MEC and MD found and suspected, and reporting procedures. Observation and OJT begin today.

VII. Visitors

None

VIII. Approval

	Date: 12/3/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Sun 7:45-4:21

Clear 27°

All week in 20's

Daily Safety Brief and Sign-In Sheet

HDR

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 12/3/2013

SSHO: Byron Cook

Name	Position	Employer	Signature
Nick Wenner	Geo Tech	HDR	[illegible]
D. Gordon	UXO III	HDR	[illegible]
C DUNMIRE	UXO II	HDR	[illegible]
R Nelson	UXO II	HDR	[illegible]
John Brunkhorst	UXO III	HDR	[illegible]
Ronald Hetzel	UXO III	HDR	[illegible]
Pete Valley	UXO II	HDR	[illegible]
Rouyer	UXO III	HDR	[illegible]
Kim Jenkins	UXO Tel II	HDR	[illegible]
Rick St. Amand	SUXOS	HDR	[illegible]
Visitors			

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104		☐	☐
Schostedt	1636		☐	☐
Schostedt	3658		☑	☐
Schostedt	3105		☒	☐
Schostedt	3885		☒	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678		☐	☐
Garmin	3679		☐	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685		☐	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☐	☐
Trimble	3975		☒	☐
Trimble	3693		☐	☐
Trimble	3974		☐	☐
Trimble	3661		☐	☐
Camera	3088		☐	☐
Camera	3083		☐	☐
Camera	3084 3965		☐	☐
Camera	3963		☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Currently 20°
High 26° clear
Sun 7:46 - 4:21

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 12/4/2013

SSHO: Byron Cook

Name	Position	Employer	Signature
Rowlison	UXO III	HDR	
Gordon	UXO III	HDR	
RNelson	UXO II	HDR	
Ronald Hetzel	UXO III	HDR	
John Brunkhorst	UXO III	HDR	
Nick Irvine	Geotech	HDR	
Pedro Valle	UXO Tz	HDR	
Kim Hawkins	UXO Tz	HDR	
Rick St. Amand	UXOS	HDR	
C Dunmire	UXO II	HDR	
Visitors			

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660	Ronnie	☒	☐
Trimble	3975		☐	☐
Trimble	3693		☑	☐
Trimble	3974		☒	☐
Trimble	3661		☐	☐
Camera	3088		☐	☐
Camera	3083		☐	☐
Camera	3084		☒	☐
Camera	3963		☑	☐
	1004	Ronnie	X	

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Gordon	☑	☐
Garmin	3679		☐	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Ronnie	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104		☐	☐
Schostedt	1636		☐	☐
Schostedt	3658		☒	☐
Schostedt	3105		☒	☐
Schostedt	3885		☒	☐
Schostedt	3887		☒	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 32 **Day/Date:** 12/5/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): One team completed mag and dig investigation of R 12, P 11, P10, P 09, N 09, N 10, and N 11. Two assisted visual survey teams resumed surveys in the South East. Team November found two surface anomalies that were non munitions related debris. Team India found nothing.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

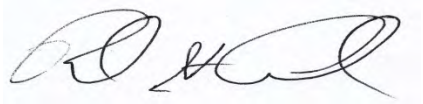
Munitions and Other Items Found Today: (Include location of the items found): P 10, two pieces of frag, .25 lb. N 09, one 37mm armor piercing projectile, 1 lb.

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): 14 pieces of non munitions related debris weighing over 30 lbs were found.

Other comments or additional information: Weather was overcast with periods of snow with a high in the mid 20's.

Schedule: With the additional grids that need to be investigated the current projected completion is 13 December 2013.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 12/5/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
John Brunkhorst	UXO Tech III	HDR	10	Mag & Dig
Pete Vallejo	UXO Tech II	HDR	10	Mag & Dig
Rob Nelson	UXO Tech II	HDR	10	Mag & Dig
Neil Roulier	UXO Tech III	HDR	10	India
Kim Hawkins	UXO Tech II	HDR	10	India
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Nick Inzinna	Field Tech III	HDR	10	
Ron Hetzel	UXO Tech II	HDR	10	Mag & Dig

PHOTOGRAPHIC LOG

Photo No.	Date:
1	12/05/13

Description: MD found in Grid P-10



PHOTOGRAPHIC LOG

Photo No.	Date:
2	12/05/13

Description: MD found in Grid N-09, 37mm armor-piercing projectile



PHOTOGRAPHIC LOG

Photo No.	Date:
3	12/05/13

Description: Terrain from Grid R-12, view looking West



PHOTOGRAPHIC LOG

Photo No.	Date:
4	12/05/13

Description: Terrain photo from the southeastern portion of the MRS, view looking North



Date: 12/5/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 032
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection: Subsurface Investigations (3.1.7 Intrusive Investigation)
Observed mag & dig team: team established grid boundaries and performed sweeps with Schonstedt magnetometers. Sweeps were spaced approximately every 50ft with deviations for vegetation. No anomaly investigation occurred during observation.

Additional QC/QA Comments: Schonstedt validation checks were conducted prior to the start of work
Observed Trimble start of day procedures; Trimble data was QCed by Nicholas Inzinna
UXOSO/QCS did not perform Initial Phase Inspection of either Assisted Visual Survey (AVS) teams; both teams were comprised of the same personnel as prior to the holiday break and had been observed previously. There was a possibility of a third (new) team beginning AVS that would require an initial observation. The SUXOS later decided the third team would not be required. UXOSO/QCS then performed Follow-Up Inspection of the mag & dig team.
Received and filed approval letter for UXO personnel identified by name and position from PM.
The MD Handling and Storage process was completed with the SUXOS' inspection of MD recovered by the mag & dig team. MD determined to be MDAS was stored in a lockable container. AVS teams did not recover any MD.

Comments for DGM Activities, if any: DGM is complete

Comments for Visual Survey Activities: Access to the south-east corner of the MRS was found by way of an easement: a logging road through the state land was used to access transects previously thought inaccessible because of the lack of ROE. AVS teams India and November are conducting surveys until transects are completed or unsurveyable areas are further delineated.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Byron Cook, UXOQCS



12/5/2013

Project Name: Port Angeles Combat Range		Report No: 032
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 12/5/2013

I. Site Safety Brief Topics:

- Driving- be aware of other drivers
- Personal Protective Equipment (PPE)- reviewed PPE requirements
- slips, trips, and falls- take time and watch footing
- Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC)- assume any anomaly could be a 'live' item
- hydration- take adequate supply of water out to work areas
- field sanitation/hygiene- clean hands prior to eating
- Exclusion Zone (EZ) (209 ft/ 43 ft)- reminder to be aware of exclusion zone
- first aid- reminder to pack a minimum first aid and eye wash
- weather- expected high of 28, partly cloudy, daylight 0748-1621

II. Safety Inspections:

Observed mag & dig team: personnel wore appropriate PPE and worked together to minimize slip/trip/fall hazards of terrain and vegetation

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

No additional comments

VII. Visitors

None

VIII. Approval

	Date: 12/5/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable **Evacuation Route:** toward the assembly point	**Supervisor of Work:** SUXOS Rick St. Amand **Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Current 22°
Overcast 28°
0748-1621

Daily Safety Brief and Sign-In Sheet

HDR

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 12/5/2013

SSHO: Byron Cook

Name	Position	Employer	Signature
John Brunkhorst	UXO Tech III	HDR	[signature]
Roulier	UXO TECH III	HDR	[signature]
D. Vallejo	UXO TECH	HDR	[signature]
C DUNMIRE	UXO II	HDR	[signature]
Vick Virsuna	Geo Tech	HDR	[signature]
D. GORDON	UXO III	HDR	D. Gordon
R St. Amand	UXOS	HDR	[signature]
Robert Nelson	UXO II	HDR	[signature]
Ronald Hetzel	UXO III	HDR	[signature]
Kim Hawkins	UXO II	HDR	[signature]
Visitors			

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☒	☐
Trimble	3975		☐	☐
Trimble	3693		☑	☐
Trimble	3974		☒	☐
Trimble	3661		☐	☐
Camera	3088		☐	☐
Camera	3083		☐	☐
Camera	3084		☒	☐
Camera	3963 3090		☒	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Gordon	☒	☐
Garmin	3679		☐	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685		☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

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Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104		☐	☐
Schostedt	1636		☐	☐
Schostedt	3658		☒	☐
Schostedt	3105		☒	☐
Schostedt	3885		☒	☐
Schostedt	3887		☒	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 33 **Day/Date:** 12/6/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 7

Activities Conducted: (Include location of work performed including equipment used): One team completed mag and dig investigation of N 12, M 09, M 10, and M 11. Two assisted visual survey teams resumed surveys in the South East. Team November found one surface anomaly that was non munitions related debris. Team India found nothing but only conducted surveys for half of the day due to demolition operations. Demolition operations were conducted to destroy one 37mm HE and demil one 75mm practice projectile.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

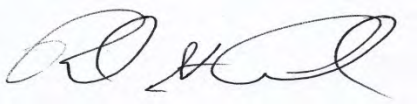
Munitions and Other Items Found Today: (Include location of the items found): M 09, one piece of frag, .25 lb. M 10, two pieces of frag, .25 lb. N 12, one 75mm practice projectile, 10 lbs. M 11, one 37mm HE projectile, 1 lb.

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): 16 pieces of non munitions related debris weighing over 300 lbs were found.

Other comments or additional information: Weather was sunny with a high in the mid 20's.

Schedule: With the additional grids that need to be investigated the current projected completion is 20 December 2013.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 12/6/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	7	
Byron Cook	UXOQC/SO	HDR	7	
John Brunkhorst	UXO Tech III	HDR	7	Mag & Dig
Pete Vallejo	UXO Tech II	HDR	7	Mag & Dig
Rob Nelson	UXO Tech II	HDR	7	Mag & Dig
Neil Roulier	UXO Tech III	HDR	7	India
Kim Hawkins	UXO Tech II	HDR	7	India
D.A. Gordon	UXO Tech III	HDR	7	November
Chuck Dunmire	UXO Tech II	HDR	7	November
Nick Inzinna	Field Tech III	HDR	7	
Ron Hetzel	UXO Tech II	HDR	7	Mag & Dig

PHOTOGRAPHIC LOG

Photo No.	Date:
1	12/06/13

Description: 37mm HE projectile and 75mm practice projectile



PHOTOGRAPHIC LOG

Photo No.	Date:
2	12/06/13

Description: Det cord coming out of the two tamped shot holes leading to the priming loop (right of photo)



PHOTOGRAPHIC LOG

Photo No.	Date:
3	12/06/13

Description: Non munitions related debris found in grid N-12



PHOTOGRAPHIC LOG

Photo No.	Date:
4	12/06/13

Description: Terrain and vegetation from the southeastern portion of the MRS, view looking East



Date: 12/6/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 033
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection: MEC Disposal by Detonation and MD Handling, Storage, and Demilitarization (3.6 Management of Material Potentially Presenting an Explosive Hazard)
The mag & dig team found a 75mm practice projectile and a 37mm HE projectile. Items were inspected by UXOSO/QCS and SUXOS and determined to be safe to move. The Buried Explosive Module was used to determine shot hole depth and a demo site was prepared to dispose of the 37mm and demilitarize the 75mm while explosives were drawn. Clallam County Dispatch was notified of operations and SUXOS conducted a demolitions safety brief. Operations were conducted IAW EM 385-1-97, 60A-1-1-31 and the PACR work plan. A consumption report was generated and signed and is filed.

Follow-Up Phase Inspection:

Additional QC/QA Comments: Schonstedt validation checks were conducted prior to the start of work
Observed Trimble start of day procedures; Trimble data was QCed by Nicholas Inzinna
Verified equipment taken into the field was signed for on the Daily Equipment Log
Began Follow-Up Phase Inspection of Assisted Visual Surveys of team India. The team did not collect any data before notification that the mag & dig team located the 75mm projectile. UXOSO/QCS met the SUXOS to inspect the round, team India was used for the demolition operation after the 37mm was found.
Vehicle and safety equipment inventory and inspection conducted
MD processed by the teams was inspected by the SUXOS, determined to be MDAS, and stored in a lockable container

Comments for DGM Activities, if any: DGM is complete

Comments for Visual Survey Activities: Team November continued AVS in the south-eastern portion of the MRS, locating one piece of NMRD and documenting several unsurveyable points

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Byron Cook, UXOQCS



12/6/2013

Project Name: Port Angeles Combat Range		Report No: 033
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 12/6/2013

I. Site Safety Brief Topics:

- Driving- be aware of other drivers
- Personal Protective Equipment (PPE)- reviewed PPE requirements
- slips, trips, and falls- take time and watch footing
- Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC)- assume any anomaly could be a 'live' item
- hydration- take adequate supply of water out to work areas
- field sanitation/hygiene- clean hands prior to eating
- Exclusion Zone (EZ) (209 ft/ 43 ft)- reminder to be aware of exclusion zone
- first aid- reminder to pack a minimum first aid and eye wash
- weather- expected high of 21, partly cloudy, daylight 0749-1621

II. Safety Inspections:

Observed demolition operations: safety brief was given, operations performed in accordance with applicable publications and guidelines, exclusion zone observed and under control until 'all clear' given

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

UXOSO/QCS and SUXOS inspected a 75mm round found by the mag & dig team, determined to be practice, and a 37mm determined to be High Explosive and safe to move. Items were moved to a prepared demo site in the open area and destroyed/demilitarized.

Vehicle safety inspections conducted, including inventory of first aid kits and fire extinguisher inspection

VII. Visitors

None

VIII. Approval

	Date: 12/6/2013
	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Current : 24° MC

High 21°

PC

Daylight 0749 - 1621

Daily Safety Brief and Sign-In Sheet

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 12/6/2013

SSHO: Byron Cook

Name	Position	Employer	Signature
Nick Iverson	Geo Tech	HDR	
Kim Hutchings	UXO Tech II	HDR	
J Koulier	UXO III	HDR	
Ronald Hetzel	UXO III	HDR	
D. GORDON	UXO III	HDR	
R St. AMAND	SUXO3	HDR	
C DUNMIRE	UXO II	HDR	
B Nelson	UXO II	HDR	
John Brunkhorst	UXO Tech III	HDR	John Brunkhorst
P. VanHoy	UXO TECH	HDR	

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660	Rollor	☒	☐
Trimble	3975		☐	☐
Trimble	3693		☒	☐
Trimble	3974		☒	☐
Trimble	3661		☐	☐
Camera	3088		☐	☐
Camera	3083		☐	☐
Camera	3084		☒	☐
Camera	3963		☒	☐
	1004	Rollor	X	

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104		☐	☐
Schostedt	1636		☐	☐
Schostedt	3658		☑	☐
Schostedt	3105		☒	☐
Schostedt	3885		☒	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Hanlon	☒	☐
Garmin	3679		☐	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Rollins	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

Vehicle Inspection Checklist and Report Form

HDR ONE COMPANY | Many Solutions

Site Name/Location: PACR

Site Supervisor: Rick St Amand

Vehicle: 2012 Dodge Ram 2500
(Make and License Plate Number) ZCM-9703-PENN

Date Inspected: 6 Dec 13

Mileage: 16204

Owner: Loose-Express Car & Truck Rental
(Rental, SKW Contract)

Item Description	Monday			Tuesday			Wednesday			Thursday			Friday		
	Pass			Pass			Pass			Pass			Pass		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Registration and License Plate	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Insurance	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Emergency Route Map/Phone #s	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
2 Tires:															
Pressure	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Condition	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
3 Equipment:															
Fire Extinguishers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
First Aid/CPR/Burn Kits	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Blood Borne Pathogen Kit	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Eyewash Kits	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Spare Tire	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Tire Changing Equipment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Tie Downs*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Chocks*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Placards*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4. Brakes															
Hand/Emergency	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Service	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
5. Belts															
Proper Tension	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Condition	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
6. General:															
Windshield	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Windshield Wipers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Windows (Condition/Operation)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Seat Belts	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Steering	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Horn	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Gas Cap	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Mirrors	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Door/Window Handles/Latches	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Cleanliness	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Exhaust System	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
7. Lights:															
Headlights (High/Low)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Brake Lights	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Parking	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Back-up	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Turn Signals	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Emergency Flashers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐
Interior Lights	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐

Contract No.: W912P8-10-D-0058
Delivery Order 0006

Vehicle Inspection Checklist and Report Form

HDR ONE COMPANY | Many Solutions

Site Name/Location: PACR

Site Supervisor: STANLAND

Vehicle: Project Rental - #1 / Project #206945
(Make and License Plate Number)

Date Inspected: 6 Dec 13

Mileage: 12071

Owner: EUTERPRISE
(Rental, SKY, Contract)

Item Description	Monday Pass			Tuesday Pass			Wednesday Pass			Thursday Pass			Friday Pass		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Registration and License Plate	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Insurance	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Emergency Route Map/Phone #s	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
2 Tires:															
Pressure	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Condition	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
3 Equipment:															
Fire Extinguishers	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
First Aid/CPR/Burn Kits	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Blood Borne Pathogen Kit	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Eyewash Kits	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Spare Tire	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Tire Changing Equipment	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Tie Downs*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Chocks*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Placards*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
4. Brakes															
Hand/Emergency	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Service	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
5. Belts															
Proper Tension	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Condition	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
6. General:															
Windshield	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Windshield Wipers	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Windows (Condition/Operation)	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Seat Belts	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Steering	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Horn	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Gas Cap	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Mirrors	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Door/Window Handles/Latches	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Cleanliness	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Exhaust System	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
7. Lights:															
Headlights (High/Low)	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Brake Lights	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Parking	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Back-up	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Turn Signals	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Emergency Flashers	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐
Interior Lights	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐

Vehicle Inspection Checklist and Report Form

HDR ONE COMPANY | Many Solutions

Site Name/Location: PACR

Site Supervisor: R. ST. AMAND

Vehicle: Project Rental #2 / Project # 206945
(Make and License Plate Number)

Date Inspected: 6 DEC 2013

Mileage: 8,163

Owner: ____
(Rental, SKY, Contract)

Item Description	Monday Pass			Tuesday Pass			Wednesday Pass			Thursday Pass			Friday Pass		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Registration and License Plate	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Insurance	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Emergency Route Map/Phone #s	☑	☐	☐	☑	☐	☐	☒	☐	☐	☑	☐	☐	☑	☐	☐
2 Tires:															
Pressure	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Condition	☑	☐	☐	☑	☐	☐	☑	☐	☐	☑	☐	☐	☒	☐	☐
3 Equipment:															
Fire Extinguishers	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
First Aid/CPR/Burn Kits	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Blood Borne Pathogen Kit	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Eyewash Kits	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Spare Tire	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tire Changing Equipment	☒	☐	☐	☑	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Tie Downs*	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒
Chocks*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Placards*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other:	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒
4. Brakes															
Hand/Emergency	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Service	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒
5. Belts															
Proper Tension	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Condition	☑	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
6. General:															
Windshield	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Windshield Wipers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Windows (Condition/Operation)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Seat Belts	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Steering	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Horn	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Gas Cap	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Mirrors	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Door/Window Handles/Latches	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cleanliness	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Exhaust System	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
7. Lights:															
Headlights (High/Low)	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐
Brake Lights	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Parking	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Back-up	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Turn Signals	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Emergency Flashers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interior Lights	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 34 **Day/Date:** 12/9/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): One team completed mag and dig investigation of L 09, L 10, T 10, T 09, T 08, T 07 and S 07. Two assisted visual survey teams resumed surveys in the South East. Team November found one surface anomaly that was non munitions related debris. Team India found nothing.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

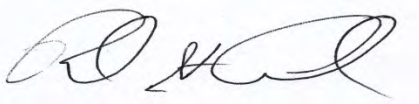
Munitions and Other Items Found Today: (Include location of the items found): L 09, two 37mm armor piercing projectiles and four pieces of frag, 4.75 lb. L 10, one piece of frag, .25 lb. S 07, one piece of frag, .25 lbs.

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): Over 30 pieces of non munitions related debris weighing over 200 lbs were found.

Other comments or additional information: Weather was mostly cloudy with a high near 30.

Schedule: Field operations are tentatively scheduled to be completed on 12-11-2013. Site teardown including consumption of the remaining donor explosives, removal of the storage magazine, site rehabilitation/seeding, replacement of the Manke dirt berm and other general demobilization activities will tentatively be completed 12-12 and 12-13 2013.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 12/9/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
John Brunkhorst	UXO Tech III	HDR	10	Mag & Dig
Pete Vallejo	UXO Tech II	HDR	10	Mag & Dig
Rob Nelson	UXO Tech II	HDR	10	Mag & Dig
Neil Roulier	UXO Tech III	HDR	10	India
Kim Hawkins	UXO Tech II	HDR	10	India
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Nick Inzinna	Field Tech III	HDR	10	
Ron Hetzel	UXO Tech II	HDR	10	Mag & Dig

PHOTOGRAPHIC LOG

Photo No.	Date:
1	12/09/13

Description: MD items from grid L-09



PHOTOGRAPHIC LOG

Photo No.	Date:
2	12/09/13

Description: Terrain from Grid S-07, view looking South



PHOTOGRAPHIC LOG

Photo No.	Date:
3	12/09/13

Description:
Unsurveyable terrain due to thick vegetation and steep slopes on either side of a range road in the southeastern portion of the MRS, view looking South



PHOTOGRAPHIC LOG

Photo No.	Date:
4	12/09/13

Description:
Unsurveyable terrain due to thick vegetation and steep slopes on either side of a range road in the southeastern portion of the MRS, view looking North



Date: 12/9/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 034
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection: Subsurface Investigations (3.1.7 Intrusive Investigation)
Observed mag & dig team: team had already established its grid. Lanes were swept at approximately 50ft intervals. Sweep speeds were appropriate. Anomaly investigation/excavation was conducted IAW EM 385-1-97. MPPEH was inspected by a UXO Tech II and The UXO Tech III team leader and determined to be NMRD, left in place.

Additional QC/QA Comments: Schonstedt validation checks were conducted prior to the start of work
Observed Trimble start of day procedures; Trimble data was QCed by Nicholas Inzinna
Verified equipment taken into the field was signed for on the Daily Equipment Log
MD processed by the teams was inspected by the SUXOS, determined to be MDAS, and stored in a lockable container
Drafted demobilization timeline to discuss with PM based on probability field operations will conclude Wednesday, Dec 11, 2013

Comments for DGM Activities, if any: DGM is complete

Comments for Visual Survey Activities: Teams November and India continued attempting AVS in the south-eastern portion of the MRS. The teams could not find access to transects and walked a road, recording unsurveyable points and documenting with photographs. Only November's Trimble was used to log data.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Byron Cook, UXOQCS



12/9/2013

Project Name: Port Angeles Combat Range		Report No: 034
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 12/9/2013

I. Site Safety Brief Topics:

- Driving- practice defensive driving
- Personal Protective Equipment (PPE)- reviewed PPE requirements
- slips, trips, and falls- be diligent while walking, especially uneven terrain and when you can't see the ground
- Unexploded Ordnance/ Munitions and Explosives of Concern (UXO/MEC)- avoid impacting, striking, or jarring anomalies prior to identification
- hydration- checked site water supply to see if resupply was necessary
- field sanitation/hygiene- asked team leaders if more wet wipes/hand sanitizer was needed
- Exclusion Zone (EZ) (209 ft/ 43 ft)- reminder to be aware of exclusion zone, especially as mag & dig approaches Deer Park Road
- first aid- reminder to pack a minimum first aid and eye wash
- weather- expected high of 34, partly cloudy, 20% precipitation with snow turning to freezing drizzle, daylight 0752-1620

II. Safety Inspections:

Mag & dig team's anomaly excavation procedures were observed to reinforce morning training: procedures were satisfactory, no deficiencies noted

III. Problems Encountered / Corrective Actions Taken:

N/A

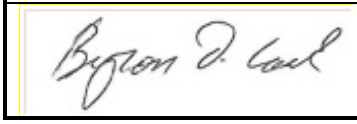
IV. Additional Health and Safety Comments:

Discussed anomaly excavation as detailed in EM 385-1-97 I.2.H. during morning safety brief

VII. Visitors

None

VIII. Approval

	Date: 12/9/2013
	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

High 34-35°
Mostly cloudy
20% chance rain/freezing drizzle
~~turning to~~ turning from snow
Daylight 0752-1620

Daily Safety Brief and Sign-In Sheet

HDR

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 12/9/2013

SSHO: Byron Cook

Name	Position	Employer	Signature
Nick Inzinna	Geo Tech	HDR	[illegible]
D Gordon	UXO Tech III	HDR	D Gordon
R Hetzel	UXO III	HDR	[illegible]
R Nelson	UXO II	HDR	[illegible]
P Vallet	UXO II	HDR	[illegible]
C Dunmire	UXO II	HDR	[illegible]
John Brunkhorst	UXO Tech III	HDR	[illegible]
Rouzier	UXO III	HDR	[illegible]
[illegible]	UXO Tech II	HDR	[illegible]
R St. Amand	SUXOS	HDR	[illegible]
Visitors			

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Gordon	☒	☐
Garmin	3679		☐	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Roamer	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☐	☐
Trimble	3975		☐	☐
Trimble	3693		☒	☐
Trimble	3974		☒	☐
Trimble	3661	Roulion	☒	☐
Camera	3088		☐	☐
Camera	3083		☐	☐
Camera	3084		☒	☐
Camera	3963		☒	☐
	1004	Roulion	X	

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104		☒	☐
Schostedt	1636		☐	☐
Schostedt	3658		☒	☐
Schostedt	3105		☐	☐
Schostedt	3885		☒	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 35 **Day/Date:** 12/10/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 10

Activities Conducted: (Include location of work performed including equipment used): One team completed mag and dig investigation of R 07, R 06, S 03, S 04, S 05 and S 06. Two assisted visual survey teams resumed surveys in the South East to fill data gaps and exhaust all possible access routes. There were no additional access routes identified and nothing was found by the visual survey teams. Demolition operations were conducted to demilitarize one 81 mm practice mortar and one 75mm practice projectile. Conducted magazine inspection.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

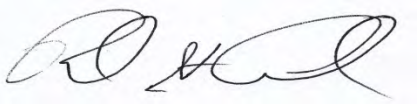
Munitions and Other Items Found Today: (Include location of the items found): S 05, three pieces of frag, .25 lb.

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): Over 15 pieces of non munitions related debris weighing over 300 lbs were found.

Other comments or additional information: Weather was mostly cloudy with intermittent snow and a high near 30.

Schedule: With the additional grids that need to be investigated the current projected completion is 11 December 2013.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 12/10/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	10	
Byron Cook	UXOQC/SO	HDR	10	
John Brunkhorst	UXO Tech III	HDR	10	Mag & Dig
Pete Vallejo	UXO Tech II	HDR	10	Mag & Dig
Rob Nelson	UXO Tech II	HDR	10	Mag & Dig
Neil Roulier	UXO Tech III	HDR	10	India
Kim Hawkins	UXO Tech II	HDR	10	India
D.A. Gordon	UXO Tech III	HDR	10	November
Chuck Dunmire	UXO Tech II	HDR	10	November
Nick Inzinna	Field Tech III	HDR	10	
Ron Hetzel	UXO Tech II	HDR	10	Mag & Dig

PHOTOGRAPHIC LOG

Photo No.	Date:
1	12/10/13

Description: Terrain from grid S-04, view looking south



PHOTOGRAPHIC LOG

Photo No.	Date:
2	12/10/13

Description: MD items from grid S-05



PHOTOGRAPHIC LOG

Photo No.	Date:
3	12/10/13

Description: Texpack binary explosive secured to 75mm practice projectile; det cord running to the left



PHOTOGRAPHIC LOG

Photo No.	Date:
4	12/10/13

Description: Same item as above, placed in shot hole and being tamped



PHOTOGRAPHIC LOG

Photo No.	**Date:**
4	12/10/13

Description: "Action" photo of detonation



Date: 12/10/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 035
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection: MEC Disposal by Detonation and MD Handling, Storage, and Demilitarization (3.6 Management of Material Potentially Presenting an Explosive Hazard)
Demolition operations were conducted to demilitarize 75mm projectile and 81mm mortar MD items that still held their ballistic shapes. All personnel involved knew their duties prior to the beginning of the operation. The SUXOS gave a pre-demolition safety brief and operations were conducted IAW EM 385-1-97and 60A-1-1-31. Clallam County dispatch was notified prior to operations and again after the conclusion. The shot holes were investigated to reduce fragments from the operation and MD Handling, Storage procedures followed. An explosives consumption report was generated and is on file.

Additional QC/QA Comments: Schonstedt validation checks were conducted prior to the start of work
Observed Trimble start of day procedures; Trimble data was QCed by Nicholas Inzinna
Verified equipment taken into the field was signed for on the Daily Equipment Log
MD processed by the mag & dig team was inspected by the SUXOS, determined to be MDAS, and stored in a lockable container
Discussed demobilization timeline with HDR PM, addressed potential set-backs, waiting for conclusion of weekly status call to begin planning travel
UXOSO/QCS and SUXOS conducted magazine inspection: chain limiting road access is still in place, no evidence of tampering or vandalism to the magazines, grounding is intact

Comments for DGM Activities, if any: DGM is complete

Comments for Visual Survey Activities: Team November attempted to fill AVS gaps in the central portion of the MRS. There were no VS transects walked due to terrain encountered but the November team collected unsurveyable points to support site documentation.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Byron Cook, UXOQCS



12/10/2013

Project Name: Port Angeles Combat Range		Report No: 035
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 12/10/2013

I. Site Safety Brief Topics:

Safety brief and safety training came from APP/SSHP: AHAs for Assisted Visual Survey Activities and Munitions and Explosives of Concern/MD Investigations, ID, Removal and Disposal. Job tasks and subtasks were addressed, potential hazards identified, and recommended actions to eliminate or minimize those hazards presented. Topics included: walking [transects or within grids], driving, complacency, encountering MEC, environmental exposure (cold weather), equipment mobilization, intrusive operations/excavations, and MPPEH management

II. Safety Inspections:

Observed demolition procedures: all personnel were made aware of their duties and responsibilities, SUXOS gave pre-demo safety brief, Clallam County dispatch was notified of operations and contacted again after conclusion of operations, procedures were followed IAW EM 385-1-97 and 60 A-1-1-31

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

Demolitions were performed to demilitarize two MD items that still had their ballistic shape

SUXOS and UXOSO/QCS performed magazine inspection: access chain is still intact and does not appear to have been tampered with, magazines show no signs of tampering or vandalism, grounding is still in place

VII. Visitors

None

VIII. Approval

	Date: 12/10/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Now 31
High 38-39 morning clouds, afternoon sun 20% -40% precip
Daylight 7:53- 16:20

Daily Safety Brief and Sign-In Sheet

HDR

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 12/10/13

SSHO: Byron Cook

Name	Position	Employer	Signature
[illegible]	Tech II	HDR	[illegible]
Rourier	Tech III	HDR	[illegible]
Valley	TECH 2	HDR	[illegible]
GORDON	Tech III	HDR	D. Gordon
R. Hetzel	Tech III	HDR	[illegible]
C DUNMIRE	UXO II	HDR	[illegible]
R Nelson	UXO II	HDR	[illegible]
John Brunkhorst	UXO III	HDR	John Brunkhorst
[illegible]	Geo Tech	HDR	[illegible]
Rick St Amans	SUXOS	HDR	[illegible]
Visitors			

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☐	☐
Trimble	3975		☐	☐
Trimble	3693		☒	☐
Trimble	3974		☒	☐
Trimble	3661		☐	☐
Camera	3088		☐	☐
Camera	3083		☐	☐
Camera	3084		☒	☐
Camera	3963		☒	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104		☐	☐
Schostedt	1636		☐	☐
Schostedt	3658		☒	☐
Schostedt	3105		☐	☐
Schostedt	3885		☒	☐
Schostedt	3887		☒	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D. Bowlsa	☒	☐
Garmin	3679		☐	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685		☐	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction
Equipment sent for repairs?	Date: Click here to enter a date.	Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 36 **Day/Date:** 12/11/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 7

Activities Conducted: (Include location of work performed including equipment used): One team completed mag and dig investigation of R 04, R 05, Q 04, Q 05 and Q 06. Two assisted visual survey teams attempted to access transects in the South East and Tech Area one. Nothing was found by the visual survey teams.

QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

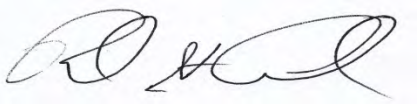
Munitions and Other Items Found Today: (Include location of the items found): None.

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): Over 25 pieces of non munitions related debris weighing over 40 lbs were found.

Other comments or additional information: Weather was mostly cloudy with a high near 30.

Schedule: All data collection activities are complete as of 12-11-2013. Site breakdown will occur on 12-12-2013 and 12-13-2013. 12-13-2013 will be the last day there are any personnel on site.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 12/11/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	7	
Byron Cook	UXOQC/SO	HDR	7	
John Brunkhorst	UXO Tech III	HDR	7	Mag & Dig
Pete Vallejo	UXO Tech II	HDR	7	Mag & Dig
Rob Nelson	UXO Tech II	HDR	7	Mag & Dig
Neil Roulier	UXO Tech III	HDR	7	India
Kim Hawkins	UXO Tech II	HDR	7	India
D.A. Gordon	UXO Tech III	HDR	7	November
Chuck Dunmire	UXO Tech II	HDR	7	November
Nick Inzinna	Field Tech III	HDR	7	
Ron Hetzel	UXO Tech II	HDR	7	Mag & Dig

PHOTOGRAPHIC LOG

Photo No.	Date:
1	12/11/13

Description: Terrain from grid Q-05, view looking North



PHOTOGRAPHIC LOG

Photo No.	Date:
2	12/11/13

Description: Buried trash observed in Grid Q-05



PHOTOGRAPHIC LOG

Photo No.	Date:
3	12/11/13

Description:
Unsurveyable terrain, no access in the northwest portion of the MRS, view looking West



PHOTOGRAPHIC LOG

Photo No.	Date:
4	12/11/13

Description:

Date: 12/11/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 036
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments: Schonstedt validation checks were conducted prior to the start of work
Observed Trimble start of day procedures; Trimble data was QCed by Nicholas Inzinna
Verified equipment taken into the field was signed for on the Daily Equipment Log
No MEC/MD found today. All grids are now completed.
Had a pre-conference call with HDR PM to discuss recent and current operations and review exit brief
Weekly status call was held by the HDR PM. PM gave an exit brief and the conclusion was that the field crew has gathered all the data that can be obtained. Everyone agreed that at the conclusion of the final mag & dig grids and any visual surveys transects that can be picked up today, field work is complete and the team can demobilize.
Operators for the company's leased vehicle were designated to drive the truck and loaded equipment back to Denver
Booked flights for site personnel; two will be departing via POV

Comments for DGM Activities, if any: DGM is complete

Comments for Visual Survey Activities: Teams November and India attempted to fill AVS gaps, entering the MRS from the west side to access the south-central and another set in Tech Approach Area 1. The India team was able to walk a short transect in the NW portion of the MRS, unsurveyable points were also collected to support site documentation. Visual Surveys is complete, as no other possible access points have been identified.

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Byron Cook, UXOQCS



12/11/2013

Project Name: Port Angeles Combat Range		Report No: 036
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 12/11/2013

I. Site Safety Brief Topics:

Today should conclude field operations after teams complete the final mag & dig grids and try to find access points to any unsurveyed transect lines. With these being the final two tasks, safety brief topics were reiterated from yesterday and included: walking [transects or within grids], driving, complacency, encountering MEC, environmental exposure (cold weather), equipment mobilization, intrusive operations/excavations, and MPPEH management

II. Safety Inspections:

Observed teams prepare for work tasks, ensured all personnel had required PPE and tools and equipment were serviceable and appropriate

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

No additional comments

VII. Visitors

None

VIII. Approval

	Date: 12/11/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Now 25°

High 39° Overcast

daylight 0754 - 1620

Daily Safety Brief and Sign-In Sheet

HDR

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 12/11/13

SSHO: Byron Cook

Name	Position	Employer	Signature
Rick St. Amand	SUXOS	HDR	[signature]
D. Gordon	Tech III	HDR	[signature]
C. Dunmire	Tech II	HDR	[signature]
[illegible]	Tech II	HDR	[signature]
N Roulier	Tech III	HDR	[signature]
John Brunkhorst	Tech III	HDR	[signature]
Ronald D. Hetzel	Tech III	HDR	[signature]
Nick Inzinna	GeoTech	HDR	[signature]
[illegible]	UXO Tech	HDR	[signature]
Robert Nelson	UXO Tech II	HPR	[signature]
Visitors			

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Trimble	3660		☒	☐
Trimble	3975		☐	☐
Trimble	3693		☒	☐
Trimble	3974		☒	☐
Trimble	3661		☐	☐
Camera	3088		☐	☐
Camera	3083		☐	☐
Camera	3084		☒	☐
Camera	3963		☒	☐
1004	Rover		X	

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Schostedt	3104		☐	☐
Schostedt	1636		☐	☐
Schostedt	3658		☒	☐
Schostedt	3105		☑	☐
Schostedt	3885		☒	☐
Schostedt	3887		☐	☐
White	3894		☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs?	Date: Click here to enter a date.	Yes	☐	No	☐

HDR | ONE COMPANY *Many Solutions®*

Daily Equipment Log
Revision 1.0

Project Name: PACR RI
Date:
Contract/Delivery Order: W9128F-10-D-0058
Project Manager: Larry Devries

Note: Signature of the operator indicates equipment is operational when it was checked out.

Equipment Description	Asset Number	Signature of Operator	Equipment Working	
			Yes	No
Garmin	3678	D Houlton	☒	☐
Garmin	3679		☐	☐
Garmin	3680		☐	☐
Garmin	3682		☐	☐
Garmin	3798		☐	☐
Garmin	3685	Rouzion	☒	☐
			☐	☐
			☐	☐
			☐	☐

Equipment Description	Asset Number	Describe Problem -Malfunction

Equipment sent for repairs? Date: Click here to enter a date. Yes ☐ No ☐

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 37 **Day/Date:** 12/12/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 5

Activities Conducted: (Include location of work performed including equipment used): The magazine custodian and one assistant removed all the remaining explosives and transported them to the meadow for destruction. All explosives were destroyed in three shots. Personnel then back filled all shot holes and spread native grass mix over the area. Two personnel received the skid steer and were present for the magazine movement from the magazine storage area to the side of Deer Park Road for subsequent pick up on December 13. The skid steer was used to replace the berm that existed prior to the beginning of field work. The berm was then reseeded with native grass mix. Prior to departing, native grass mix was spread at the Schriner check out point that had been used as a parking area for the field work. QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR). Demobilization activities occured off-site following site rehabilitation.

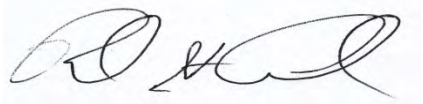
Munitions and Other Items Found Today: (Include location of the items found): None.

Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): None.

Other comments or additional information: Weather was mostly cloudy with a high near 30.

Schedule: All data collection activities are complete as of 12-11-2013. Site breakdown will occur on 12-12-2013 and 12-13-2013. 12-13-2013 will be the last day there are any personnel on site.

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 12/12/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	5	
Byron Cook	UXOQC/SO	HDR	5	
John Brunkhorst	UXO Tech III	HDR	5	Demo
Pete Vallejo	UXO Tech II	HDR	5	Demo
Rob Nelson	UXO Tech II	HDR	5	Demo
Neil Roulier	UXO Tech III	HDR	5	Demo
Kim Hawkins	UXO Tech II	HDR	5	Skid steer
D.A. Gordon	UXO Tech III	HDR	5	Demo
Chuck Dunmire	UXO Tech II	HDR	5	Magazine
Nick Inzinna	Field Tech III	HDR	5	
Ron Hetzel	UXO Tech II	HDR	5	Demo

PHOTOGRAPHIC LOG

Photo No.	Date:
1	12/12/13

Description: Site rehabilitation of demo area



PHOTOGRAPHIC LOG

Photo No.	Date:
2	12/12/13

Description: Reseeding demo area after shot holes were collapsed and refilled



PHOTOGRAPHIC LOG

Photo No.	Date:
3	12/12/13

Description: Emptied portable explosives magazine being removed from the magazine storage area



PHOTOGRAPHIC LOG

Photo No.	Date:
4	12/12/13

Description:
Reconstruction of berm



PHOTOGRAPHIC LOG

Photo No.	Date:
5	12/12/13

Description: Reseeding after berm construction



Date: 12/12/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 037
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments: A demolition operation was conducted to dispose of remaining explosives. Operations were conducted IAW EM 385-1-97 and 60A-1-1-31. An inventory of all material was conducted by the SUXOS, UXOSO/QCS, and magazine custodian and destruction was witnessed by the same. An Explosives Consumption Report was generated and is on file.

Concurrent with the demolition operation, the empty portable explosives magazines were moved up to an access point on Deer Park Road. The magazines will be picked up tomorrow. The chain used to limit access to the magazine area was reclaimed by HDR personnel and the original berm rebuilt and seeded.

Following the demolition operation site rehabilitation was conducted. Personnel collapsed and filled in shot holes and native grass seed was spread over the area.

The IVS was removed, as well as laths placed by HDR; laths marking survey points established by Wengler Surveying & Mapping were left in place.

All HDR equipment was loaded into the HDR leased vehicle. Two personnel have been designated to drive back to Denver. Site personnel were released: two are departing by POV, five departed to Seattle for flights tomorrow morning. The SUXOS and UXOSO/QCS remain to oversee the magazines and the skid steer being picked up, MDAS shipment, and then will depart to Seattle for flights Saturday, 14 Dec 2013.

Clallam Fire District 2 Chief Sam Phillips was notified by e-mail, as agreed upon earlier, that the magazines were emptied and HDR no longer possesses any explosives in his district.

Comments for DGM Activities, if any: DGM is complete

Comments for Visual Survey Activities: Visual Survey is complete

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Byron Cook, UXOQCS



12/12/2013

Project Name: Port Angeles Combat Range		Report No: 037
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 12/12/2013

I. Site Safety Brief Topics:

Today's operations will consist of: disposing of remaining explosives, site rehabilitation, and demobilizing activities. The safety brief for demolitions is deferred to the SUXOS, who will give a specific operational safety brief prior to. The site safety brief and training are derived from the Activity Hazard Analyses (AHAs) for heavy equipment (skid steer) and demobilizing activities. Topics include: lifting, loading and unloading equipment, securing loads as necessary, slips/trips/falls, back injuries, crushing hands or feet, PPE related to tasks (i.e. reflective vest for skid steer spotter), driving company and rental trucks, communication between ground personnel and equipment operator, and environmental concerns- with emphasis on trip planning for personnel driving for demob

II. Safety Inspections:

Observed demolition operations to dispose of remaining explosives: SUXOS gave a demolition specific safety and operations brief and appointed tasks, Clallam county dispatch was notified of operation and again after conclusion, personnel wore PPE as appropriate for the tasks they performed, and demolitions area and exclusion zone were controlled by site personnel until after SUXOS' final 'all clear' was given and area was rehabilitated

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

Evergreen Towing was on site to remove portable explosives magazines from the explosives magazine storage area to a staging point on Deer Park Road. Austin Powder was notified that the magazines are empty and ready to be picked up. Pick-up was scheduled for tomorrow (13 Dec 2013). Two UXO Techs II were on hand to provide escort.
D&K Rentals was on site to drop off a skid steer. The designated equipment operator conducted a safety and operations check prior to accepting, and then rebuilt the berm blocking the access off of Deer Park Road after the magazines had been removed. The berm was seeded with native grass seed. Equipment pick-up is scheduled for tomorrow (13 Dec 2013).
The IVS, laths, and flagging were removed from the site.
Company equipment was loaded into the HDR leased vehicle. Two operators were designated to drive the vehicle back to Denver. Site personnel were released. Two will depart by POV, two are driving the leased truck, and five drove to Seattle for flights tomorrow (13 Dec 2013) morning. The SUXOS and UXOSO/QCS will remain to oversee the magazine and skid steer pick-ups, ship the collected and processed MDAS, then drive to Seattle for flights Saturday (14 Dec 2013) morning.

VII. Visitors

None

VIII. Approval

	Date: 12/12/2013
Byron D. Card	

Daily Safety Brief and Sign-In Sheet

Location of Job (Unit/Location on Project): Port Angeles Combat Range		**Area:**
Required PPE: leather boots gloves eye protection weather & work appropriate clothing	**Wind Direction:** variable	**Supervisor of Work:** SUXOS Rick St. Amand
	Evacuation Route: toward the assembly point	**Safety Brief Prepared By:** UXOSO/QCS Byron Cook
Team Pre-Job Preparation 1. Fill out Daily Tailgate/Safety Sign-In. 2. Review Daily Tailgate/Safety Sign-In. 3. Sign Daily Tailgate/Safety Sign-In.	**Assembly Point:** 1. Staged vehicles 2. Staging area	**Are other crews in area?** Yes

Comments:

Driving, PPE, First aid, field sanitation/ hygiene, slips/trips/falls, UXO/MEC, EZ (209/43), hydration, weather

Current 30° Overcast
High 40-41°

Daylight 0765 - 1620

Rain ~ 1pm - 2pm, taper off, increase again ~ 9pm

Contract No.: W9128F-10-D-0058
Delivery Order 0006

Daily Safety Brief and Sign-In Sheet

HDR

Project Manager: Larry deVries

Project Task Order # W9128F-10-D-0058

Project Location Port Angeles Combat Range, WA

Date: 12/12/13

SSHO: Byron Cook

Name	Position	Employer	Signature
Ronald Hetzel	UXO III	HDR	[signature]
K. Hawkins	UXO II	HDR	[signature]
Robert Nelson	UXO III	HDR	[signature]
Nick Winne	Geotech	HDR	[signature]
Rourier	UXO III	HDR	[signature]
C. DUNMIRE	UXO II	HDR	[signature]
GORDON	UXO III	HDR	D. Gordon
John Brunkhorst	UXO III	HDR	John Brunkhorst
P. Valley	UXO II	HDR	[signature]
R. St. Amand	SUXOS	HDR	[signature]
Visitors			

HDR

Heavy Equipment Inspection

Date: 12-12-13

Supervisor: Rick St Amant

Equipment Type: Skid Steer

Location Pack

Beginning Hrs.: 1079

Ending Hrs. 1080

A=Add O=Okay C=Comments N/A=Not Applicable

Item	Activity	SUN	MON	TUE	WED	THU	FRI	SAT
1	Check engine oil level and engine compartment for debris, engine oil leaks, etc.	☐	☐	☐	☐	☑	☐	☐
2	Check hydraulic oil level, inspect the cap and vent.	☐	☐	☐	☐	☑	☐	☐
3	Check radiator coolant level, check radiator fins for dirt, ,leaves, debris, etc.	☐	☐	☐	☐	☑	☐	☐
4	Check transmission oil level (dozers and trucks) and swing case (excavators).	☐	☐	☐	☐	☑	☐	☐
5	Check oil level in frame joint bearing; consult operators manual.	☐	☐	☐	☐	☑	☐	☐
6	Check for seat belt, good condition, and working properly.	☐	☐	☐	☐	☑	☐	☐
7	Check wheels, tires, and/ or tracks for damage, cuts, pressures, broken links, etc.	☐	☐	☐	☐	☑	☐	☐
8	Check ground engaging tools; look at cutting edge, teeth, blade, bucket, etc.	☐	☐	☐	☐	☑	☐	☐
9	Inspect visible hydraulic hoses and lines; check for scuffs, leaks, etc.	☐	☐	☐	☐	☑	☐	☐
10	Inspect ROPS/FOPS for any obvious signs of loose mounts, broken or missing bolts, etc.	☐	☐	☐	☐	☑	☐	☐
11	Check radio operation, gauges, lights, controls, backup alarms, horn, etc.	☐	☐	☐	☐	☑	☐	☐
12	Inspect operator's compartment for cleanliness and; check floor for buildup of dirt around pedals, or any loose items; inspect seat(s); clean windows; look for cracks etc.	☐	☐	☐	☐	☑	☐	☐
13	Do a walk-around inspection for any obvious signs of future problem areas; check grab handles and step treads, etc.	☐	☐	☐	☐	☑	☐	☐
14	Check operation of all systems; boom, bucket, blade, dump bed, etc.	☐	☐	☐	☐	☑	☐	☐
15	Look under the machine for any loose or hanging objects, leaks, or anything out of the ordinary.	☐	☐	☐	☐	☑	☐	☐
16	Check fuel level, fill tank prior to beginning operations.	☐	☐	☐	☐	☑	☐	☐
17	Ensure the presence of the operations/maintenance manual. Ensure operator has current training and adequate qualifications to operate this specific heavy equipment.	☐	☐	☐	☐	☑	☐	☐
18	Check location and condition of the fire extinguisher. Ensure adequate charge.	☐	☐	☐	☐	☑	☐	☐

Comments:

Signature: [signature]

Employee: Kim Hawkins

HDR 12850 E Control Tower Rd Centennial, CO 80112	**Project Name:** Port Angeles Combat Range **Project Location**: Port Angeles, WA **Report No**.: 38 **Day/Date:** 12/13/2013 **Contract #:**W9128F-10-D-0058, Delivery Order 0006

Personnel on Site/Area of Responsibility/Daily Site Operating Hours:

See Attached Site Personnel List Site Operating Hours: 0

Activities Conducted: (Include location of work performed including equipment used): Removed locks from explosives magazines and documented condition and pick up. Shipped MDAS to Timberline Environmental. Dropped off the key to the skid steer at D&K Rental.
QA/QC activities were also conducted as summarized on the Daily Quality Control Report (DQCR).

Munitions and Other Items Found Today: (Include location of the items found): None.

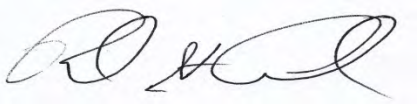
Changed Conditions/Delays/Conflicts Encountered: (List any conflicts which have hindered visual surveys and other operations today): None.

Other comments or additional information: Weather was sunny with a high near 30.

Schedule: All field work is now complete.

All site demobilization activities are complete. This is the final Daily Site Report for the PACR-RI/FS

Contractors' Verification: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the plans and specifications except as noted above.

SUXOS	**Date**: 12/13/2013
	

USACE OESS:	Webster Keller	**USACE PM**:	Mirek Towster
PM:	Larry Devries	**UXOQCS**:	Byron Cook
SUXOS:	Rick St.Amand	**UXOSO**:	Byron Cook
MC Sampling Lead	N/A	**Other**:	USACE Munitions Design Center: John Miller USACE Regional Project Lead: Mark Murphy

Name	Position	Employer	Hours	Team
Rick St.Amand	SUXOS	HDR	0	
Byron Cook	UXOQC/SO	HDR	0	

PHOTOGRAPHIC LOG

Photo No.	Date:
1	12/13/13

Description: Empty portable magazine



PHOTOGRAPHIC LOG

Photo No.	Date:
2	12/13/13

Description: Removal of magazines by Austin Powder



PHOTOGRAPHIC LOG

Photo No.	Date:
3	12/13/13

Description: MDAS re-inspection and repackaging



PHOTOGRAPHIC LOG

Photo No.	Date:
4	12/13/13

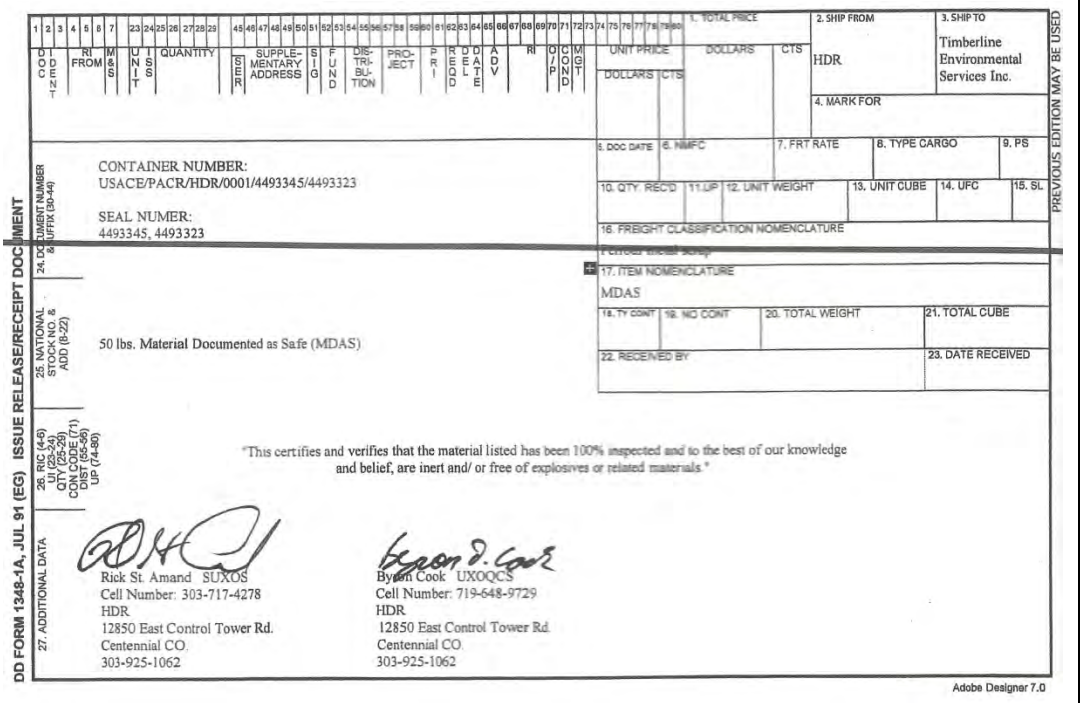
Description: Final MDAS package ready for shipment



PHOTOGRAPHIC LOG

Photo No.	Date:
5	12/13/13

Description: Copy of 1348-1A (Item 16. Freight Classification Nomenclature reads: Ferrous metal scrap)



DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

CONTAINER NUMBER:
USACE/PACR/HDR/0001/4493345/4493323

SEAL NUMER:
4493345, 4493323

2. SHIP FROM: HDR

3. SHIP TO: Timberline Environmental Services Inc.

4. MARK FOR

16. FREIGHT CLASSIFICATION NOMENCLATURE: Ferrous metal scrap

17. ITEM NOMENCLATURE: MDAS

50 lbs. Material Documented as Safe (MDAS)

"This certifies and verifies that the material listed has been 100% inspected and to the best of our knowledge and belief, are inert and/ or free of explosives or related materials."

Rick St. Amand SUXOS
Cell Number: 303-717-4278
HDR
12850 East Control Tower Rd.
Centennial CO.
303-925-1062

Byron Cook UXOQCS
Cell Number: 719-648-9729
HDR
12850 East Control Tower Rd.
Centennial CO.
303-925-1062

Adobe Designer 7.0

Date: 12/13/2013 **HDR EOC** 12850 E Control Tower Rd Centennial, CO 80112	**Project Name**: Port Angeles Combat Range **Contract #**: W9128F-10-D-0058, Delivery Order 0006 **Report #**: 038
USACE Safety Specialist: Webster Keller	**Project Manager**: Larry deVries
SUXOS: Rick St. Amand	**UXOQCS:** Byron Cook
UXOSO: Byron Cook	**Project Geophysicist:** Jon Jacobson, Geophysicist III
MC Sampling Lead: N/A	**Additional Team Members:**

LIST DEFINABLE FEATURES OF WORK AND INSPECTION COMMENTS

Preparatory Phase Inspection:

Initial Phase Inspection:

Follow-Up Phase Inspection:

Additional QC/QA Comments: Final on-site work: Austin Powder picked up the portable explosives magazines, D&K Rentals contacted the SUXOS stating that they were short-staffed and could not pick up the skid steer. The skid steer will be left on the side of Deer Park Road and the key turned in to D&K Rental's office, located in Sequim, WA.

MDAS was 100% re-inspected and repackaged for shipment to Timberline Environmental Services, Inc. IAW EM 385-1-97. A chain of Custody form and DD Form 1348-1A with the statement, "This certifies that the material listed has been 100% inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related material." were generated. The SUXOS signed as the inspector and the UXOSO/QCS signed as the verifier.

All field work and demobilization activities are completed. This is the final DQCR for the PACR-RI/FS.

Comments for DGM Activities, if any: DGM is complete

Comments for Visual Survey Activities: Visual Survey is complete

Comments for MC Sampling, if any:

Non-Compliant Items Identified Today	Non-Compliant Items Corrected Today

On behalf of the contractor, I certify that this report is complete and correct and the equipment and material used and work performed during this reporting period is in compliance with the work plan specifications to the best of my knowledge unless otherwise noted in this report.

Byron Cook, UXOQCS



12/13/2013

Project Name: Port Angeles Combat Range		Report No: 038
Project No: W9128F-10-D-0058	Location: Port Angeles, WA	Date: 12/13/2013

I. Site Safety Brief Topics:

Key topics for today's operations are: driving (to-and-from the worksite and demobilizing to Seattle), lifting, PPE while handling scrap

II. Safety Inspections:

Completion of field and demobilization activities conducted today was performed in accordance with safe work practices and the SSHP/APP AHAs recommendations for actions to eliminate or minimize hazards.

III. Problems Encountered / Corrective Actions Taken:

N/A

IV. Additional Health and Safety Comments:

Austin Powder was on site to pick up emptied portable explosives magazines. Magazines were successfully removed from site.

D&K Rentals contacted the SUXOS to say they could not pick up the skid steer today. Skid steer will be left on the side of Deer Park Road and SUXOS, UXOSO/QCS will drop the key off at the D&K Rentals office.

MDAS was 100% re-inspected and repackaged for shipment to Timberline Environmental Services, Inc. for final disposition. The package was dropped off at FedEx for two business day delivery.

Field work and demobilization activities are complete. This is the final Daily Safety Report for the PACR-RI/FS.

VII. Visitors

None

VIII. Approval

	Date: 12/13/2013
Byron D. Card	

CONTENTS

PAGE	REFERENCE	DATE

Rite in the Rain®
ALL-WEATHER WRITING PAPER

ALL-WEATHER
FIELD BOOK

Name _____

Address _____

Phone _____

Project DO 06 Port Angeles
Team INDIA

Rite in the Rain — A patented, environmentally responsible, all-weather writing paper that sheds water and enables you to write anywhere, in any weather. Using a pencil or all-weather pen, *Rite in the Rain* ensures that your notes survive the rigors of the field, regardless of the conditions.

Specifications for this book:

Page Pattern		Cover Options	
Left Page	Right Page	Polydura Cover	Fabrikoid Cover
Columnar	1/4" Grid	Item No. 350N	Item No. 350NF

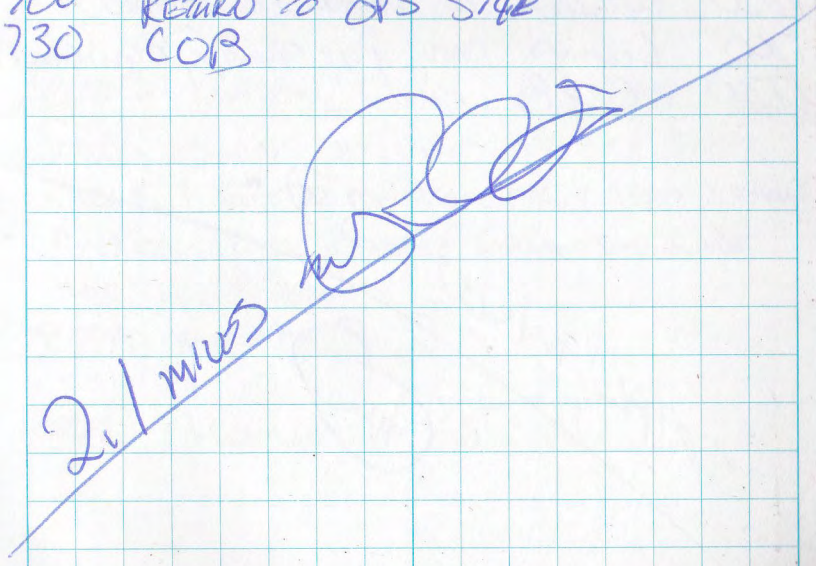
RiteintheRain.com

Contract No.: W9128F-10-D-0058
Delivery Order 0006

29 OCT 13 TL: ROULIER

TEAM: INDIA
AREA: 3 TRANSECTS.

0730 DEPART FOR AREA of OPS
0800 AREA of OPS SAFETY BRIEF
0830 BEGIN TRANSECTS
1130 LUNCH IN THE FIELD
1200 RETURN TO TRANSECTS
1300 TOOK SITE DOC PICS
1630 FINISHED TRANSECTS
1700 RETURN TO OPS SITE
1730 COB



Contract No.: W912BF-10-D-0006
Delivery Order 0006

30 OCT 13 TL: RAULIER
HAWKINS

0730 DEPART FOR WORK SITE
0800 ARRIVE AT WORK SITE / SAFETY BRIEF
0830 DEPART FOR TRANSECTS
1030 ARRIVED AT TRANSECTS
1100 BEGIN RECORDING NON SURVAILABLE POINTS
1130 LUNCH
1200 CONTINUES WITH TRANSECTS
1400 RECORDED NON SURVEILLABLE POINTS ON TRANSECTS ON THE WAY OUT OF AREA
1630 RETURNED TO WORK SITE SAFELY
1700 CLEANED AND PUT AWAY EQUIPMENT
1730 COB

3.2 mi
TOTAL MILES

31 OCT 13 TL RAULIER
HAWKINS
COOK

0730 DEPART FOR WORKSITE
0800 ARRIVE AT WORKSITE / SAFETY BRIEF
0830 DEPART FOR TRANSECTS
1000 BEGIN TRANSECTS
1030 SURVEY MARKER FOUND
1130 LUNCH
1230 RESUME TRANSECTS
1600 STOP TRANS HEAD BACK
1645 RTN TO TRUCK
1700 PACK OUT
1730 COB

NOTES: RANDOM ITEMS OF TRASH FOUND INCLUDE MULTIPLE PIECES OF STEEL CABLE, 1 SOLID 10' LONG STEEL RODE, 1 STEEL BROKEN BUCKET, 1 LONG PIECE OF GALVANIZED WIRE, AND HOT ROCKS.

TOTAL MILES: 3.2

TOTAL ANOMALIES: 15

~~3~~ 1 NOV 13 TL ROLLICK
HAWKINS

0730 DEPART HOTEL
0800 ARRIVE WORKSITE / SAFETY BRIEF
0830 DEPART FOR TRANS.
1000 ARRIVE IN TRANS. AREA
1145 LUNCH
1215 BEGIN TRANS.
1405 DEPART TRANS AREA
1515 BREAK DOWN
1530 DEPART FOR HOTEL
1600 ARRIVE AT HOTEL FOR TIMESHEETS AND EXPENSES REPORTS AND REPLENISH of SUPPLIES.
1730 COB

NOTES: 4 ITEMS FOUND, ALL LARGE PIECES OF CABLE

TOTAL ANOMALIES 4
TOTAL MILES 2.3

4 NOV 13 TL ROLLICK
HAWKINS

0630 DEPART HOTEL
0700 ARRIVE WORKSITE / SAFETY BRIEF.
0730 DEPART FOR TRANSECTS
0900 ARRIVE IN TRANSECTS AREA
1145 LUNCH
1215 RETURN TO TRANSECTS
1445 DEPART TRANSECTS
1540 PICK UP RETURN TO WORKSITE/BASE AREA
1600 DEPART WORKSITE AREA
1630 COB

NOTES: 7 ITEMS, NON MD, FOUND ON SURFACE.

TOTAL ANOMALIES : 7
TOTAL MILES : 3.2 TRANS. MILES

5 NOV 13 TL: Rollor Hawkins

0630 Depart Form Hotel / Safety Brief
0700 Arrive worksite
0730 Depart worksite for Transects
~~0830~~ Begin Transects
1145 Lunch
1445 Depart Transects
1540 Pick up and Return work site area
1600 Depart
1630 COB

NOTES: 10 Items Found
NO MD

MILES: 2.6

6 NOV 13 TL Rollor Hawkins

0630 Depart Hotel / Safety Brief
0700 Arrive work site
0715 Depart worksite for Transects
0900 Arrive at Transects
1200 Lunch
1445 Depar. Transects
1540 Pick up and rtn to worksite area
1600 Depart work area
1630 COB

NOTES: 16 Items Found 2 Mils
NO MD

MILES: 2.9

7 NOV 13 TM ROULIER
HAWKINS

0630 DEPART HOTEL
0700 DEPAT SAFE BREIF
0730 DEPART WORKSITE FOR TRANSECTS
1030 ARRIVE IN TRANSECT AREA
1200 LUNCH
1330 DEPART TRANSECTS
1540 EXIT AND PICK UP
1600 DEPART WORK SITE
1630 COB

NOTES : 3 ITEMS FOUND NONE MD
MILES : 1.8

SHONSTATE # 3105
CAMERA # 1004
TRIMBLE # 3660
GARMIN # 3685

8 NOV 13 TM ROULIER
HAWKINS

0630 DEPART HOTEL
0700 DEPART FROM SAFE BREIF
0730 ~~DEPART~~ WORKSITE FOR TRANSECTS
0930 ARRIVE AT TRANSECT AREA
1130 LUNCH
1345 DEPART TRANSECTS
1540 ARRIVE WORKSITE
1600 DEPART FOR HOTELS
1630 COB

SHONSTATE # 3105
CAMERA # 1004
TRIMBLE # 3660
GARMIN # 3685

11 NOV 13 TM Rollier Hawkins

0630 Depart Hotel
0700 Safety Brief
0730 Arrive at worksite
0800 Depart for transects
0945 Arrive at transects
1127 Found large cable
Pic # 1332 Location: 5318906.2m N
473596.4m E
247.89 (HAE)

1200 Lunch
1345 Ext transect area
1530 Rtn to worksite
1600 Rtn to Hotel
1630 COB

NOTES: 1 item found 6" deep
Location listed above

Miles: 15 miles
Shipstate # 3105
Camera # 1004
Trimble # 3660
Garmin # 3685

12 NOV 13 TM Rollier Hawkins

0630 Depart Hotel
0700 Safety Brief
0730 Arrive worksite
0945 Depart for transects
0945 Arrive; Start transects
0912 Pic # 1334 Large cable found
Location: 5318565.77m N
473791.33m E
297.82m (HAE)

1200 Lunch
1345 Start ext transect area
1430 Start rtn to work start area
1530 Rtn to work start area
1600 Rtn to Hotel
1630 COB

Shipstate # 3105
Camera # 1004
Trimble # 3660
Garmin # 3685

13NOV13 TM Rancier Hawkins

1630 Depart Hotel
0700 Safety Brief
0800 Dunkon
0930 Start Transects
1630 Locate Hot Rock Location:
5319254.8 N
473602.03 E
263.64 (HAE)

1200 Lunch
1330 Exit Transect Area
1530 Arrive at Work Site Area
1600 Depart for Hotel
1630 COB

Notes: 1 Item Found Not MD

Miles: 1.05 miles

Shoestring # 3105
Camera # 1004
Trimble # 3660
Garmin # 3685

14NOV13 TM Rancier Hawkins

0630 Depart Hotel
0700 Safety Brief
0730 Arrive at Work Site
0745 Depart for Transects
1025 Arrive at Transect Investigation for Survey Areas.
1130 Large Cable Found Location
Surface 5320026.37 N
473802.10 E
287.35 (HAE)
1140 Large Cable Found Location
6 in Deep 5320171.78 N
473881.22 E
248.85 (HAE)

1200 Lunch
1330 Exit Transect Area
1530 Rtn to Work Site
1600 Rtn to Hotel
1630 COB

Shoestring # 3105
Camera # 1004
Trimble # 3660
Garmin # 3685

15 NOV 13 TM Rouiller
HAWKINS

0630 DEPART HOTEL
0700 SAFETY BREIF
0730 ARRIVE WORK SITE
0745 DEPART FOR TRANSECTS
0930 ARRIVE AT TRANSECTS
1030 LARGE CABLE FOUND LOCATION
5319670.2 N
473872.71 E
271.50 (HAE)

1200 LUNCH
1415 BUNKER INVENTORY
1430 DEPART FOR HOTEL AND EXPENSE REPORTS
1630 COB

SHONSTATE #3105
CAMERA #1004
TRIMBLE #3660
GARMIN #3685

3 Dec 13 TM Rouiller
HAWKINS
NELSON
VALLEJO

0630 SAFETY BREIF
0700 VALLEJO REVIEW WORK PLAN / SAFETY
LOAD UP VEHICLES
0730 RECIEVE EXPLOSIVES AND SECURE IN BUNKER
0830 START DAY AT CHECKOUT POINT
0900 SITE SAFETY BREIF
0930 START MAG AND DIG.
0945 Q-1 SITE DOC 1038 ~~START~~
1030 END of Q-1 NO PIC
62 ITEMS ALL TRASH
50 LBS of TRASH
1035 START Q-2 SITE DOC 1039
1130 11 ITEMS TRASH 5 LBS.
2 ITEMS MD 81mm MORTER FIN PARTS 1 LB.
PIC # 1042 of MD
1135 START R-2 SITE DOC 1041
1248 END of R-2 / ITEM TRASH 1 LB. NO PIC
SHONSTATE: 3658 / 3105
CAMERA: 3963
TRIMBLE: 3693

3 Dec 13 cont

1250 START R-1 SITE DOC # 1042
6 ITEMS TRASH 5 LB.
END OF R-1 PROCEED TO R-3

1330 ~~SITE DOC #~~ NO PICK

1335 R-3 SET UP. SITE DOC # 1043

1345 START TIME
4 ITEMS TRASH 2 LB
1 ITEM MD FRAG .5 LB

1435 SITE DOC # 1044 END R-3
MOVE TO Q-3

1440 Q-3 SITE DOC # 1045
13 ITEMS TRASH 6.7 LBS.

1325 END DOCK NO PICK
MOVING TO S-2

1350 S2 SITE DOC # 1046

1330 NO ITEMS FOUND NO PIC

NOTHING FOLLOWS

5 DEC 13

0700 SAFETY BRIEF
0730 START OF DAY POINT AT SHREVEPORT
0800 DEPART FOR TRANSECTS
0905 BEGIN TRANSECTS AREA 3
1200 LUNCH
1445 DEPART AREA 3
1615 DEPART FOR SHREVEPORT CHECK POINT
1630 DEPART FOR HOTEL
1700 COB

NOTES: 2.5 MILES TRANSECTS
NO ITEMS FOUND
2.5 MILES TRANSECTS
TOTAL: 5 MILES TRANSECTS

TM ROULLIER
GORDON
HAWKINS
DUNMIRE

SHONSTATE: #3105 / 3885
CAMORA: # 1004 / 3964
TRIMBLE: # 3660 / 3974
GARMIN: # 3685 / 3698

6 DEC 13 TM ROULIER
HAWKINS

0700 SAFETY BRIEF
0730 START of DAY SHREVNOR POINT
0800 DEPART FOR AREA 2 VISUAL SURVEYS
0930

CONTENTS

PAGE	REFERENCE	DATE

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ALL-WEATHER WRITING PAPER

ALL-WEATHER
FIELD BOOK

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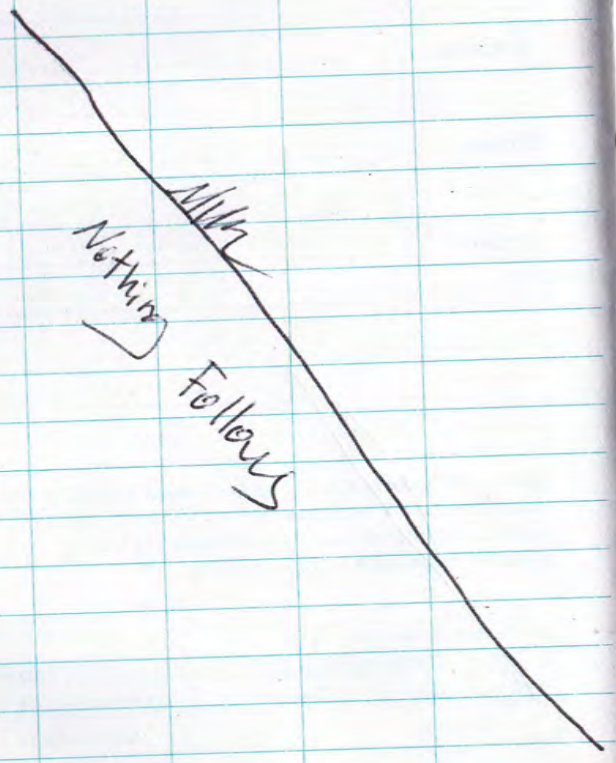
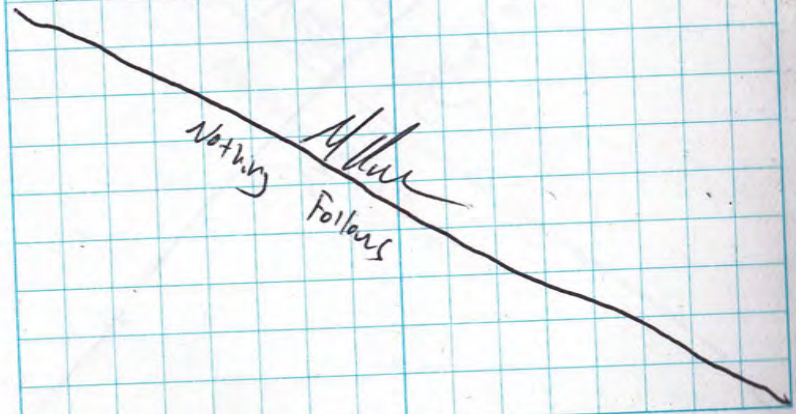
VS

23 Oct 13 Team Lima
TL: Reece Tech II: Nelson
Geo: Rhueter
0800: Instrument Chalkout
0830: Depart for transects
0900 Start Transects
1600 End Transects



VS

24 Oct 13 Team Lima
TL: Reece Tech II: Nelson Geo: Reuter
0730 Safety Brief
0745 Instrument Chck
0800 Depart for transects
0830 Start transects
1000 Spoke to several landowners around the MRS about ROE's
1100 Exploration of areas for entrances to unsurveyable transects
1300 documented rough terrain
1600 ended transects
1615 depart for rally point
1700 COB



VS

25 Oct 2013
Team Lima
TL: Reece Tech II: Nelson Geo: Reuter
0730 Instrument Checks
0745 Depart for transects
0800 Start transects
1100 Spiced and tracked several unsurveyable areas
1330 ended transects
1345 departed for control point
1400 COB

Nothing follows

DGM

28 Oct 2013
Team Lima
TL: Reece Tech II: Nelson Geo: Reuter
Geo: Jacobsen
0730 Instrument Checks
0745 Begin DGM preparation
0800 Troubleshoot R-8
1000 Begin DGM
1600 End DGM
1615 IVS
1630 depart for control point
1700 COB

Nothing follows

29 Oct 2013 DGM Team Lima

TL: Reece Tech II: Nelson Geo: Jacobsen Geo: Reuter

0730 Safety brief
0745 IVS and Instrument check
0815 Begin DGM
1030 Surveyed unsurveyable areas
1300 Re-do IVS due to bad morning IVS Data
1345 Resume DGM
1630 Depart for IVS
1700 Depart for control point
1730 COB

Nothing Follows

30 Oct 2013 Team Lima DGM

TL: Reece Tech II: Nelson Geo: Reuter
Geo: Jacobsen

0730 Safety Brief
0745 Assisted putting seed along DGM Line
0930 Scouted Public Utilities Division location for entrance to transect lines in area 1
1230 Depart for IVS and equipment test line
1245 Begin DGM
1610 End DGM
1630 Depart for IVS
1730 COB

ML
1430 Nelson twisted ankle, but was able to proceed through the Day

Nothing Follows

31 Oct 2013 Team Lima DGM

TL: Reece UXO II: Nelson Geo: Reuter

Geo: Jacobsen

0730 Safety Brief

0800 Departed to speak with PVD Supervisor for access to transect survey area

1200 Stood for access point to Western portion of MRS transect survey area

1400 Depart for IVS

1415 Begin DGM

1630 End DGM

1700 IVS

1730 COB

Matt Ill

Nothing Follows

1 Nov 2013 Team Lima DGM

TL: Reece TechII: Nelson Geo: Reuter

Geo: Jacobsen

0730 Safety Brief

0800 Depart for IVS

0830 Planted Corps Seed

0900 Begin DGM

1300 Planted Corps Seed

1400 End DGM

1415 Depart for IVS

1500 COB

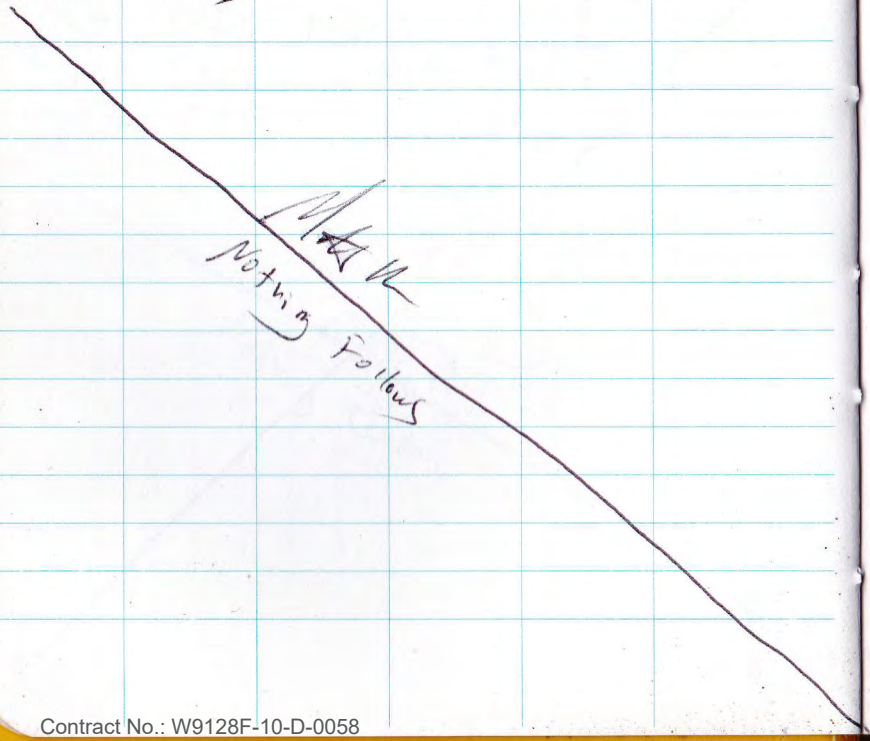
Matt Ill

Nothing Follows

4 Nov 2013 Team Lima DGM

TL: Reece Tech II: Nelson Geo: Jacobsen
Geo: Reuter

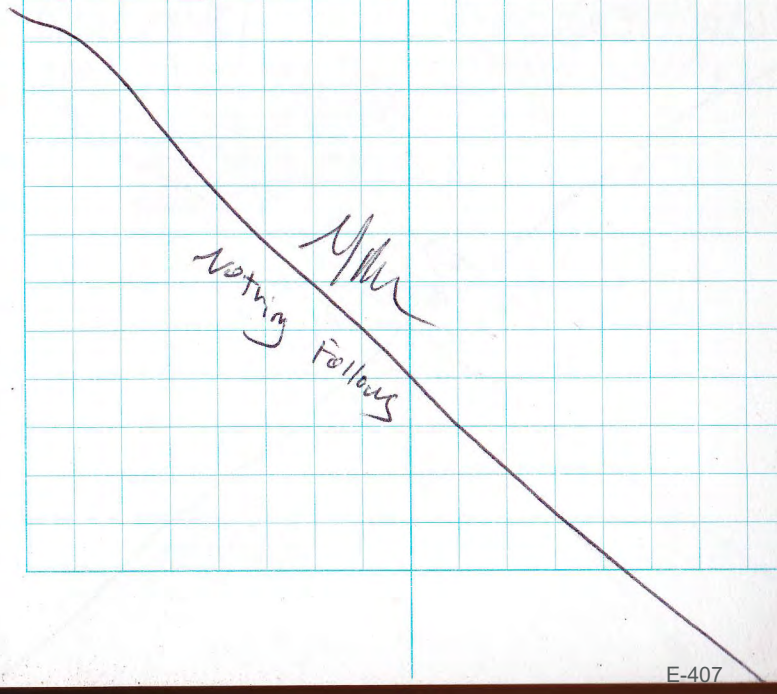
0630 Safety Brief
0700 IVS and Instrument check
0730 Put in Corps Seed
0800 Begin DGM
1400 Scouted unsurveyable area in valley in TAA2
1445 End DGM
1530 IVS
1630 COB



5 Nov 2013 Team Lima DGM

Tech III: Reece Tech II: Nelson Geo: Reuter
Geo: Jacobsen

0630 Safety Brief
0715 IVS and Instrument check
0745 Put in Corp Seed
0815 Begin DGM
1400 Scouted Several Unsurveyable and dangerous Survey areas in TAA2
1500 End DGM
1530 IVS and Instrument check
1630 COB



7 Nov 2013 Team Lima VS

TL: Reece Tech II: Nelson Geo: Reuter

Schonstedt: 3104

GPS: 3679

0630 Safety Brief

0700 Instrument Check

0730 Depart for transects

0800 Tried to access TA1, ~~Unsuccessfu~~
Surveyed unsurveyable areas

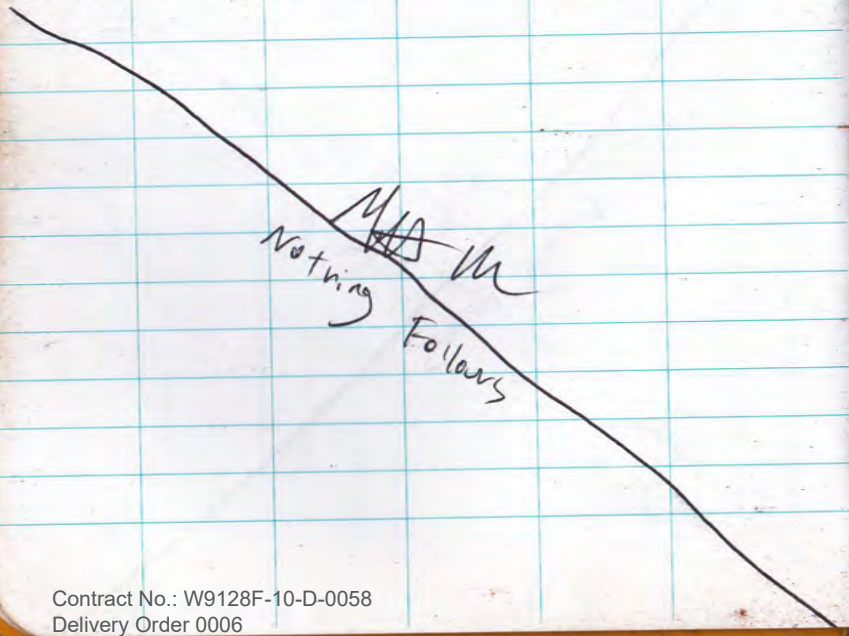
1100 Depart for entrance to East side of TA1

1230 Begin Transects

1530 End Transects

1630 COB

1.8 Miles



11 Nov 2013 Team Lima DGM

Tech II: Reece Tech II: Nelson Geo: Reuter

Geo: Jacobsen

GPS: 3679 Schonstedt: 3104

0630: Safety Brief

0715: IVS and Instrument Check

0900: Begin DGM

~~1500~~

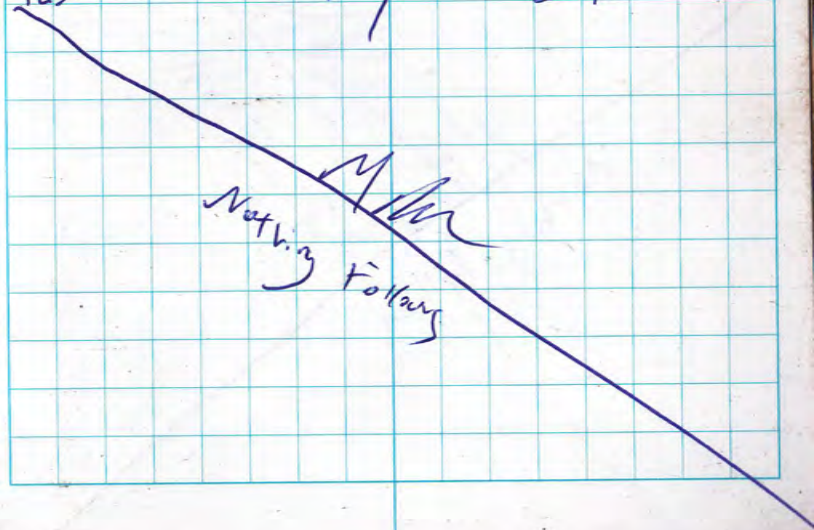
1300: Nelson injured knee tripping in the woods

1330: Surveyed several unsurveyable lines

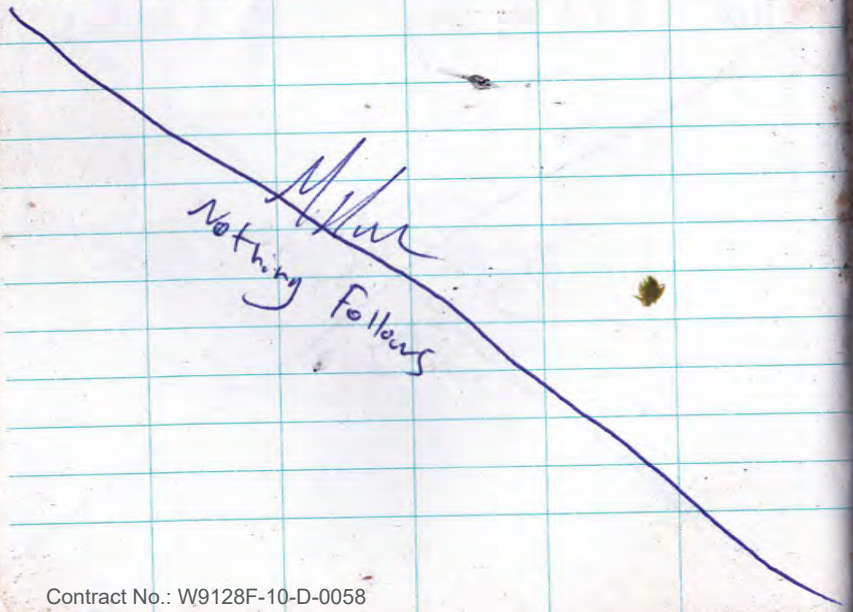
1500: End DGM

1515: ~~IVS~~

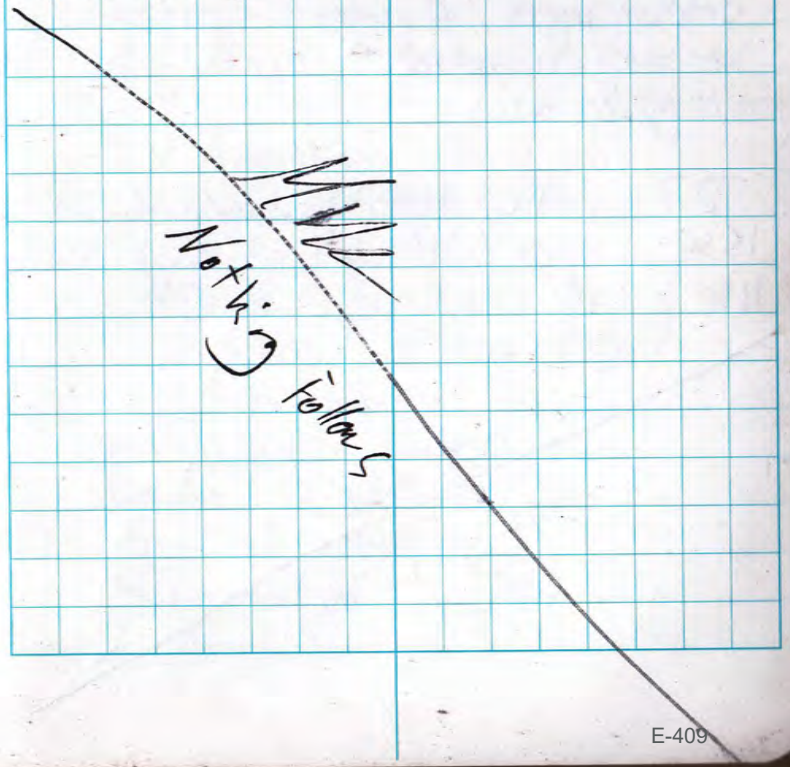
1630: End of Day 2.1 Miles



12 NOV 2013 Team Lima DGM/VS
Tech III: Reece Tech II: Nelson Geo: Ruetter
Geo: Jacobsen
Schonstedt: 3104 GPS: 3679
0630: Safety Brief
0715: IVS
0800: Begin DGM
1030: End DGM 1130: Begin Transects
1200 Tried to access TA1, unsuccessful
1245: Tried to access another approach into TA1, unsuccessful
1400: Begin Transects in TA2
1600: End Transects
1630: COB



13 NOV 2013 Team Lima VS
Team III: Reece Tech II: Nelson Geo: Ruetter
Schonstedt: 3104 GPS: 3679, 3682
0630: Safety Brief
0715: Depart for TA1
1100: Could not access transects in TA1, to steep, dense brush, dangerous
1230: Begin Transects in TA2
1530: End Transects
1600: Depart for control point
1630: COB



14 Nov 2013 Team Lima Mag + Dig
TL: Reece Tech II: Nelson
Schonstedt: 3104 XH: Lima
0630: Safety Brief
0715: Set up for Mag + Dig
0800: Instrument check
0830: Put in corner stakes
1000: Begin Grid L4
MD: 11 pieces Smallarms: 12 NMRD: 2
11lb. 11lb. Photo: 0981
22lbs. Total MD
Smallest depth: 0 inches
Deepest: 16 inches
Avg: 8 inches

27 anomalies 25 Finds
1530: Finish Grid L4
1630: COB

Nothing Follows

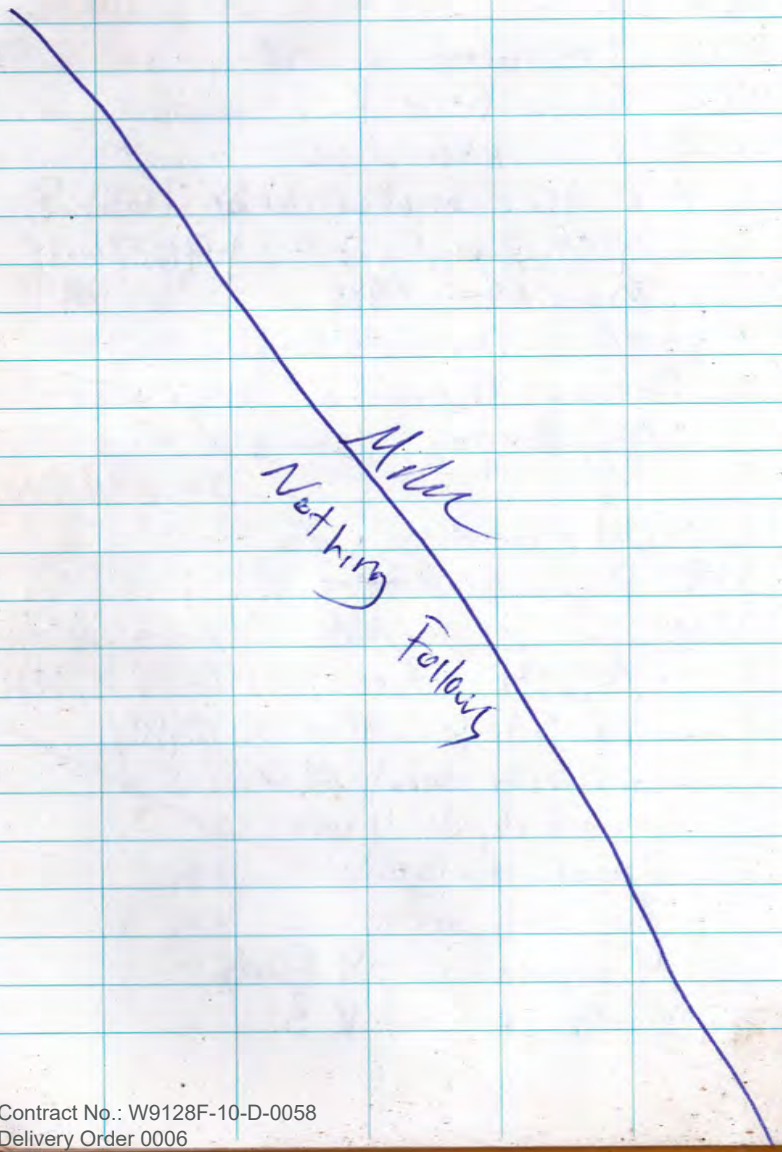
15 Nov 2013 Team Lima Mag + Dig
TL: Reece Tech II: Nelson
Schonstedt: 3104 XH: Lima
0630: Safety Brief
0715: Instrument check
0800: Begin Grid K4
1030: Finish Grid K4
MD: 10 Smallarms: 5 Trash: 8
1.5lbs. MD 19lbs Trash
Photo: ~~0985~~ 0986 MK
Smallest Depth: 3
Deepest Depth: 12
Avg. Depth: 6

Due to the size of the grid being short, ran 4 lines

24 Anomalies 23 Finds
1100: Begin Grid ~~K3~~ M4
1350: End Grid M4
MD: 4 Small Arms: 0
0.5lbs Photo: 0984
0.5lbs total MD
Smallest depth: 4 inches
Deepest: 12 inches
Avg: 8 inches
4 anomalies 4 Finds
1400: Begin Grid K3

1430: Wrap up and back to control point and Instrument check area

1500: COB



18 Nov 13 Team Lima Mag + Dig

TL: Reece Team M: Nelson

Schonstedt: 3104 YH: Lima

0630: ~~Safety~~ Brief

0715: Instrument check

0730: Begin K3

0800: UXO Found, 37 MM

0815: UXO Found, 37 MM

0825: UXO Found, 37 MM

0842: UXO Found, 37 MM

0940: Finish Grid K3

MEC: 4 MD: 8 SA: 0 Trash: 9

1 lb MD photo: 0993

18 lbs. Trash

UXO item 1: 7 inches Deep

UXO item 2: 6 inches

UXO item 3: 5 inches

UXO item 4: 7 inches

Deepest MD item: 8 inches

Shallowest: 3 inches

Avg: 6 inches

23 anomalies 23 Finds

ran shorter Multiple lanes due to smaller grid size

1000: Started Grid L3

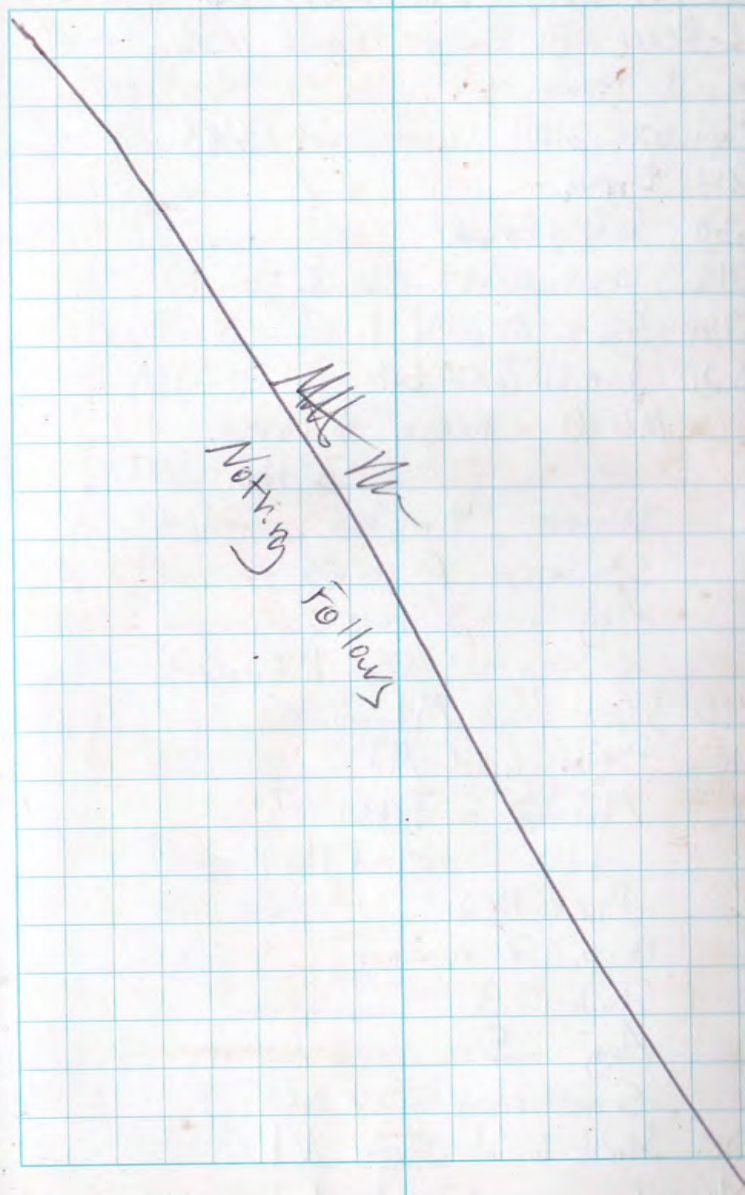
1305: End Grid L3

MD12 SA6 ~~RRD 2~~ Trash 10
1 lb. ~~[illegible]~~ 16 lbs

Photo: 0995
Deepest item: 14 inches
Shallowest: 4 inches
Avg: 7 inches
30 Anomalies 30 Finds
1311: Started Grid L2
1450: Finish L2
MD: 3 Trash: 14 Photo:
0.5 lbs. 22 lbs. 0996
17 anomalies 17 Finds
Deepest item: 14 inches
Shallowest: 4 inches
Avg. 8 inches
1500: Started Grid K2
1540: Finished Grid K2
MD: 0 Trash: 17
0 lbs. 43. lbs
Deepest item: 6 inches
Shallowest: 0 inches
Avg. 3 inches
17 anomalies 17 Finds
Small Grid So ran Several
Smaller lanes

1600: COB

Nothing Follows



19 Nov 2013 Team Lima Mag + Dig
TL: Reece III: Roulier Tech II: Nelson
Tech II: Hawkins
Schonstedt: 3104 Schonstedt: 3105
VH: Lima
0630 Safety Brief
0715 Instrument Check
0745 Start Grid L1
0820 Finish Grid L1
MD: 0 Trash: 6 items
3 lbs.
Deepest: 4 inches
Shallowest: 0 inches
Avg: 2 inches
6 anomalies 6 Finds
0840 Start Grid M1
0910 Finish Grid M1
MD: 2 Trash: 3
1 lb. 1 lb.
Photo: 1002
Deep: 7 inches
Shallow: 3
Avg: 5
5 anomalies 5 Finds
0920 Start Grid ~~M0~~ M1
1000 Finish Grid M1

MD: 0 Trash: 10
8 lbs.
Deepest: 12 inches
Shallowest: 1
Avg: 6
11 anomalies 10 Finds
1016: Started Grid M2
1115 Finish Grid M2
MD: 0 Trash: 7
2 lbs.
Deepest: 8 inches
Shallow: 2
Avg: 5
8 anomalies 7 Finds
1215: Started Grid N00
1245: Finished Grid N00
MD: 0 Trash: 3
2 lbs.
Deepest: 18 inches
Shallow: 4
Avg: 7
5 anomalies 3 Finds
1250: Started Grid M00
1810: Finished Grid M00
MD: 0 Trash: 14
8 lbs.

Deepest item: 9 inches
Shallowest: 3 inches
Avg. 5
Anomalies 14 Finds 14
1315: Started Grid L 00
1340: Finished Grid L 00
MD: 0 Trash: ~~4~~ 13
3 lbs.

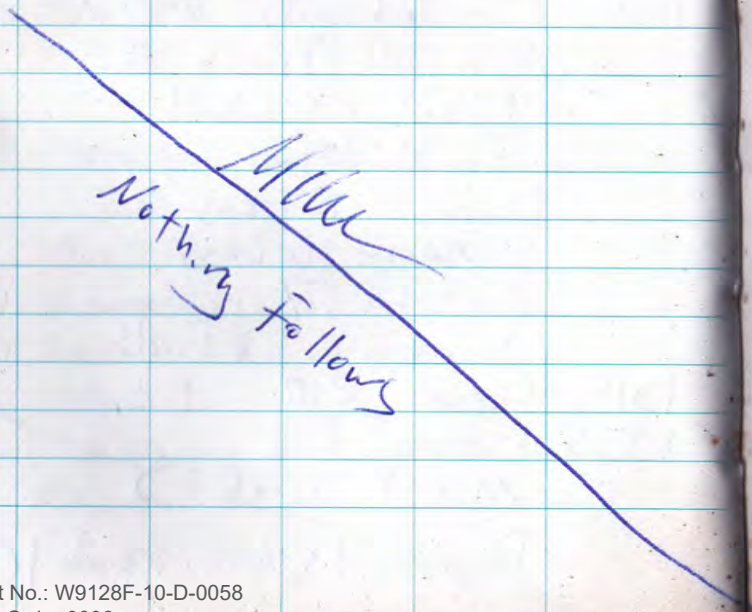
Deepest item: 7 inches
Shallowest: 1 inches
Avg. 5 inches
13 anomalies 13 Finds
1400 Started Grid M3
1520 Finish Grid M3
MD 3 Trash 4
5 lbs. 6 lbs
Photo 1008
Deepest: 8 inches
Shallow: 3 inches
Avg. 5
7 Anomalies 7 Finds
1600 COB

MM
Nothing Follows

20 Nov 2013 Team Lima Mag + Dig
TL: Reece Tech II: Nelson
Schonstedt: 3104 XH: Lima
0630 Safety Brief
0715 Instrument Chck
0740 Begin Grid Q9
0930 Finish Grid Q9
MD: 0 Trash 1
3 lbs.
Deepest: 6 inches
Shallow: 6 inches
Avg. 6
2 anomalies 1 Find
1000 Started Grid R9
1120 Finished Grid R9
MD: 2 Trash: 1
1 lb: 2 lbs.
Photo: 1012
Deepest: 8 inches
Shallowest: 6 inches
Avg. 7
4 anomalies 3 Finds
1215 Started R10
1335 Finished R10
MD: 1 Trash: 2
Deepest: 12 inches Photo: 1014

Shallowest: 4 incks
Avg: 8
5 anomalies 3 Finds
1345 Started Grid Q10
1510 Finished Grid Q10
MD: 8 Trash: 3
1 lb. 1 lb.
Photo: 10lb
Deepest: 12 incks
Shallowest: 5
Avg 7
12 anomalies 11 Finds
1600 COB

Nothing follows



21 Nov 2013 Team Lima
Mag + Dig
TL: Reece, Roulier
Tech II: Hawkins, Nelson
Schonstedt: 3104, 3105 XH: Lima
0630 Safety Brief
0715 Instrument Check
0745 Begin Grid S-08
0910 Finish Grid S-08
MD: 0 Trash: 112 items
311 lbs.
Deepest: 18 incks
Shallow: 4
Avg 10
115 anomalies 112 Finds
0940 Begin Grid S-09
1005 Finish S-09
MD: 0 Trash: 3
17 lbs.
Deepest: 12 incks
Shallow: 4
Avg: 8
3 anomalies 3 Finds
1010 Started Grid S10
1050 Finished Grid S10
MD: 0 Trash: 2
3 lbs.

Deepest 8 inches
Shallow 4
Avg 6
2 anomalies 2 Finds
1100 Started S11
1237 Finished S11
1 MD 3 Trash
0.5 lbs 2 lbs.
Deepest: 6
Shallow 3 Photo: 1021
Avg: 4
4 anomalies 4 Finds
1245 started R11
1330 Finished R11
MD: 0 Trash: 13
4 lbs.
Deepest: 7 inches
Shallow: 0
Avg: 4
17 anomalies 13 Finds
1340 Started Q11
1440 Finish Q11
MD 14 Trash 10
4 lbs.
11b.
Photo: 1023
Deepest. 12 inches
Shallow: 4

Avg 8
28 anomalies 24 Finds
1445 Started T-11
1530 Finished T-11
0 MD 3 Trash
11b.
Deepest: 0
Shallowest: 0
Avg 0
3 anomalies, 3 finds
1600 CoB

Nothing Follows

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22 NOV 2013 Team Lima Mag & Dig
TL: Reece, Roulier Tech II: Humcars, Nelson
Schonstedt: 3104, 3105 XH: Lima
0630 Safety Brief
0730 Instrument Check
0745 Start Grid T 12
~~0 MD 0 Trash~~
0900 End Grid T 12
MD: 0 Trash: 0
0910 Start Grid S 12
0950 Finish S 12
MD: 2 Trash: 7
0.5 3 lbs.
Photo: 1030
Deepest: 6 inches
Shallow: 3
Avg: 5
11 anomalies 9 Finds
1000 Started T 13
1055 Finish T 13
MD: 0 Trash: 10
2 lbs.
Deepest: 3 inches
Shallow: 0
Avg: 2
14 anomalies, 10 Finds

1100 Started Grid S 13
1205 Finished S 13
MD: 0 Trash: 0
1210 Started R 16
1255 Ended R 16
MD: 0 Trash 3
5 lbs.
Deepest: 4 inch
Shallow: 0
Avg: 2
5 anomalies 3 Finds
1300 Started R 15
1330 Finished R 15
MD: 0 Trash: 8
3 lbs.
Deepest: 5 inch
Shallow: 2 inch
Avg: 3
8 anomalies 8 Finds
1335 Started Grid R 14
1430 Finished R 14
MD: 0 Trash: 6
3 lbs.
Deepest: 4 inches
Shallow: 0
Avg: 2

6 anomalies 6 Ends
1440 Started Grid R13
1515 Finished Grid R13
MD: 0 Trash: 1
11b.
Deepest: 0
Shallow: 0
Avg: 0
1 Anomaly 1=ind
1600 CO13

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ALL-WEATHER WRITING PAPER

ALL-WEATHER
FIELD BOOK

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18 Oct 2013

Met with personnel who drove HDR leased truck with site equipment. Equipment was inventoried and inspected, geophysical equipment was tested.
Local purchase of equipment/supply deficiencies
Drove to MRS, inspected site for portable magazines
DGM began work on preliminary survey control point activities
Notified local sheriff and fire departments of upcoming operations

19 Oct 2013

Designated an area for IVS, swept w/ Schonstedt, cleared anomalies, then check w/ EM-61. More anomalies needed to be cleared and the area was re-swept. Data processing needs to be completed before continuing

21 Oct 2013

Received skid steer. Hawkins inspected and removed berm to provide access to area for magazines. Recce supervised / spotted.
IVS installed/established

22 Oct 2013

In-briefing given to site personnel (SI. Amaral, Jacobson, Rueter, Reece, Nelson, Gordon, Dunmire, Boulia, Hawkins). Briefing included: APP/SSHP, technical approaches to the project, expected munitions and greatest item of concern, emergency contact numbers and route, daily operations, reporting requirements OSHA 3-Day begins
Trucks set up for site and IAW APP/SSHP
personnel on MRS for Trimble training provided by Rueter
Hospital route driven
Day boxes delivered

Contract No.: W9128F-10-D-0058
Delivery Order 0006

23 Oct 2013

PM Larry deVries on site to observe beginning of field operations and assist in selecting survey control points

Surveyor James Wengler of Wengler Surveying & Mapping arrives

PM and surveyor given safety brief and escorted by UXOSO/QCS

Observed Team Lima Conducting visual surveys in Technical Approach Area 1

24 Oct 2013

Surveyors from Wengler on site to establish control points; safety brief given and escorts provided

Electrician arrives to ground portable explosives magazines; safety brief given and escort provided

Magazines grounded IAW DA Pam 385-64 Table 17-1, Grounding System Inspection and Test Requirements, and NFPA 780 Section 8.7.5 metal portable Magazines

Observed Team November Assisted Visual Survey in Technical Approach Area 3 (Initial Observation)

No MRSH found by any teams today

25 Oct 2013

Wengler Surveyors on site to continue/complete establishing control points; Surveyors were given a site safety brief and provided escorts

Observed surveyors and escorts in Tech Area 2

Field operations concluded early to allow time for vehicle/safety equipment checks and admin - timesheets and expense reports

No MPPEH found today

28 Oct 2013

Performed Initial Inspection of DGM-EM61 Coil
failed initial calibrations and was replaced, passed re-test

Team Lima performed AVS, leading the DGM team, and recording non-munitions related features (fence and survey marker)

Explosives were delivered, inventoried, and secured
Magazines were inspected
Keys issued
UXOSO/QCS: #122081 for initiators mag
SUXOS: #22675 for HE mag
Custodian: #CCCC for HE mag and
#486-3390 for initiators mag
No one person can access either magazine

No MPPEH located today

29 Oct 2013

Received Net Explosive Weight and hazard classes of contents of magazines from custodian; forwarded in writing to Clallam Fire District 2 (Chief Sam Phillips via e-mail as previously agreed)

UXO SO/QCS and SUXOS attempted to find access to 75-ft transects in Area 3; could not find access, advising teams to be liberal with unsurveyable documentation due to terrain/vegetation

30 Oct 2013

Observed DGM calibrations & DGM survey of Technical Approach Area 2. An inert 37mm is now being used as a seed in one transect per day to meet WP para 3.4.6.1; John Jacobson (as DGM QC) will ensure this is done.

Several partial transects had to be dropped as unsurveyable due to terrain and vegetation effecting EM-61 latter survey. It may be possible to re-visit some of these areas as strictly AVS

31 Oct 13

0 Observed Team India performing AVS of the 75-foot spaced transects in Tech Approach Area 3 Team performed surveys along pre-planned transects, adjusting for terrain and vegetation. Areas that required > 50% variance were documented as unsurveyable, as well as slope that could not be safely negotiated Anomalies found were adequately investigated

1 Nov 2013

Updated Daily Inventory to reflect a Sridon Schonstedt and update camera serial no.

Conducted Magazine inspection w/ SUXOS; no evidence of tampering of vandalism, grounding still in place, chain across access road still intact

End of week safety inspections, FA kit inventories, Monthly fire ext. checks

Key inventory conducted

Depart early for Admin

4 Nov 2013

OESS Webster Keller arrives on site, shown magazines - magazine inspection conducted while there - and open area where DGM coverage is being performed in Tech Area 2
Teams Lima and DGM were observed

No MPPEH found by any teams today
SUXOS
Proposed accessing west side of MRS from Mount Pleasant/Snow Ridge roads, Team November departing from Port Angeles instead of rally point on Deer Park Rd. Spoke to OESS about installing a two point test for Schonstedt on west side. Approved by OESS and USACEHNC

5 Nov 13

Went out with Team November, installed two inert 37mm bullets at 6" and 12" to test Schonstedt; team designated a point to log Trimble start of day future

Travelled back to Schriver rally point, OESS conducted QA checklist

6 Nov 13

After observing Schonstedt checks, worked on filling QA deficiencies

Weekly status call took place today

7 Nov 13

Observed Schonstedt checks and start of day procedures

PM expressed concern that no MPPEH is being found in AVS sweeps; UXO 50/QCS and SUXOS performed seperate AVS of 75-ft spaced transect area in Tech Approach Area 3. Walked transect lines, between transect lines, across (perpendicular to) transects. Nine anomalies were investigated, none were munitions related

Received and forwarded letter from electrician regarding grounding magazines IAW NFPA 780 to OESS

Forwarded e-mail chain describing work plan approval to OESS

8 Nov 13

Observed Team November perform AVS, accessing Tech Approach Area 3 from the west of MRS, OESS also observed.

Team followed pre-planned transects loaded in a Trimble GeoXT, adjusting for terrain and vegetation. Vegetation was so thick in areas that reliance on the Schonstedt was needed, TL expanded sweep in more open areas. Some areas where navigation/survey was impossible or unsafe were documented as 'unsurveyable.'

OESS departed around lunch, expressed 'no issues' with team's performance

11 Nov 13

Observed Schonstedt function check across from Schriver rally point (at IVS)
Observed Trimble start of day
Observed EM-61 litter calibrations check

EM-61 passed, teams were able to perform surveys
Observed Team Lima perform AVS and lead litter team on pre-planned transects, adjusting for terrain and vegetation. Areas that took the teams out of tolerance were documented as unsurveyable. Twice Lima out paced the DGM team because of difficulty maneuvering the litter.

In-transect seeding was not done due to lack of positional accuracy

Observed second set of IVS data

No teams found MEC

12 Nov 13

Observed India and Lima Schonstedt check
Verified Daily Equipment Inventory

OESS QA checklist completed - forwarded to HDR PM and UXO QM

UXO SO/QCS and OESS performed AUS QC of 75-ft transect area walked by UXO SO/QCS and SUXOS previously; tracks were dissimilar, 18 additional anomalies were investigated, non were munitions related

No teams found MPPEH

13 Nov 13

Observed Schonstedt checks
verified Daily Equipment Inventory

UXO SO/QCS, SUXOS, OESS, magazine custodian inspected magazines
Key inventory - all assigned key holders have applicable keys

Observed preparation for In-situ XRF sampling to be performed tomorrow

No MPPEH

14 Nov 13

Observed Schonstedt check and Trimble start of day
verified Daily Inventory

Team Lima was selected to begin subsurface investigations
performed Preparatory Phase Inspection
work began after inspection/review of procedures
Performed Initial Phase inspection
Team was given a priority area by PM where it is
believed mortars were fired; Team followed up in their investigation

Observed XRF/performed Initial Inspection

Lima found MD in grid L-4, MD Handling, storage
procedures followed; SUXOS inspected and stored in
locked container

15 Nov 13

Observed Schonstedt check and Trimble start of day
verified Daily Inventory

Followed up with Lima's performance of subsurface
Investigations and MD Handling

Mark Murphy, USACE PM from Seattle, on site
Given safety brief, escorted by OESS and SUXOS,
given "tour" by Field Tech formerly from Lima

SUXOS, UXOSO/QCS, custodian conducted magazine
inventory, no descrepancies

Lima's MD inspected by SUXOS and secured

Weekly safety inspections conducted, admin

* XRF was not conducted today due to rain *

18 Nov 13

Two additional HDR personnel and three Versar personnel mob'ed to the site. Certifications were requested, checked, and deficiencies re-requested

Schonstedts were tested at IVS

New personnel were given site orientation and briefing, including ABP/SSHP, Subsurface Investigations, MD Handling, Storage, and Demil, and MEC Disposal

New personnel were integrated into Mag & Dig teams after Prep. Phase Inspection

Conducted Initial Inspection of Subsurface Investigation & MD Handling and Storage

Four MEC items (37mm HE) found in K-03 this morning were disposed of, process was inspected

MD Handling and storage audited, SUXOS stored MDAs

No XRF due to rain

19 Nov 13

Versar Schonstedts arrived, will not be carried on HDR equipment inventories

Schonstedts were tested at IVS

A second luggage scale was purchased and supplied to the additional Mag & Dig team

Performed Follow-up inspections of both Mag & Dig teams and MD Handling & Storage procedures

~~Lead~~ MC Sampling Lead (Field Tech III Jeff Rueter) decided to conduct XRF Thursday (21 Nov 13) to allow ground to dry

20 Nov 13

Observed morning Schonstedt check

Received TA2 Density Map: All grids from Surveyor Creek to Deer Park Road Need to be investigated. Assisted SUXOS in determining Time estimate to completion and cannot finish and demob by Thanksgiving

Participated in Weekly Status call

Drew up demob schedule and booked travel arrangements. Friday will be final field day, Sat will be demob activities and personnel released to Seattle for Sunday Flights. UXOSO/QCS and SUXOS will stay an additional day to perform weekly magazine inspection Personnel will re-mob 2 Dec, Field work to begin 3 Dec

MD inspected by SUXOS, MDAS secured

21 Nov 13

Schonstedt checks conducted

Observed XRF sampling, began sampling the four grids where SA debris was found

Magazine inspection conducted

MD Handling completed w/ SUXOS inspection and securing MDAS

22 Nov 13

Observed Schonstedt checks

USACE Regional Project Lead Mark Murphy and WA Dpt of Ecology UXO Ronnie Johnson conducted site visit. Given safety brief and escorted by OESS, UXO SO/QCS, led by Field Tech Ducter. Areas of interest were the grid MEC items were found, area of Swagerty incident, edge of Surveyor Creek documented as unsurveyable. Also shown disposal area

After visit, In-situ XRF was completed: no points tested above action level

SUXOS inspected MD processed by teams; MDAS secured

Teams secured site equipment; IVS, survey poits, laths and flagging will stay

Versar personnel demob'ed after conclusion of field work

23 Nov 13

No Field work - Demob activities

All site equipment was downloaded from vehicles and stored in All View Motel rm 26 Leased vehicle was safety inspected and will be left in parking at hotel. A Safety briefing was conducted and included holiday topics. Personnel were then released to travel to Seattle for flights out tomorrow

Time sheets were filled out

Expense reports are to be done individually and submitted while 'home'

24 Nov 13

UXO SO/QCS and SUXOS retrieved two-item test strip on West side of MRS, then conducted magazine ~~inventory~~ inspection

SUXOS, UXOSO/QCS demobilized following field activities

3 Dec 13

Site personnel re-mobilized 2 Dec
Hetzel, Vallejo, Inzinna added
Reece, Gullickson, Ruter didn't return
Won't have UESS for the rest of project
Personnel re-reviewed WP and practices for Mag & Dig, Visual surveys, and MD Handling & Storage

Field work resumed, observed mag & dig ~~Crew~~ Team

Hetzel was on site 1 Dec to inspect magazines, reviewed his report

Explosives were received and secured, data cards reviewed. Inspection conducted

Reminded HDR Bill a UXO approval letter is needed for new Techs

Contract No.: W9128F-10-D-0058
Delivery Order 0006

4 Dec 13

Observed Schonstedt checks/Trimble start of day

SUXOS sent two VS teams to Hurricane Ridge Road in Olympic Natl Park to attempt access to south-west corner of MRS

Participated in weekly status call

VS teams were unable to access MRS due to steep terrain. Asked Forest Rangers for assistance; Rangers checked topo maps and informed teams there is no access

MD found by mag & dig inspected by SUXOS, MDAS secured

5 Dec 2013

Observed Schonstedt checks, Trimble start of day

SUXOS intends to form a third VS team to check access routes into un-surveyed areas of TA1; a new team would require an Initial Phase Inspection. Have to skip Initial Inspection of current VS teams, however the current teams have been established (worked together) and performed VS prior to Thanksgiving demob

HDR FM e-mailed UXO approval letter; printed and filed

SUXOS decided not to stand up the third VS team; UXOSO/QCS observes Mag & Dig, follow-on inspection performed

VS teams found access to SE corner of MRS via logging road through state land no MD/MEC found

MD processed by Mag & Dig inspected by SUXOS, MDAS secured

6 Dec 13

Observed Schonstedt checks and Trimble start of day

Left w/ VS Team India to perform Follow-UP Inspection. Received call From Mag & dig to check 75mm. Reported India (no data collected), met SUXOS. Determined 75mm to be practice, removed For later demil.

Mag & Dig Found 37mm ME in their next grid, arranged demo draw to destroy and demil 75mm UXOSO/QCS and SUXOS determined 37mm safe to move shot set up in middle & open area.

Mag & Dig team and Teams India used for demo, then cleaned shot holes

Vehicle safety inspections conducted, admin (timesheets and expense reports) taken care of

MD process was followed

VS Team November continued in SE MRS

9 Dec 2013

Observed Schonstedt validation and Trimble start of day, verified Daily Inventory

Drafted demob time line based on probability field operations will conclude Wednesday (11 Dec)

E-mailed ~~Discussed~~ demob time line w/ PM

Observed mag & dig operations

Observed SUXOS inspect MD, MDAS secured

VS Teams India and November continued attempting transects in SE MRS, could not access new transects. Walked a road recording un surveyable points on November's Trimble

10 Dec 13

Observed Schonstedt checks and Trimble start of day, verified inventory

Observed demolition procedures to demil a practice 75 mm and 81 mm

Discussed demob timeline w/ HDR PM, addressed possible setbacks, waiting for weekly status meeting to begin planning travel

UXO SO/QCS and SUXOS inspected magazines

MD processed by mag & dig inspected by suxos, MDAS secured

VS Tm November attempted to fill transects in central portion of MRS; no transects walked due to terrain, unsurveyable points collected

11 Dec 13

Observed Schonstedt checks, Trimble start of day verified inventory

Pre-conference call w/ PM to discuss recent and current operations for exit brief

weekly status call - PM gave exit brief, all involved agreed everything was done to collect all possible data and team can demob

Grids were completed - no MD/MEC found today

VS teams November & India attempted to fill AVS gaps, entering from the west to access south-central and TA 1. India was able to walk 9 short transect in NW portion of MRS. Unsurveyable points collected, AVS complete

Two personnel selected to drive company vehicle back, booked flights for 5 for Fri and UXOSO/QCS and SUXOS Sat, two departing by Sat

12 Dec 13

Observed demo operation to dispose of remaining explosives

Two personnel escorted/over saw emptied magazines moved by Evergreen Towing for storage area to a site off of Deer Park for access to Austin Powder Same two received skid steer from D&K Rentals and re-built berm to block access to off Deer Park

IVS, flaggings and laths used by HDR removed laths, survey points installed by Wenzler Surveying & Mapping were left in place

Shot holes were rehabbed, native grass seed spread over demo area, parking/rally point, and berm

HDR equipment loaded into leased truck

Personnel released to drive to Seattle for demob

Okanogan Fire Dist. 2 notified no more explosives on site

13 Dec 13

UXOSO/QCS and SUXOS oversaw Austin Powder remove portable exp. magazines

D&K Rentals contacted SUXOS, cannot pick up skid steer. SUXOS will take key to D&K office

MDAS was 100% re-inspected and repackaged for shipment to Timberline, 1348-1A prepared

UXOSO/QCS and SUXOS demob after conclusion

HDR

Field Change Request Form 1

This is to be completed prior to the implementation of any changes to the approved work plan

1. What is the approved design?

Section 3.4.8 Data Processing states:

"In general, GPS data points with position dilution of precision (PDOP) values higher than 4 and RTK fix solution other than 3 will be removed."

2. What are the changes/ deviation from the approved work plan?

The text will be revised as follows:

"In general, GPS data points with position dilution of precision (PDOP) values higher than 4 ~~and RTK fix solution other than 3~~ will be removed."

3. What is the justification for change?

The Digital Geophysical Mapping (DGM) positioning accuracy requirement for the project is +/- 1 meter. An RTK fix solution of 3 indicates +/- 2 centimeter positioning. Since centimeter level accurate positioning is not required the other RTK solutions of 1, 2 and 4 are acceptable. Please note that there is a reference to similar text in Table 3-6 for positioning specifications where the removal of RTK positioning solutions other than 3 is appropriate (i.e. daily GPS checks) and is not proposed for revision.

Requesters Name: Lawrence deVries, Project Manager Date: November 11, 2013
HDR, Inc.

Approvers Name: MILLER.JOHN.M.1231274274 Digitally signed by MILLER.JOHN.M.1231274274 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=MILLER.JOHN.M.1231274274 Date: 2014.01.24 12:21:49 -06'00' Date:
USACE Omaha District

Field Change Request Form 2

This is to be completed prior to the implementation of any changes to the approved work plan

1. What is the approved design?

Section 3.1.4 Investigation Strategy states:

Technical Approach 2 will be conducted within the **Direct Impact Fire Area** and **adjacent buffer zones to the east and west** (R01-SR01, R01-SR02, R01-SR05, a portion of R01-SR04, and a portion of R01-SR07). The technical approach within this area is driven by the use of 37mm and 75mm artillery fired and fixed and towed ground based targets within a discrete area.

• AVS will be performed by a UXO Technician and a Geophysical/Field Technician (**Section 3.1.5**). All field teams will be assembled in accordance with EM-385-1-97 (USACE, 2013).

o Initial AVS transects will be spaced 75 ft. apart.

o AVS transects will be spaced 35 ft. apart within the open area where there were likely targets (meadow) illustrated in historical aerial photography (**Figure 3-7**).

o Non-munitions related features (e.g., fencing, utilities) that can interfere with DGM will be recorded

• DGM surveys will be conducted to determine areas with high subsurface metallic anomaly densities(**Sections 3.1.6** and **3.4**)

o DGM transects will be spaced 75 ft. apart.

o DGM transects will be spaced 35 ft. apart within the open area where there were likely targets (meadow) illustrated in historical aerial photography (**Figure 3-7**).

o 200 ft. x 200 ft. subsurface investigation grids will be positioned over areas identified as containing high anomaly densities (250 anomalies per acre or greater) determined by the DGM.

o A minimum of 10 percent (%) of each grid (i.e., a 200 ft. x 200 ft. grid with 5 ft. lanes at the 0 ft., 50 ft., 100 ft., 150 ft. and 200 ft. intervals).

o Contiguous subsurface investigation grids stepping out from the high anomaly density areas (i.e., 250 anomalies per acre or greater) will be established if munitions are observed and until the extent of the munitions have been determined.

• Analytical sampling for explosives will be conducted, if required (**Section 3.1.11.1**). "

2. What are the changes/ deviation from the approved work plan?

Portions of areas depicted on the attached map will be surveyed utilizing assisted visual surveying (AVS) techniques with real time excavations.

The environmental factors described below in item 3 do not permit the establishment of mag and dig grids. The munitions related items (if any) recovered during the real time excavations will be utilized to determine the nature and extent of any munitions that may be present.

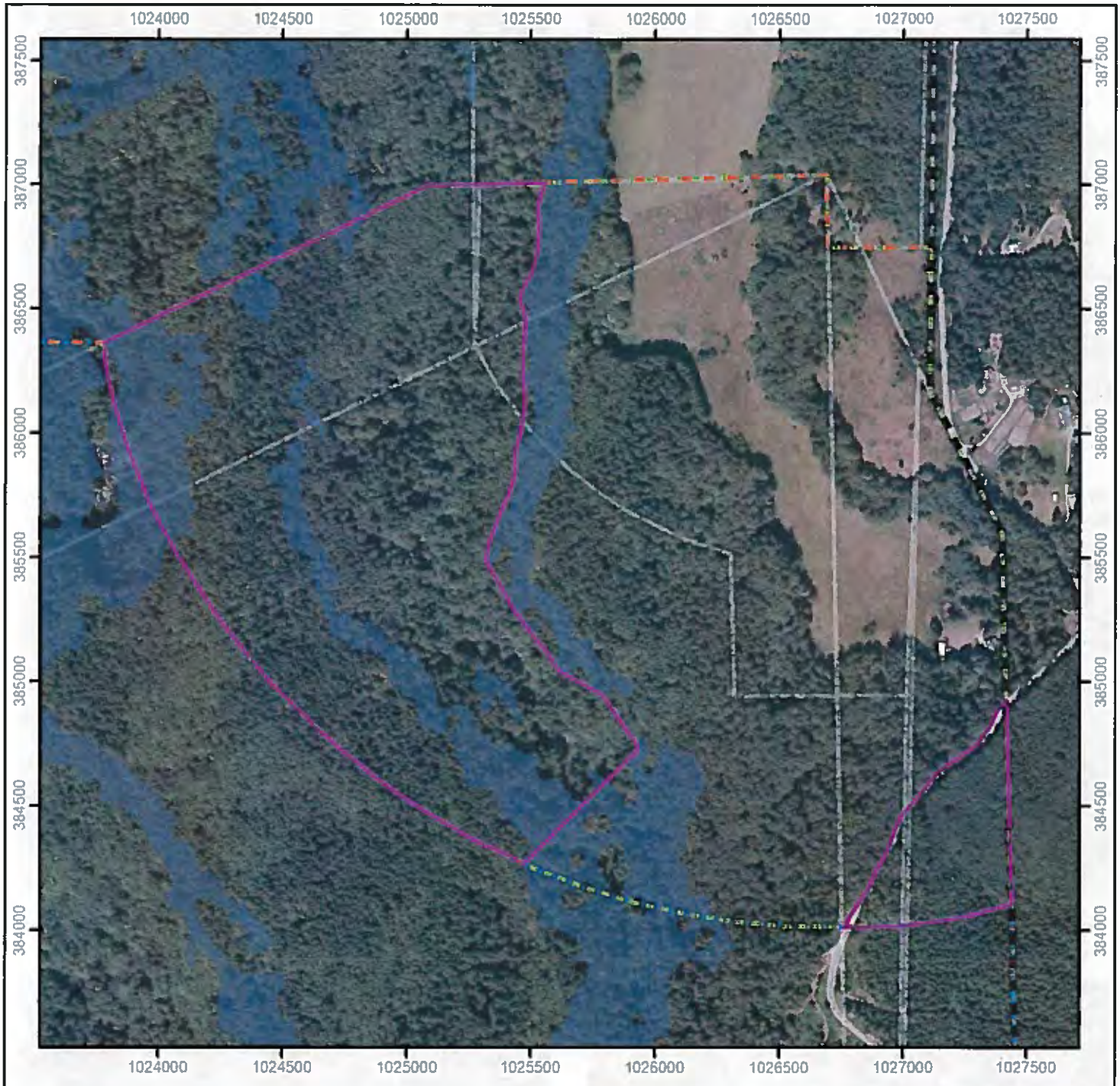
AVS with real time excavation transects will be walked at a transect spacing of 75' to the extent practical. It is anticipated there will also be areas that can not be surveyed with AVS and real time excavations due to the environmental factors described below in item 3.

3. What is the justification for change?

The areas depicted on the attached map can not be surveyed utilizing Digital Geophysical Mapping (DGM) techniques due to the impassable vegetation, down trees, slippery slopes and other environmental hazards. Attached are 12 pictures that depict the site conditions described above to support the FCR. Instead of calling the areas unsurveyable HDR is proposing to survey the areas utilizing AVS with real time excavation techniques to fill the data gaps.

Requesters Name: Lawrence deVries, Project Manager Date: November 19, 2013
HDR, Inc.

Approvers Name: MILLER.JOHN.M.12312 74274 Digitally signed by MILLER.JOHN.M.1231274274 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=MILLER.JOHN.M.1231274274 Date: 2014.01.24 12:20:26 -06'00' Date:
USACE Omaha District



Field Change Request 2

Legend

- Unsurveyable *(from slope anaysis)*
- Area proposed for assisted visual surveys with real time excavations
- Tech Approach 1 Boundary
- Tech Approach 2 Boundary
- Tech Approach 3 Boundary
- Historical Range Features
- Project Boundary

0 500 1,000 Feet

0 200 400 Meters

Map Units: Feet
Coordinate System: NAD 1983 State Plane North Zone

HDR

Data source(s)
Ortho: USGS 1956 Historical Imagery
Topo map: ESRI USA Topographic Maps map service, accessed 11/19/2013





1283 -Dense vegetation approximately 1.5 meters tall consisting of ferns, thorn bushes, downed trees, slippery footing, mud, walking safety hazard, unsurveyable for DGM



1282 -Dense vegetation consisting of ferns, thorn bushes, downed trees, slippery footing, mud, walking safety hazard, unsurveyable for DGM



1285-Dense vegetation approximately 1 meters tall consisting of ferns, thorn bushes, downed trees, slippery footing, mud, walking safety hazard, unsurveyable for DGM



1286 -Dense vegetation consisting of ferns, thorn bushes, downed trees, slippery footing, mud, walking safety hazard, unsurveyable for DGM



L0967 - Dense vegetation approximately 2 meters tall consisting of small trees, thorn bushes, many downed trees hidden under ground vegetation, slippery footing, walking safety hazard, unsurveyable for DGM



L0966 - Dense vegetation approximately 2.5 meters tall consisting of small trees, thorn bushes, slippery footing, mud, walking safety hazard, unsurveyable for DGM



L0964 - Dense vegetation approximately 2.5 meters tall consisting of small birch trees, slippery footing, walking safety hazard, unsurveyable for DGM



L0962 - Dense vegetation approximately 2.5 meters tall consisting of thorn bushes, slippery slope and mud, downed trees hidden under ground vegetation, unsurveyable for DGM



L0969 -Dense vegetation approximately 1.5 meters tall consisting of ferns, thorn bushes, downed trees hidden under ground vegetation, slippery footing, walking safety hazard, mud, unsurveyable for DGM



L0960 - Dense vegetation approximately 1.5 meters tall consisting of downed maple trees, downed trees hidden at ground surface, slippery footing and mud, walking safety hazard, unsurveyable for DGM



L0959 - Dense vegetation approximately 2 meters tall consisting of thorn bushes, slippery slope and mud, unsurveyable for DGM



L0953 - Steep terrain, slippery slope and mud, trees and branches hidden directly under ground surface, walking safety hazard, unsurveyable for DGM



L0954 - Dense vegetation approximately 1 meter tall consisting of ferns, large downed trees, slippery slope and mud, walking safety hazard, unsurveyable for DGM



L0955 - Dense vegetation consisting of ferns, thorn bushes, slippery footing and mud, walking safety hazard, unsurveyable for DGM



L0956 - Dense vegetation approximately 2 meters tall consisting of small trees, thorn bushes, downed trees hidden under ground vegetation, walking safety hazard, unsurveyable for DGM



L0958 - Dense vegetation consisting of thorn bushes, slippery footing due to wet rocks, creek, and mud, walking safety hazard, unsurveyable for DGM



L0957 - Dense vegetation approximately 1 meter tall consisting of thorn bushes and downed trees, steep terrain, slippery slope and mud, walking safety hazard, unsurveyable for DGM



L0968 - Dense vegetation approximately 2 meters tall consisting of small trees, thorn bushes, downed trees hidden under ground vegetation, slippery footing, walking safety hazard, unsurveyable for DGM

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APPENDIX

Geophysical Investigation Quality Control Data

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Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AA Survey Type: Static/Spike

Processed Filename: 2013301_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330102AA.pos	E021330101AA.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

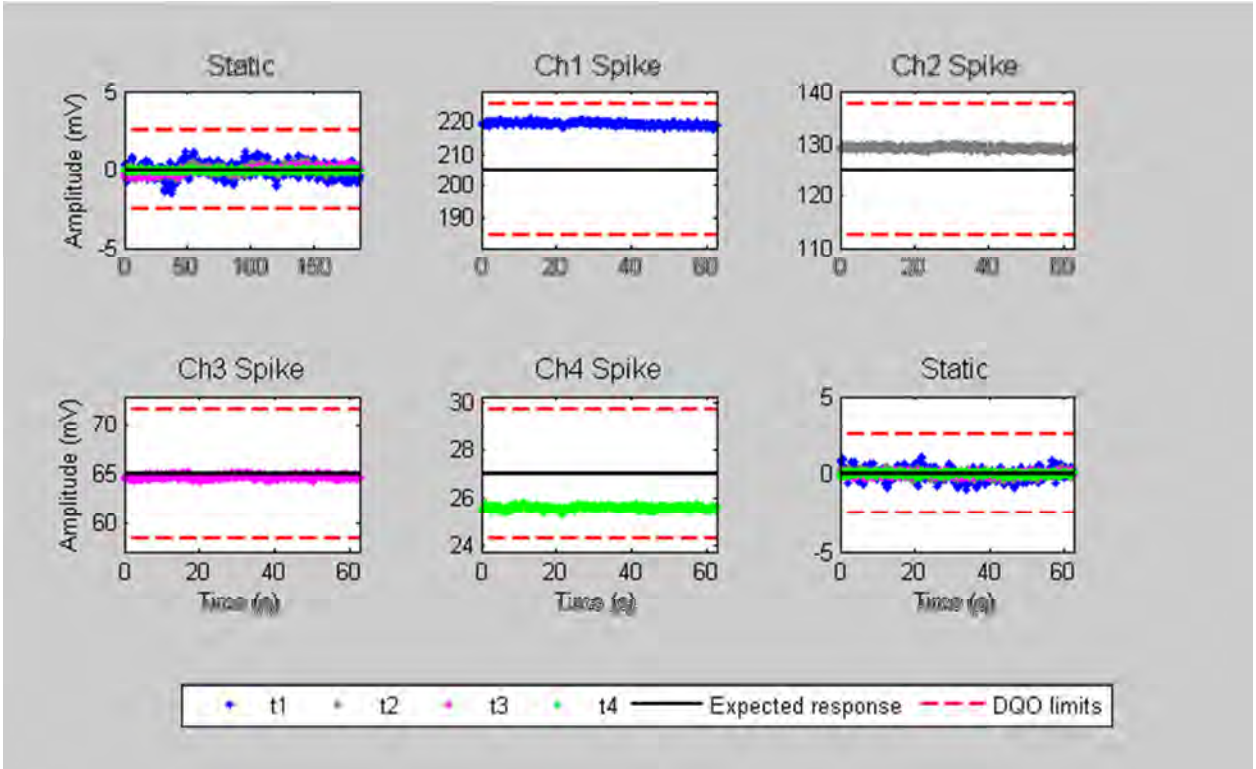
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AA Survey Type: Static/Spike

Processed Filename: 2013301_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AB Survey Type: Cable Shake

Processed Filename: 2013301_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
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Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

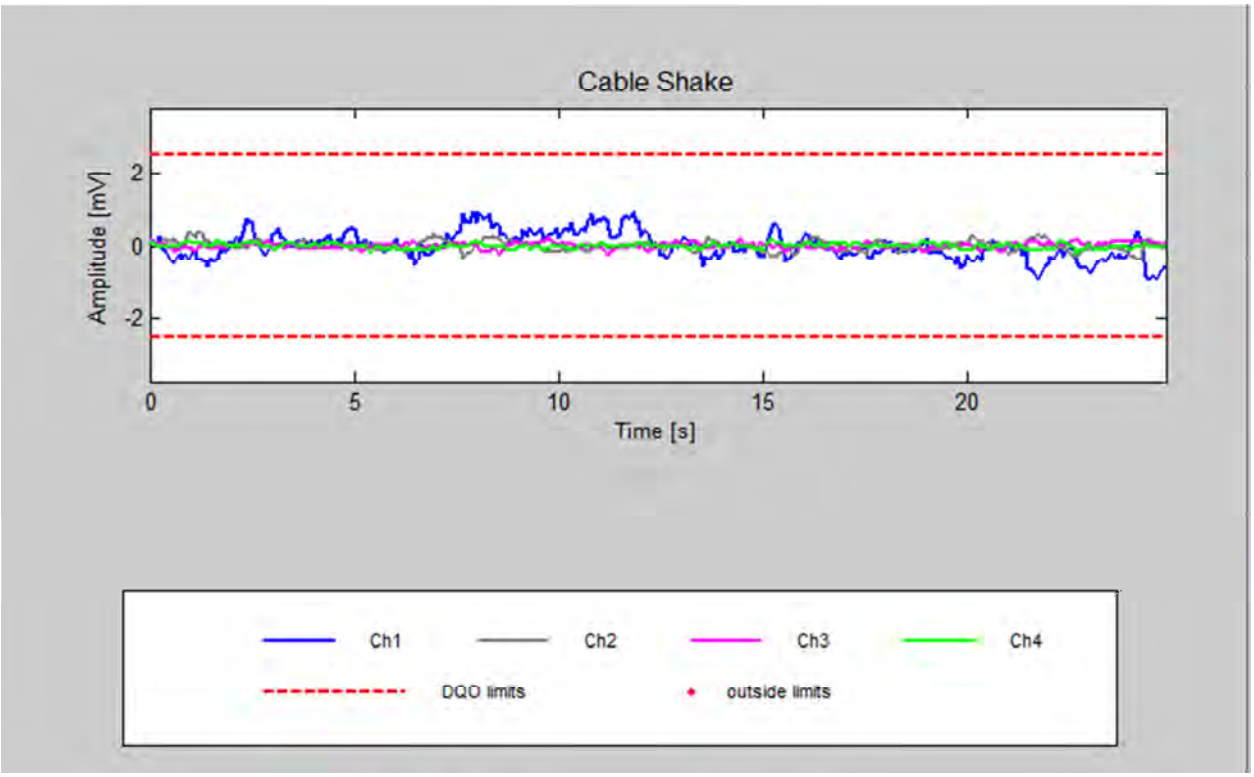
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AB Survey Type: Cable Shake

Processed Filename: 2013301_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AC Survey Type: Personnel

Processed Filename: 2013301_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
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Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

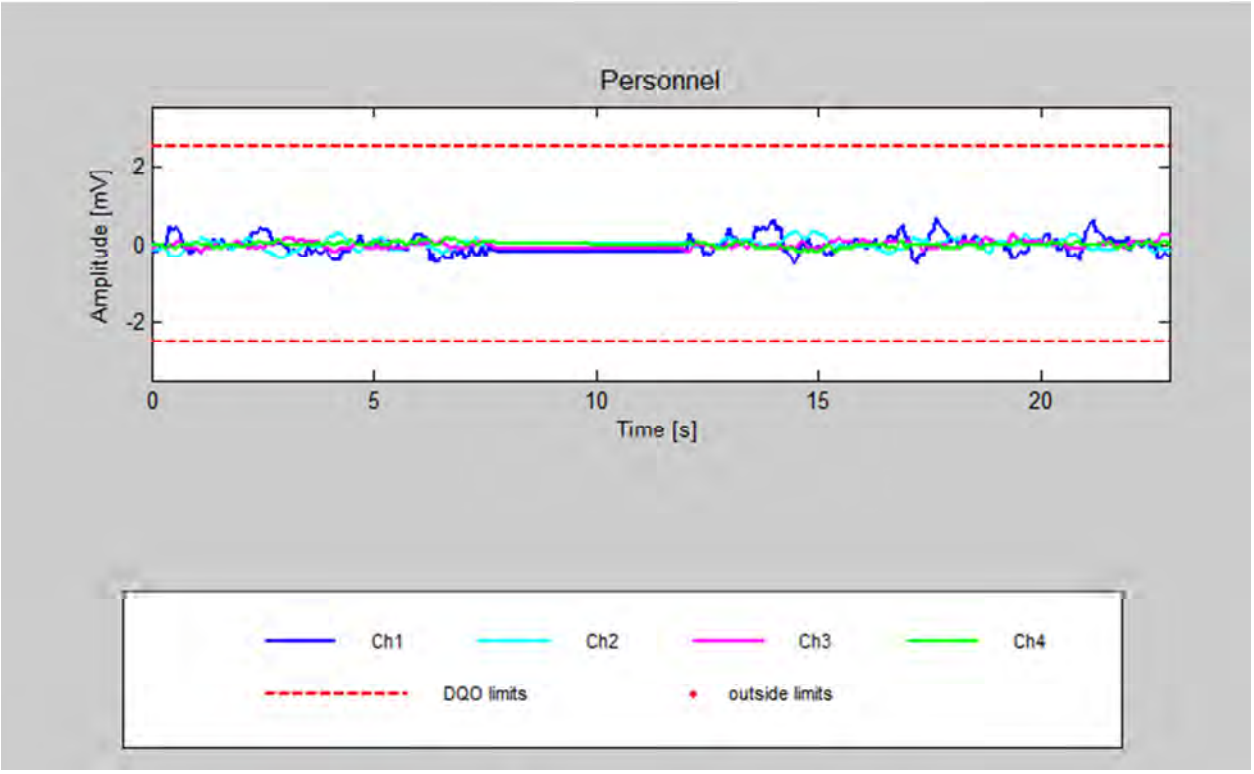
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AB Survey Type: Personnel

Processed Filename: 2013301_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AD Survey Type: Time Cal

Processed Filename: 2013301_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
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Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

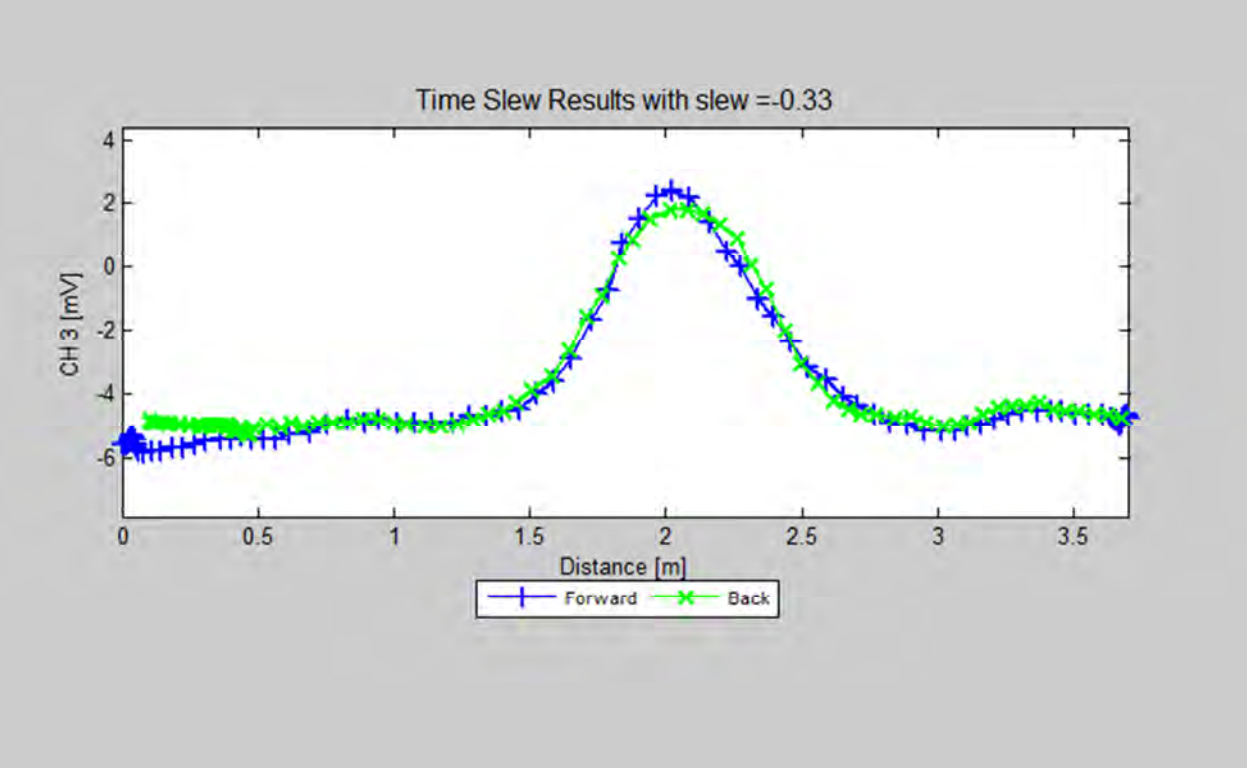
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AD Survey Type: Time Cal

Processed Filename: 2013301_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AF Survey Type: IVS/Noise

Processed Filename: 2013301_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
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Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

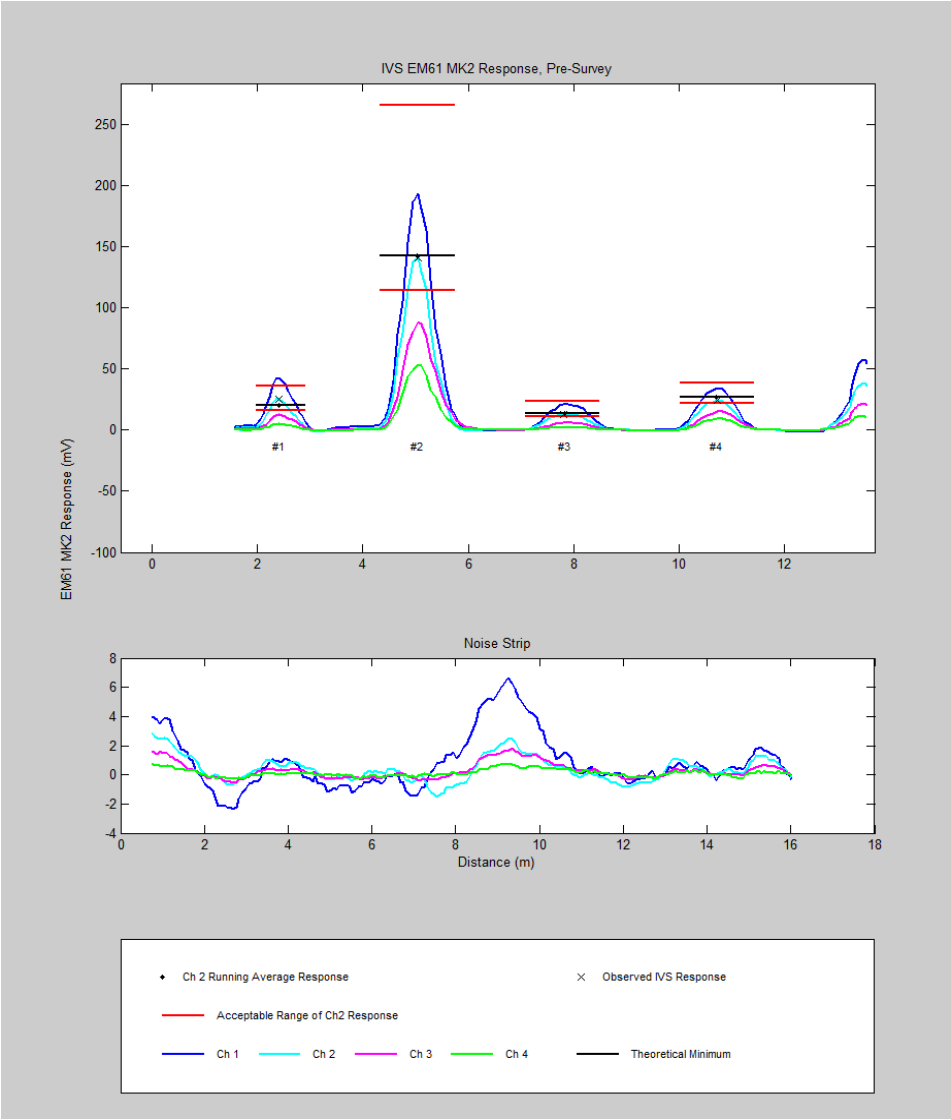
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AF Survey Type: IVS/Noise

Processed Filename: 2013301_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AH Survey Type: Survey

Processed Filename: 2013301_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330103AH.pos	E021330101AH.sen	-0.29	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AI Survey Type: Survey

Processed Filename: 2013301_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
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Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AJ Survey Type: Survey

Processed Filename: 2013301_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330103AI.pos	E021330101AI.sen	-0.29	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AK Survey Type: Survey

Processed Filename: 2013301_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330103AK.pos	E021330101AK.sen	-0.29	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AL Survey Type: Survey

Processed Filename: 2013301_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330103AL.pos	E021330101AL.sen	-0.29	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AM Survey Type: Survey

Processed Filename: 2013301_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330103AM.pos	E021330101AM.sen	-0.29	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AN Survey Type: Survey

Processed Filename: 2013301_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330103AN.pos	E021330101AN.sen	-0.29	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AO Survey Type: Survey

Processed Filename: 2013301_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330103AO.pos	E021330101AO.sen	-0.29	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AP Survey Type: Static/Spike

Processed Filename: 2013301_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330103AP.pos	E021330101AP.sen	-0.29	0	0

Processor Name: Stuart Bancroft Processing Status: Failed

Processing Comments: Spike high on channel 1. Other results are good and should not affect target picking.

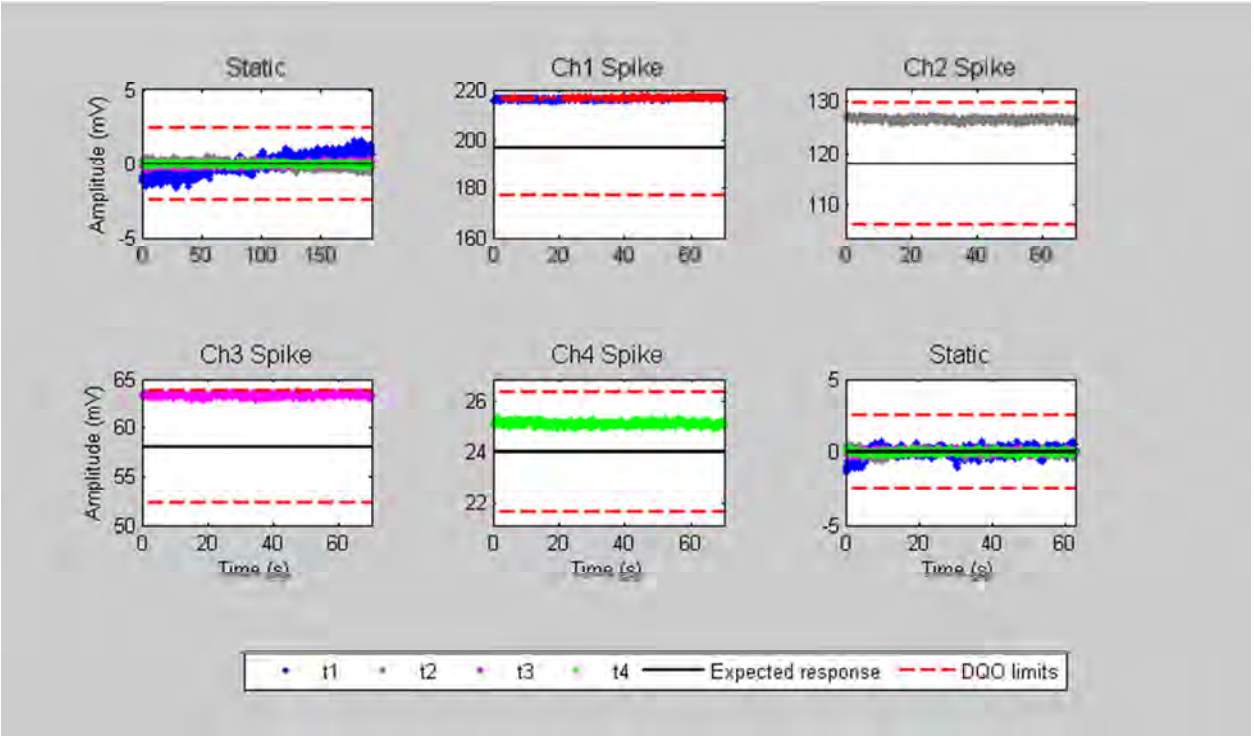
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AP Survey Type: Static/Spike

Processed Filename: 2013301_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AQ Survey Type: IVS/Noise

Processed Filename: 2013301_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330102AQ.pos	E021330101AQ.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

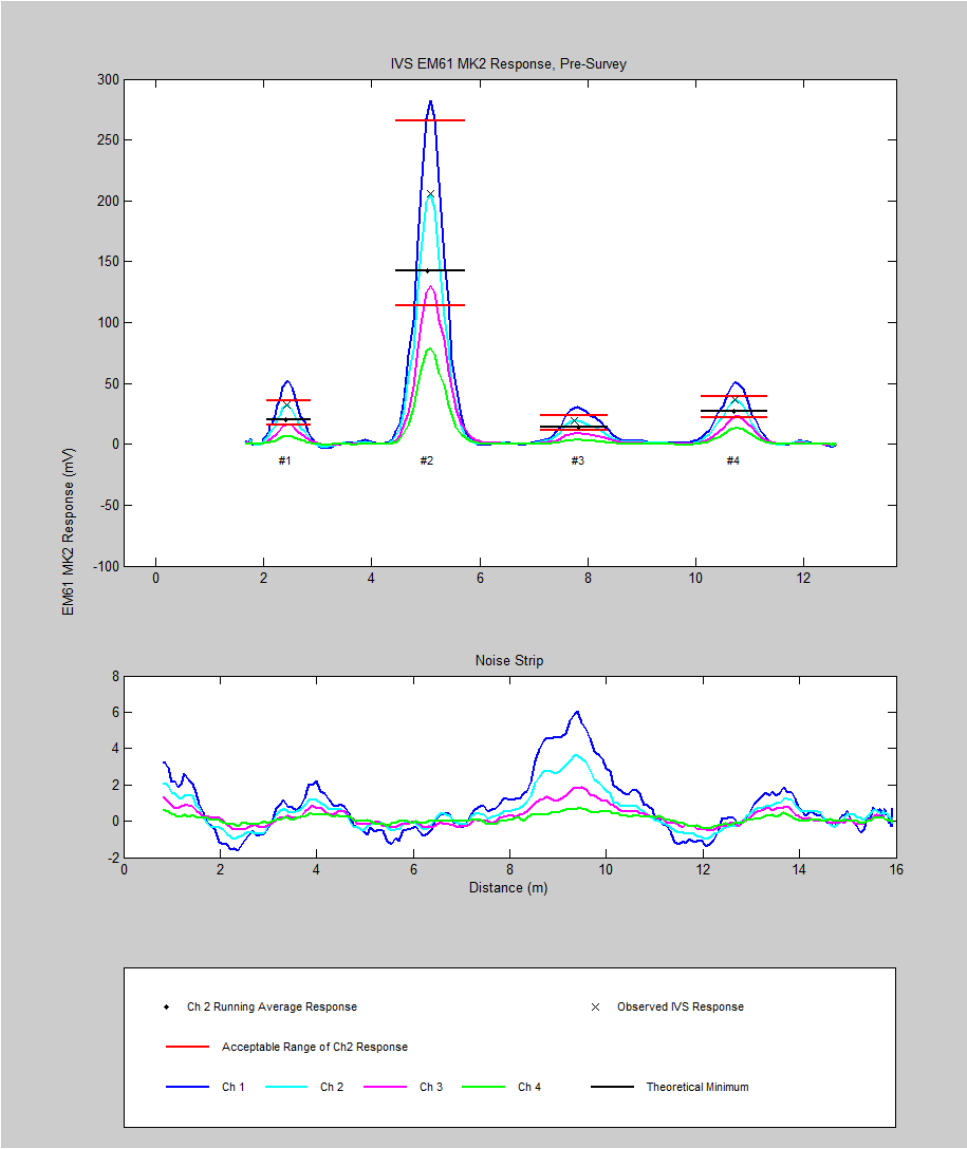
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/28/2013 Site:PACR Log Date: 2013301

Raw Data File: E2013301AM Survey Type: IVS/Noise

Processed Filename: 2013301_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AA Survey Type: Static/Spike

Processed Filename: 2013302_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330202AA.pos	E021330201AA.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Failed

Processing Comments: Static failed on Ch 1 pre and post spike. Ch1, 2 and 3 are high during the spike test. Test fails but results from IVS, Noise and other tests confirm function. Results are only slightly high and should not negatively affect target picking.

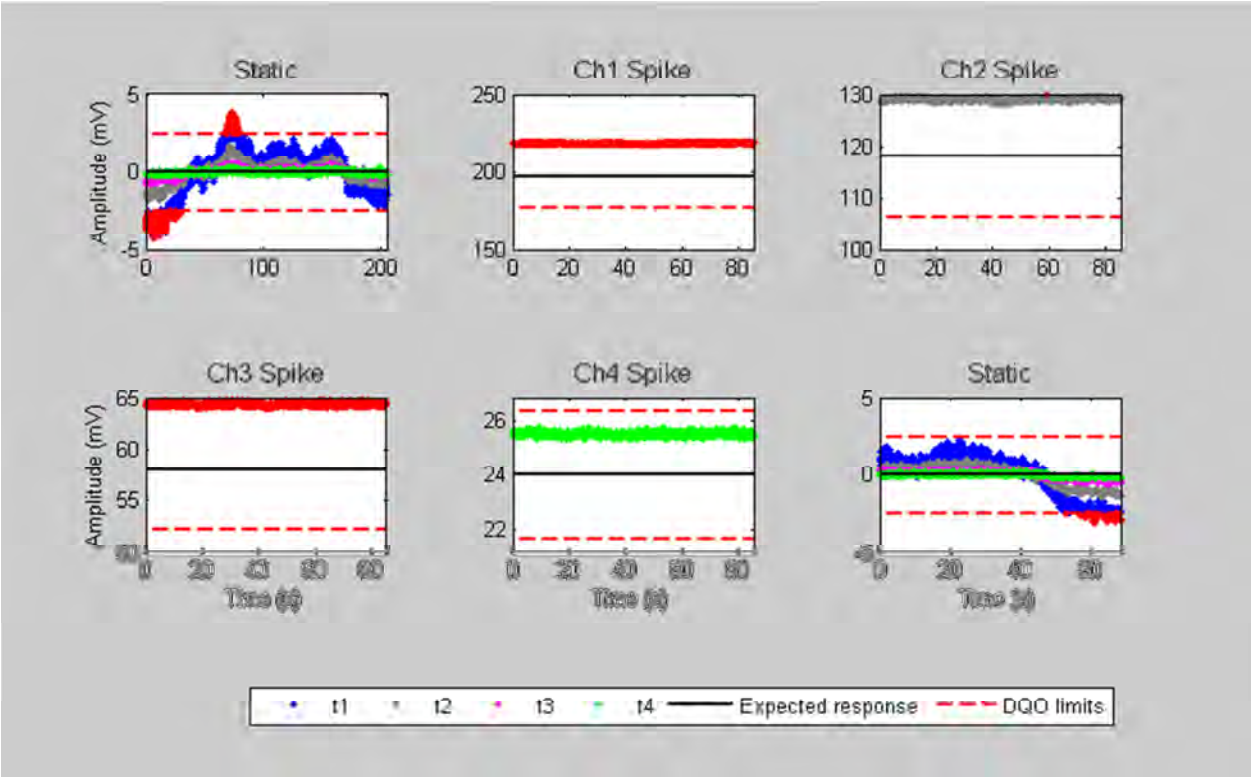
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AA Survey Type: Static/Spike

Processed Filename: 2013302_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AB Survey Type: Cable Shake

Processed Filename: 2013302_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330202AB.pos	E021330201AB.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

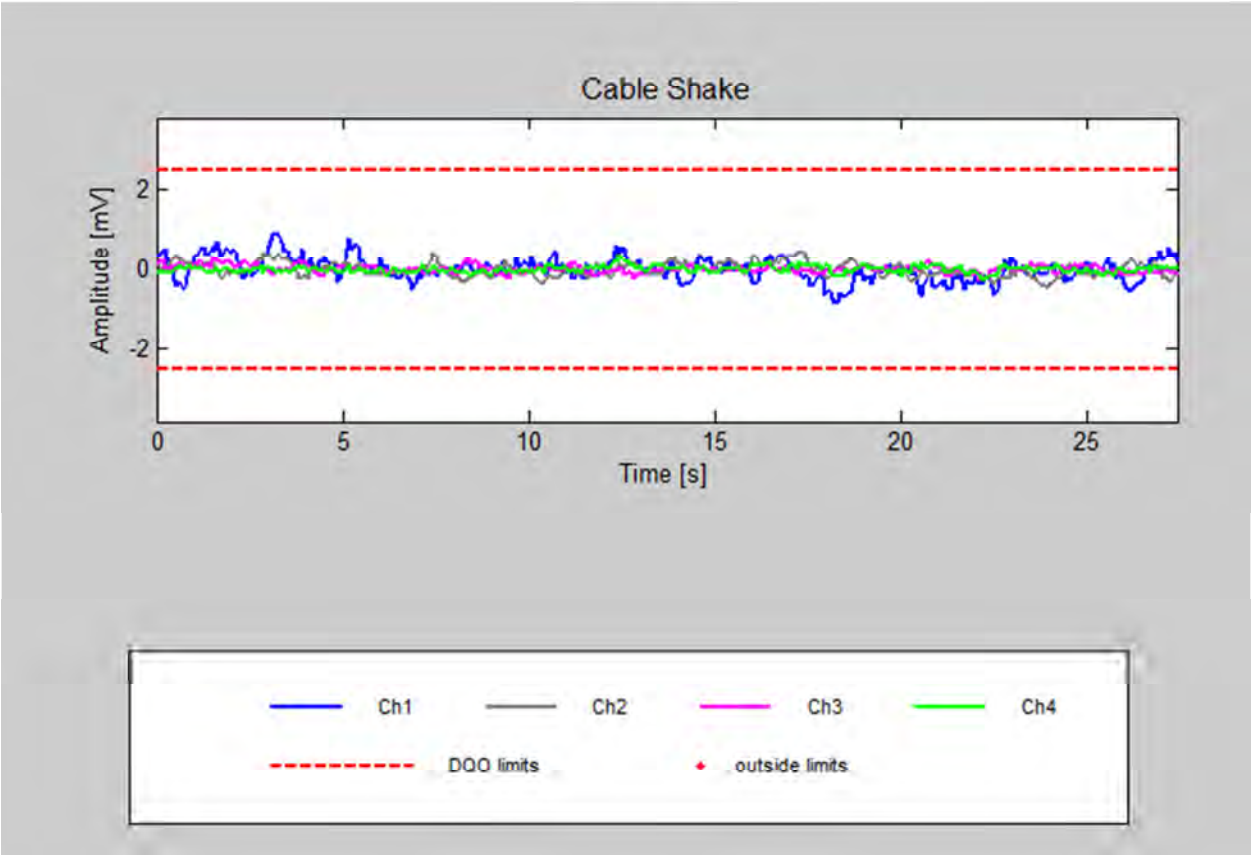
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AB Survey Type: Cable Shake

Processed Filename: 2013302_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AC Survey Type: Personnel

Processed Filename: 2013302_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330202AC.pos	E021330201AC.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

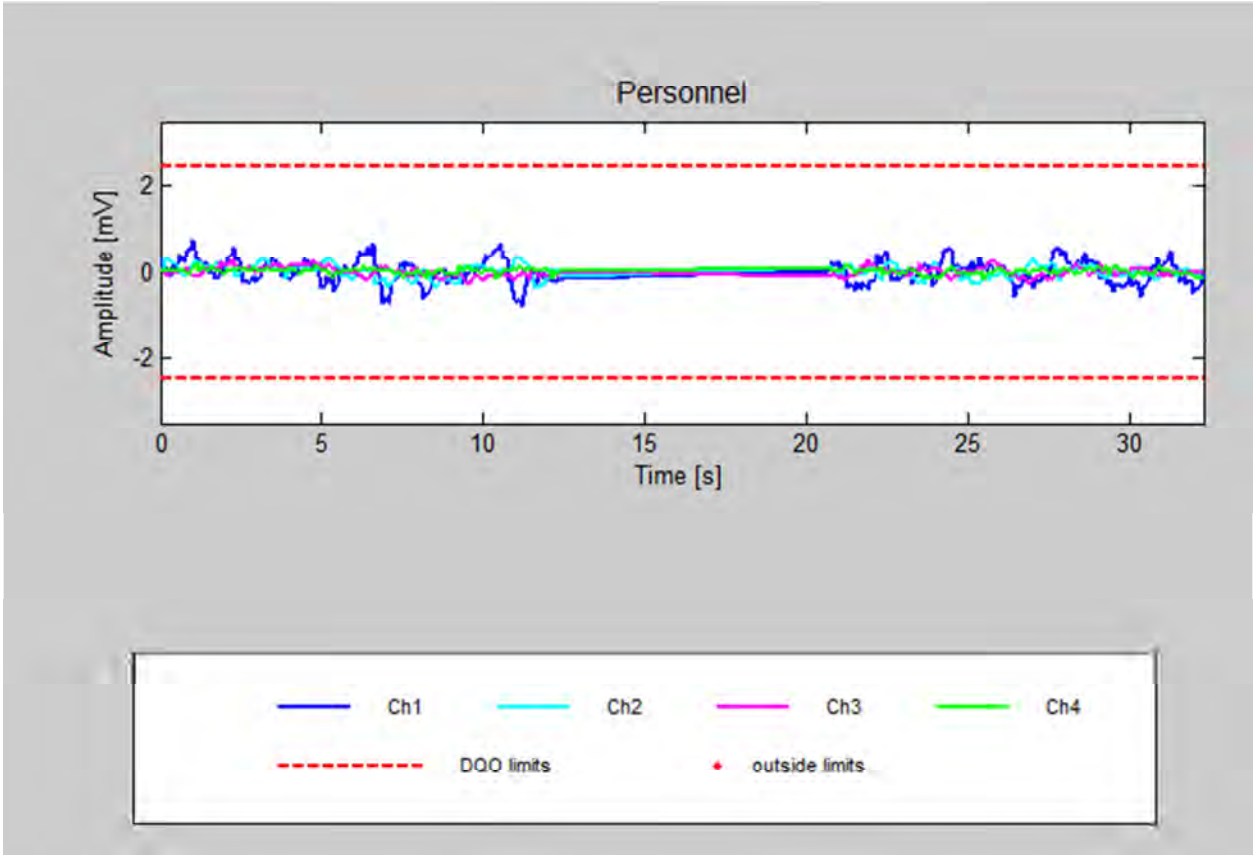
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AB Survey Type: Personnel

Processed Filename: 2013302_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AD Survey Type: Time Cal

Processed Filename: 2013302_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330202AD.pos	E021330201AD.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

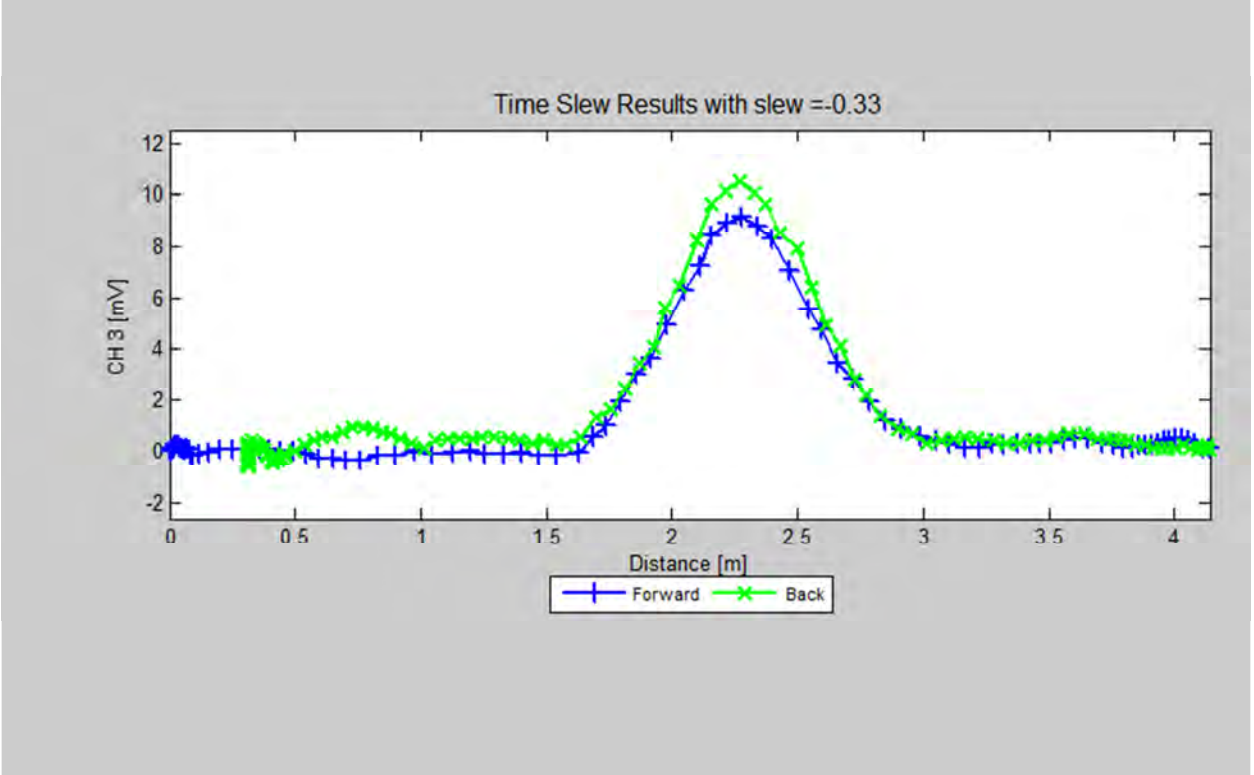
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AD Survey Type: Time Cal

Processed Filename: 2013302_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AF Survey Type: IVS/Noise

Processed Filename: 2013302_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330202AF.pos	E021330201AF.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

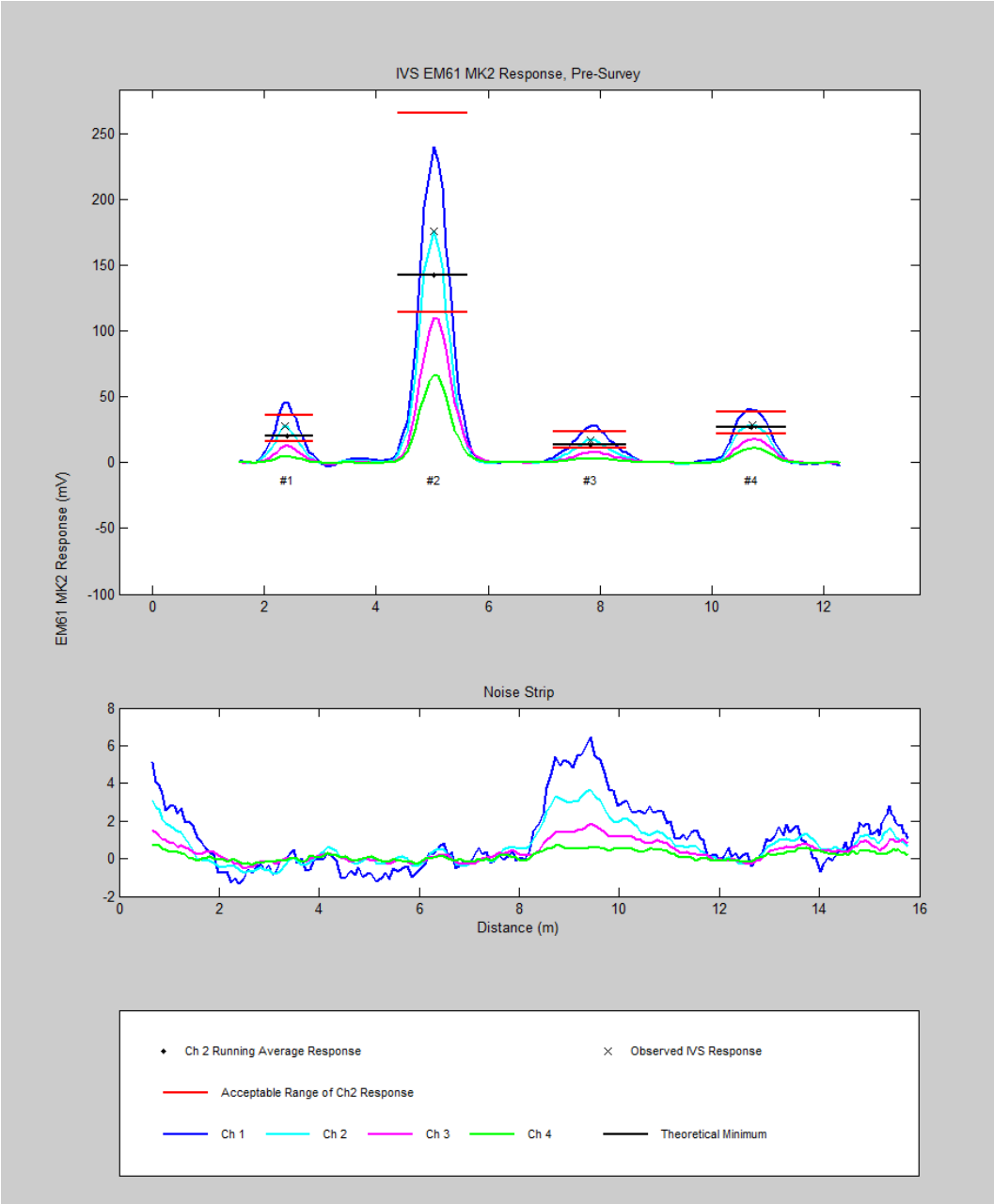
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AF Survey Type: IVS/Noise

Processed Filename: 2013302_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AH Survey Type: Survey

Processed Filename: 2013302_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330203AH.pos	E021330201AH.sen	-0.29	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AI Survey Type: Survey

Processed Filename: 2013302_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330203AI.pos	E021330201AI.sen	-0.29	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AJ Survey Type: Survey

Processed Filename: 2013302_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330203AI.pos	E021330201AI.sen	-0.29	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AL Survey Type: Static/Spike

Processed Filename: 2013302_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330203AL.pos	E021330201AL.sen	-0.29	0	0

Processor Name: Stuart Bancroft Processing Status: Failed

Processing Comments: Spike high on channel 1. Other results are good and should not affect target picking.

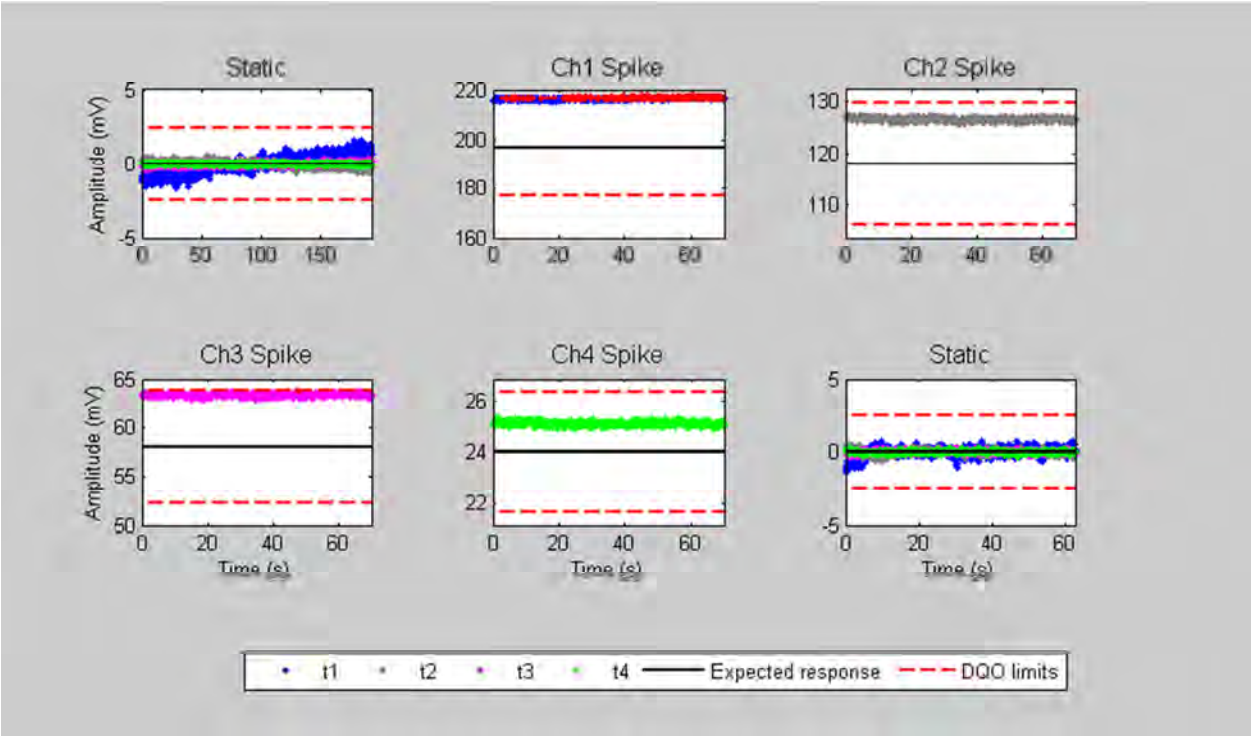
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AL Survey Type: Static/Spike

Processed Filename: 2013302_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AM Survey Type: IVS/Noise

Processed Filename: 2013302_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330202AM.pos	E021330201AM.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

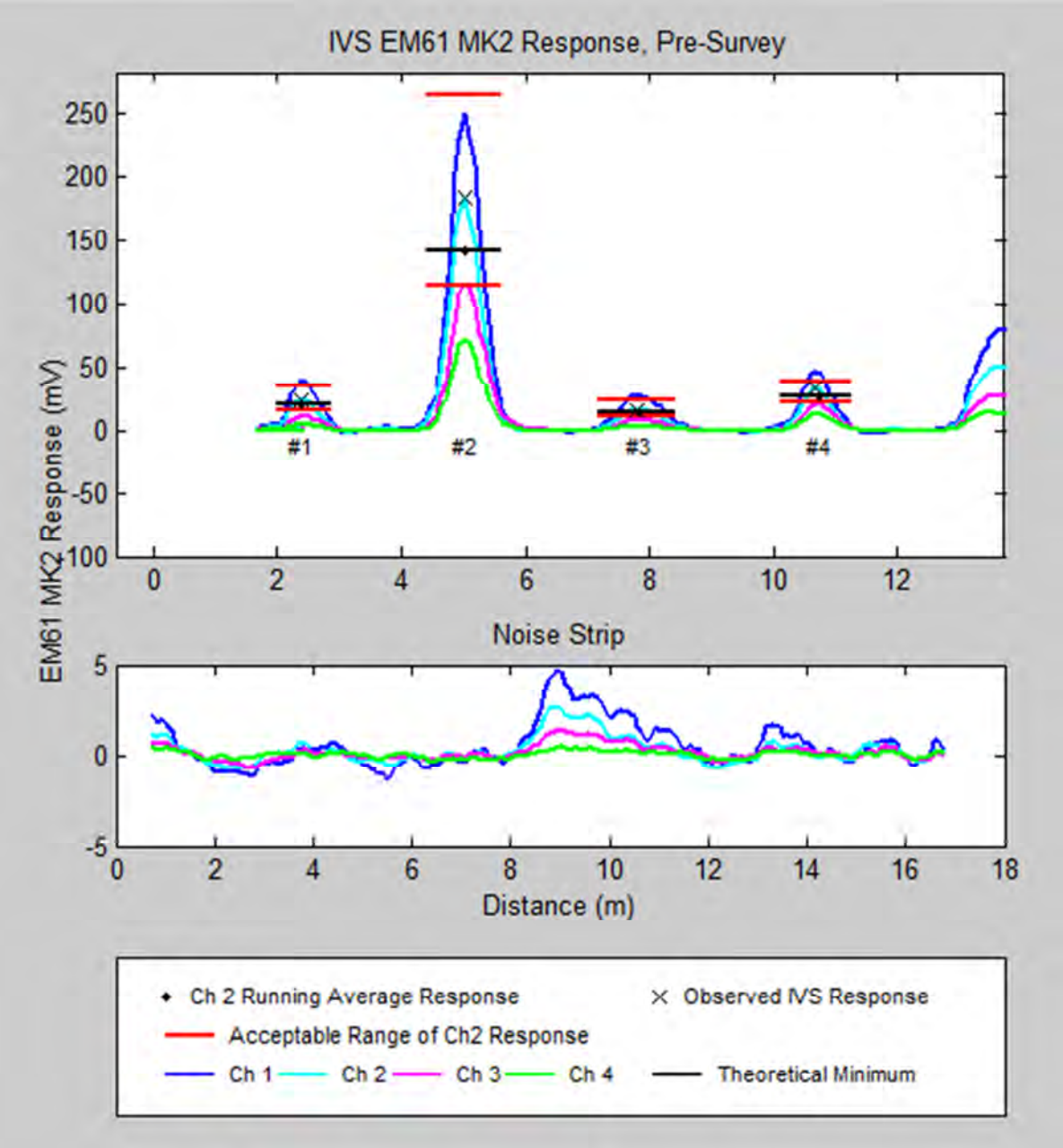
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AM Survey Type: IVS/Noise

Processed Filename: 2013302_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AO Survey Type: Survey

Processed Filename: 2013302_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330203AO.pos	E021330201AO.sen	-0.29	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AS Survey Type: Static/Spike

Processed Filename: 2013302_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330202AS.pos	E021330201AS.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

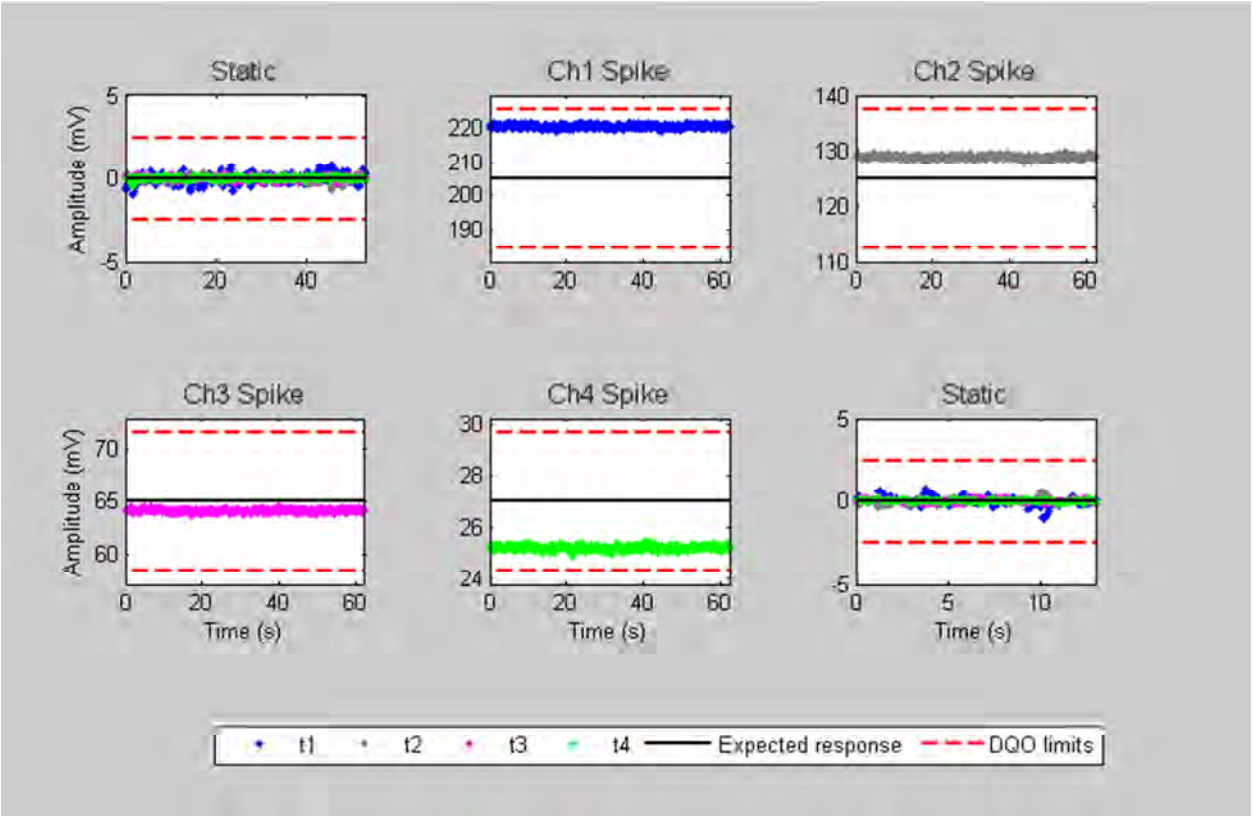
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AS Survey Type: Static/Spike

Processed Filename: 2013302_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AT Survey Type: IVS/Noise

Processed Filename: 2013302_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330202AT.pos	E021330201AT.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

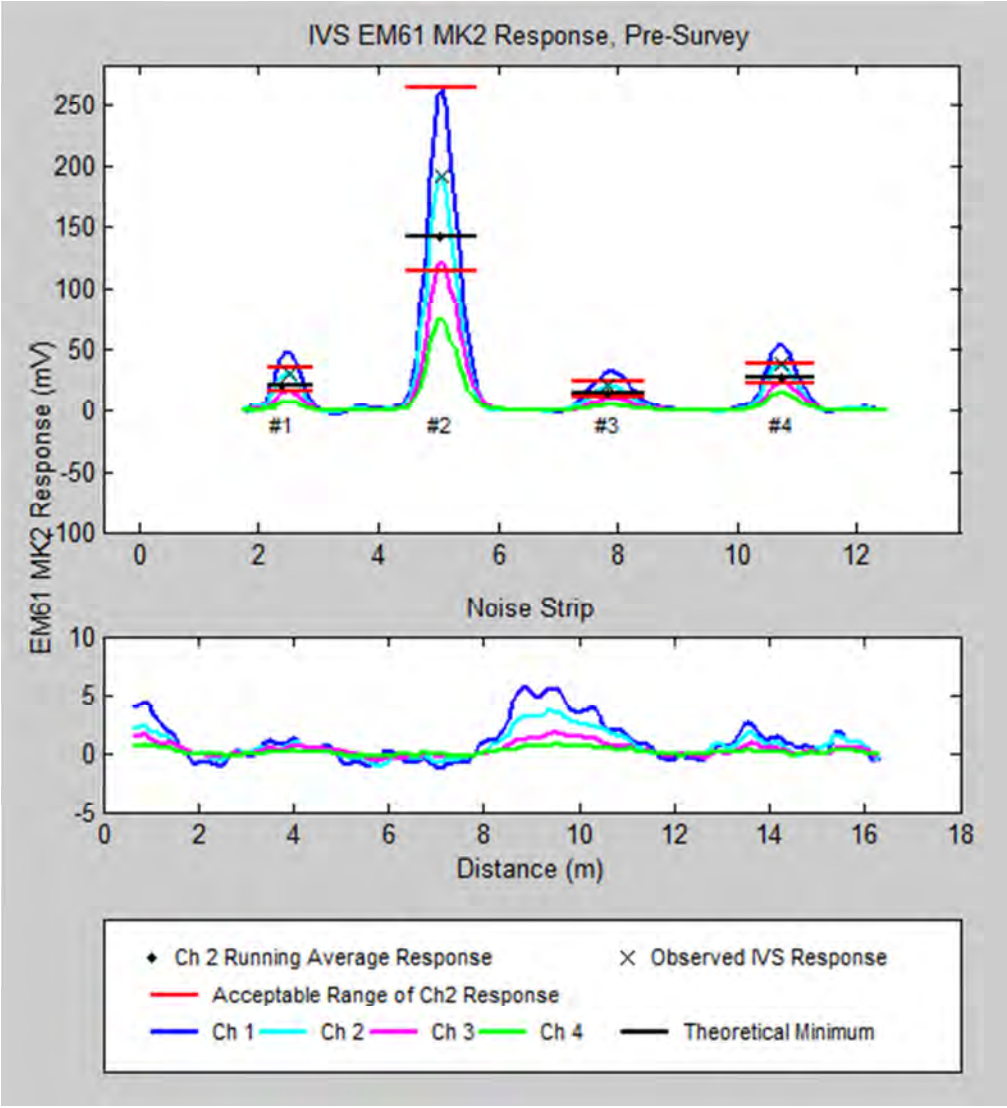
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/29/2013 Site:PACR Log Date: 2013302

Raw Data File: E2013302AT Survey Type: IVS/Noise

Processed Filename: 2013302_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AA Survey Type: Static/Spike

Processed Filename: 2013303_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330303AA.pos	E021330301AA.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Static failed onCh 1 pre and post spike. Ch1, 2and 3 are high during the spike test. Test fails but results from IVS, Noise and other tests confirm function. Results are only slightly high and should not negatively affect target picking.

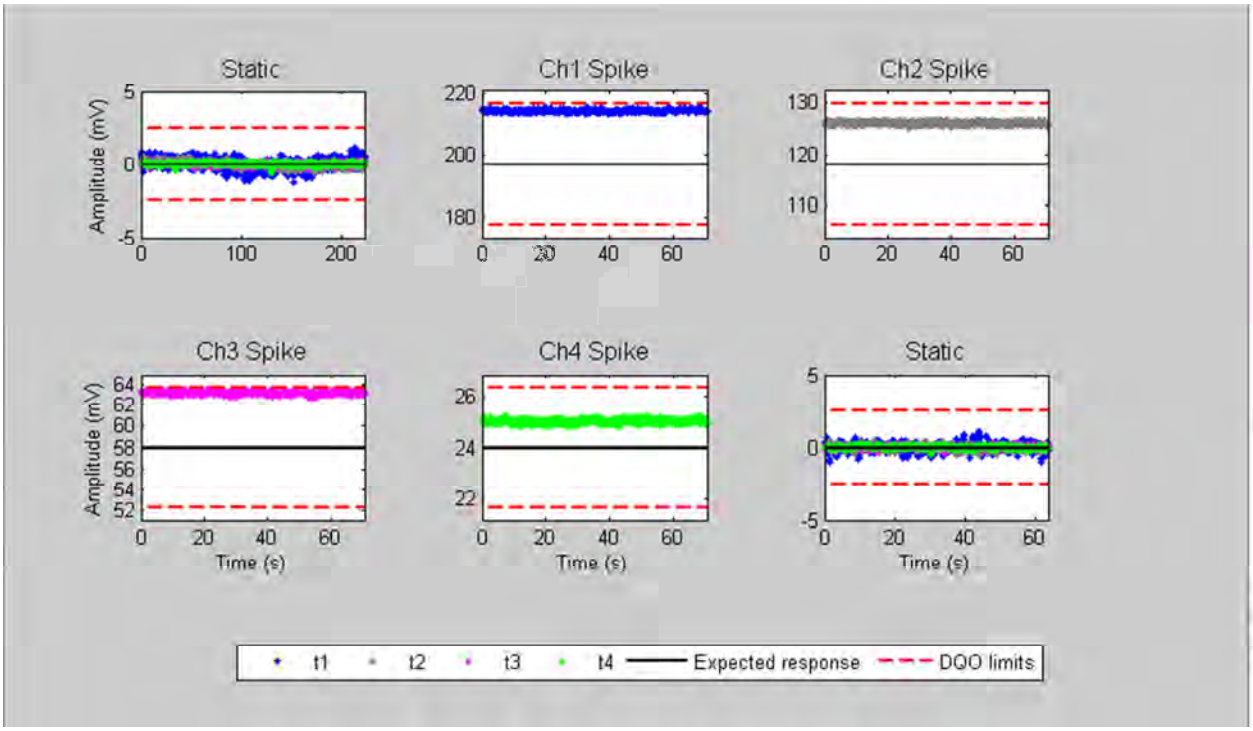
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AA Survey Type: Static/Spike

Processed Filename: 2013303_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AB Survey Type: Cable Shake

Processed Filename: 2013303_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330303AB.pos	E021330301AB.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

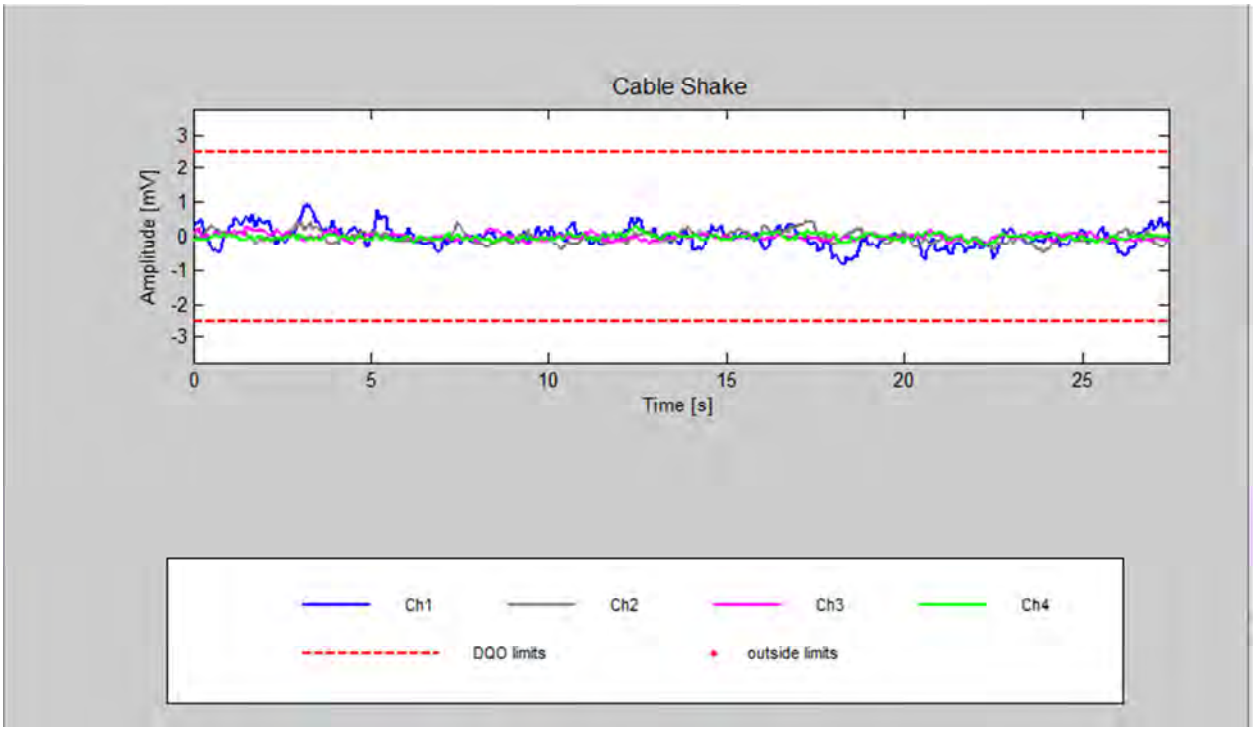
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AB Survey Type: Cable Shake

Processed Filename: 2013303_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AC Survey Type: Personnel

Processed Filename: 2013303_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330303AC.pos	E021330301AC.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

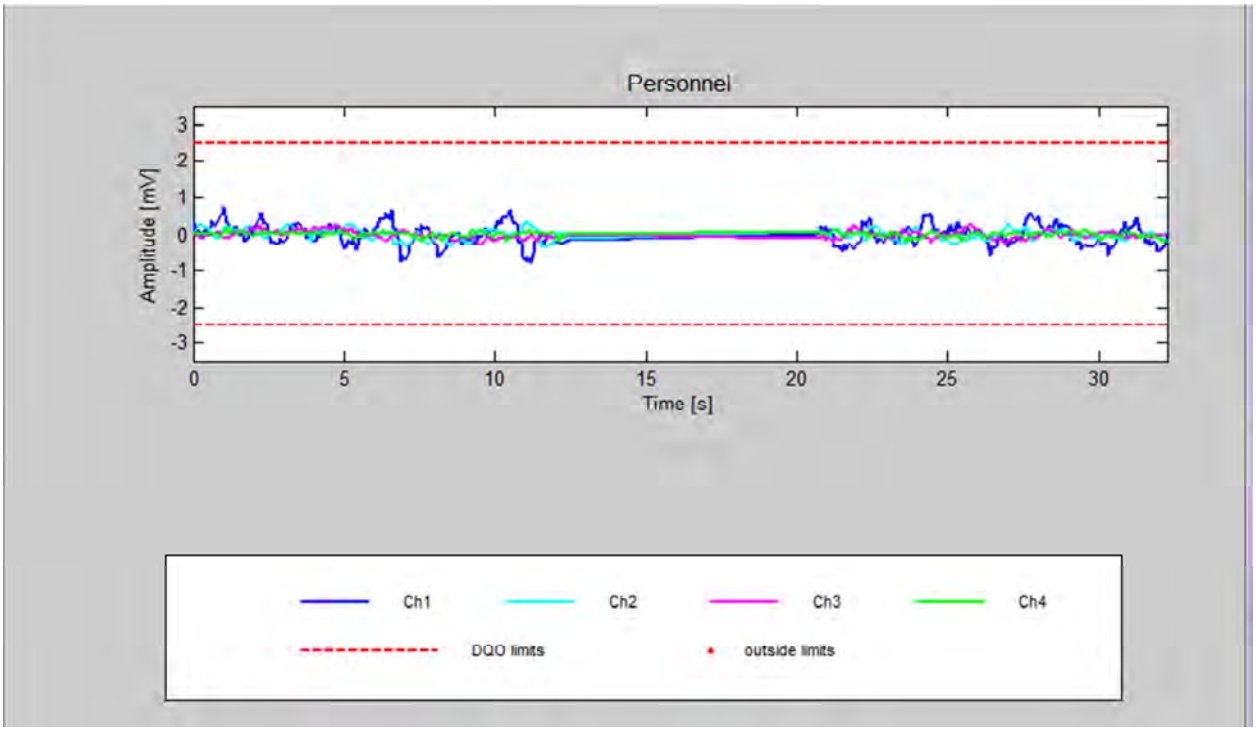
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AB Survey Type: Personnel

Processed Filename: 2013303_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AD Survey Type: Time Cal

Processed Filename: 2013303_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330303AD.pos	E021330301AD.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

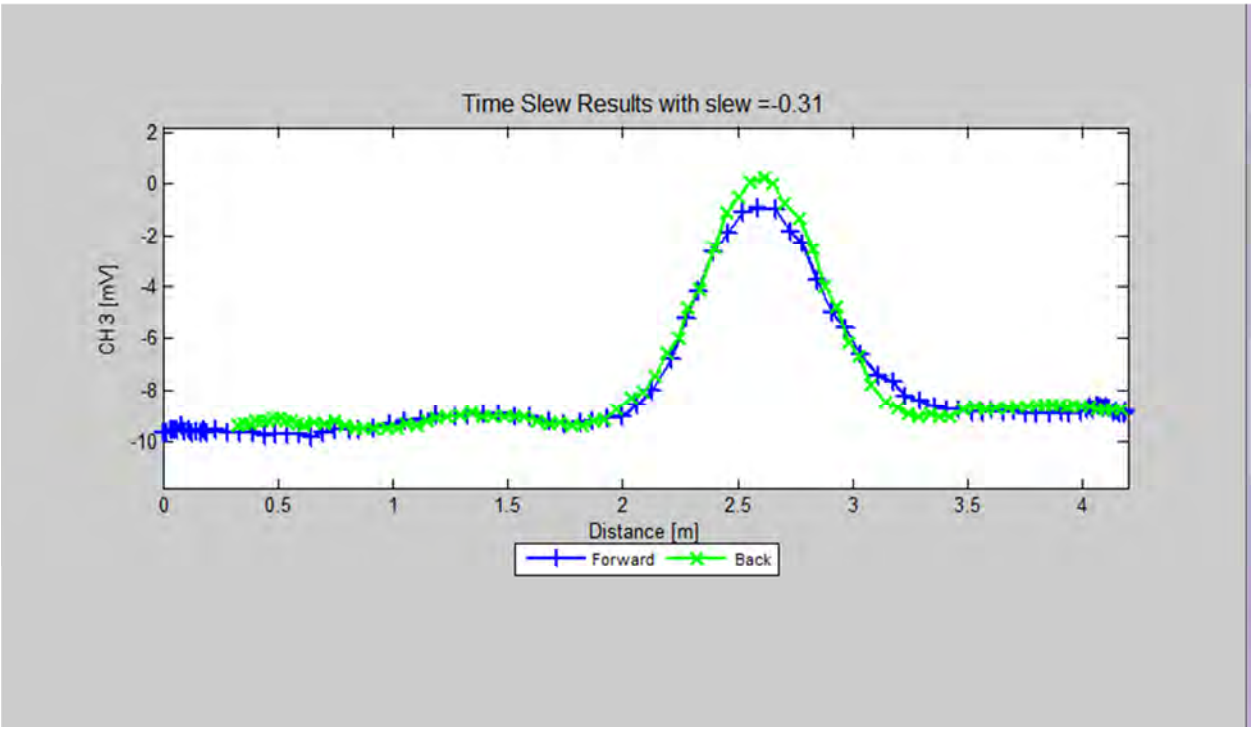
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AD Survey Type: Time Cal

Processed Filename: 2013303_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AE Survey Type: IVS/Noise

Processed Filename: 2013303_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330303AE.pos	E021330301AE.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

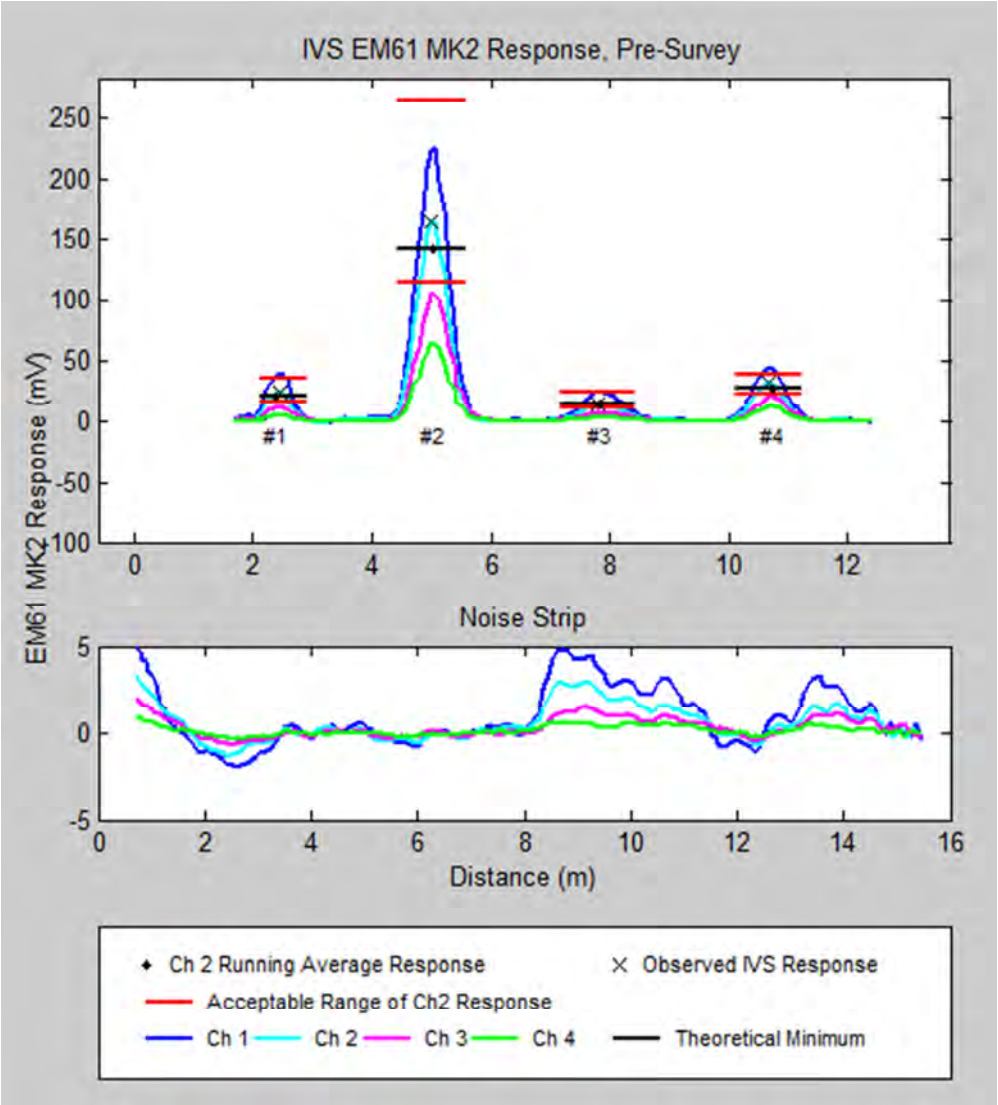
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AE Survey Type: IVS/Noise

Processed Filename: 2013303_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AH Survey Type: Survey

Processed Filename: 2013303_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330303AH.pos	E021330301AH.sen	-0.28	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AI Survey Type: Survey

Processed Filename: 2013303_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330303AI.pos	E021330301AI.sen	-0.28	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AJ Survey Type: Survey

Processed Filename: 2013303_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330303AJ.pos	E021330301AJ.sen	-0.28	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AK Survey Type: Survey

Processed Filename: 2013303_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330303AK.pos	E021330301AK.sen	-0.28	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AL Survey Type: Static/Spike

Processed Filename: 2013303_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330303AL.pos	E021330301AL.sen	-0.28	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Spike high onchannel 1. Other results are good and should not affect target picking.

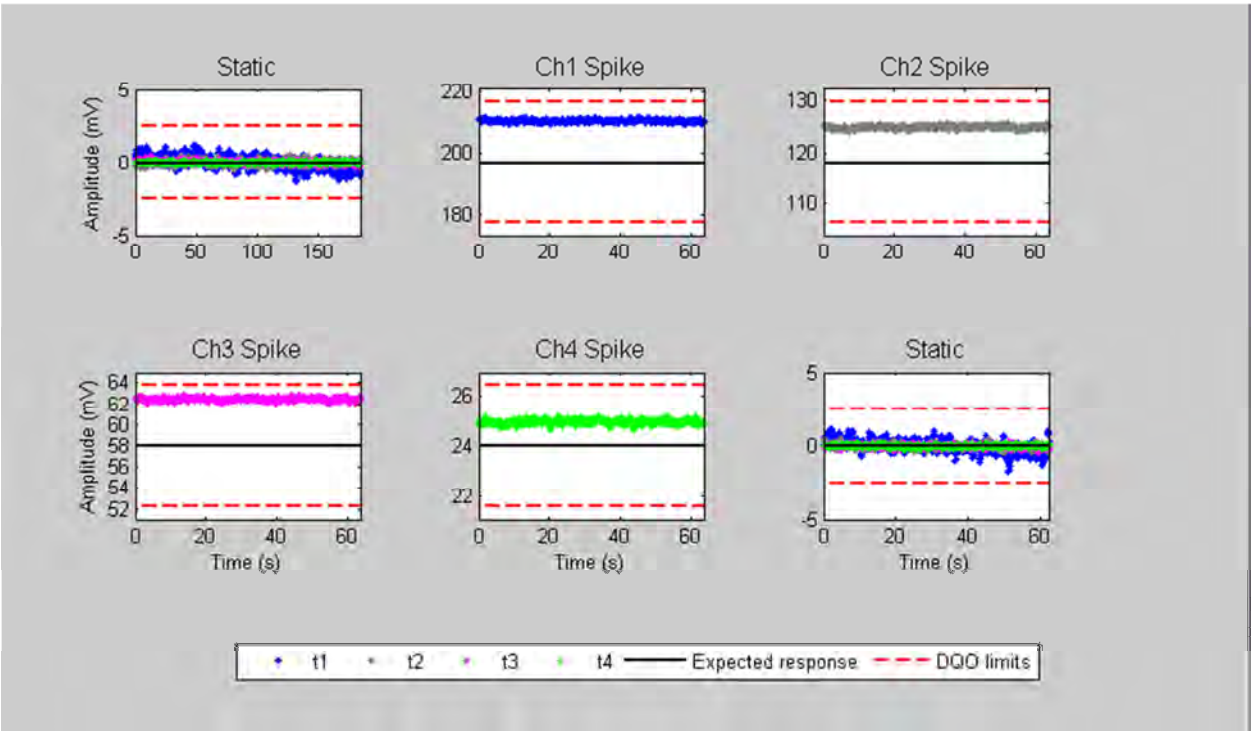
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AL Survey Type: Static/Spike

Processed Filename: 2013303_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AN Survey Type: IVS/Noise

Processed Filename: 2013303_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330303AN.pos	E021330301AN.sen	-0.28	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

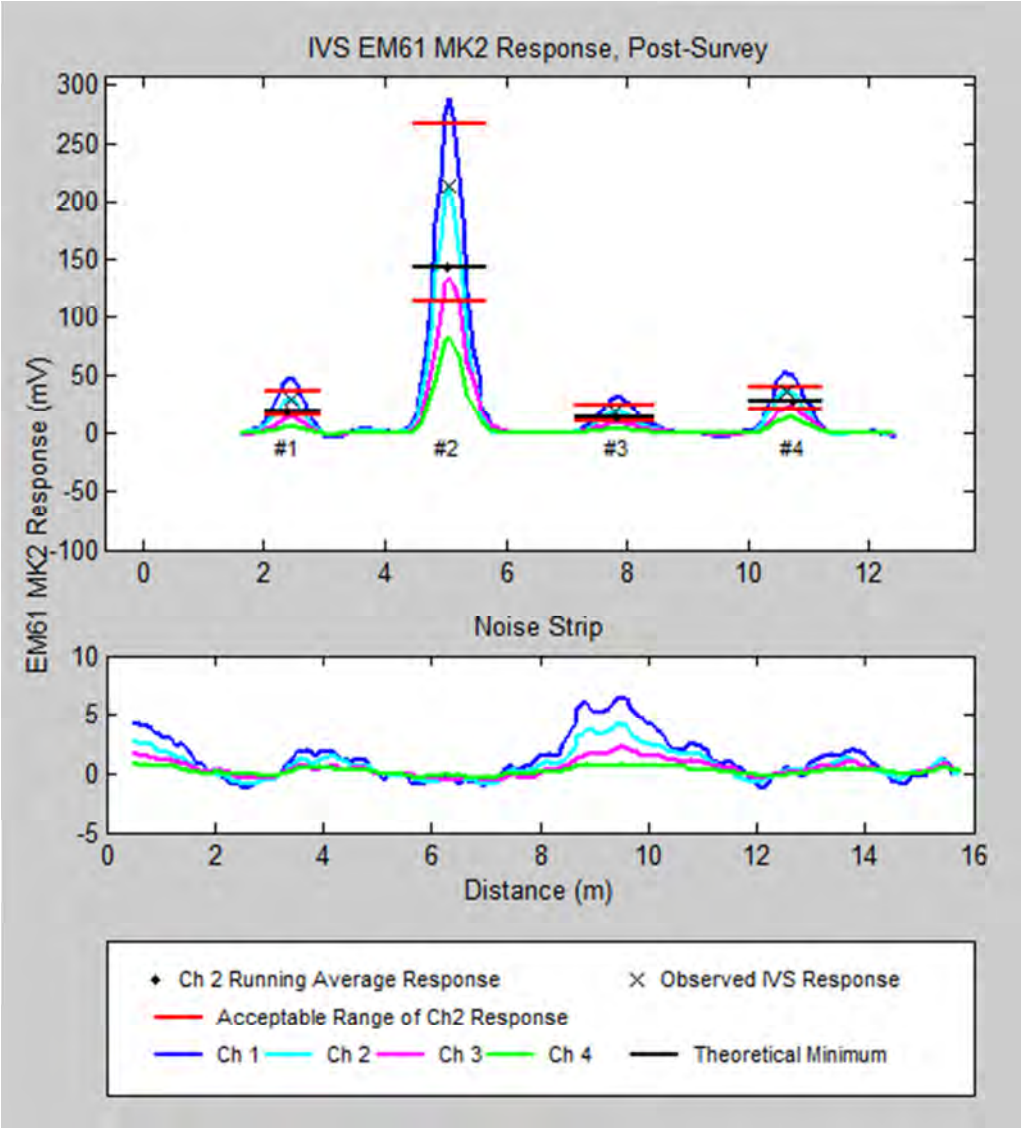
QC Name: Jon Jacobso

Daily Survey and Processing Summary

Survey Date: 10/30/2013 Site:PACR Log Date: 2013303

Raw Data File: E2013303AN Survey Type: IVS/Noise

Processed Filename: 2013303_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/31/2013 Site:PACR Log Date: 2013304

Raw Data File: E2013304AB Survey Type: Static/Spike

Processed Filename: 2013304_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330402AB.pos	E021330401AB.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Failed

Processing Comments: Static failed on Ch 1 pre and post spike. Ch1, 2 and 3 are high during the spike test. Test fails but results from IVS, Noise and other tests confirm function. Results are only slightly high and should not negatively affect target picking.

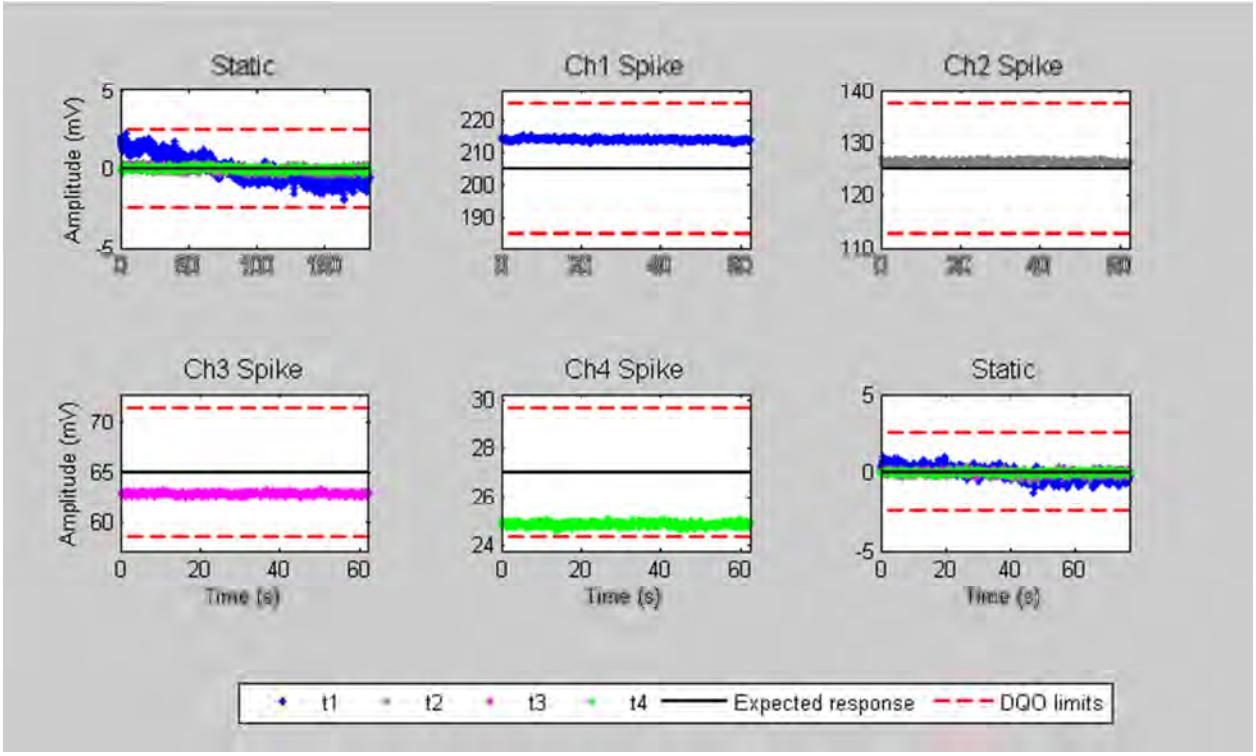
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/31/2013 Site:PACR Log Date: 2013304

Raw Data File: E2013304AB Survey Type: Static/Spike

Processed Filename: 2013304_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/31/2013 Site:PACR Log Date: 2013304

Raw Data File: E2013304AD Survey Type: Cable Shake

Processed Filename: 2013304_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330402AD.pos	E021330401AD.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

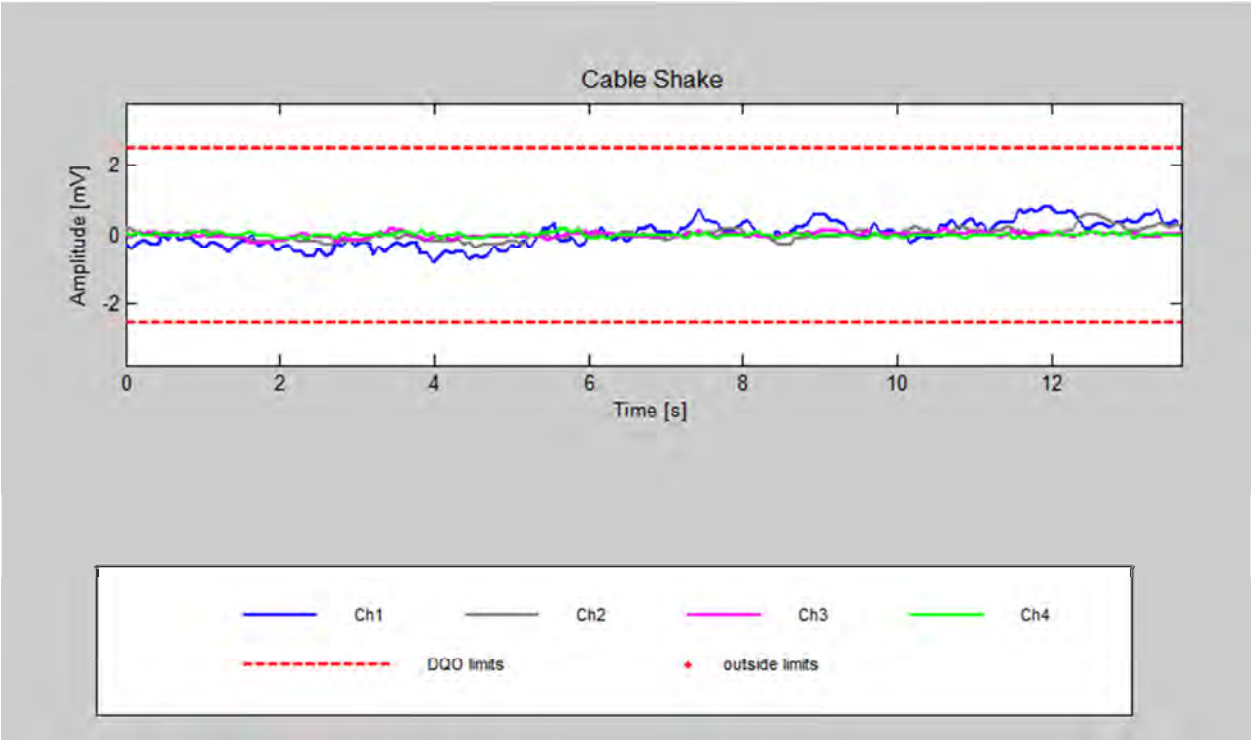
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/31/2013 Site:PACR Log Date: 2013304

Raw Data File: E2013304AD Survey Type: Cable Shake

Processed Filename: 2013304_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/31/2013 Site:PACR Log Date: 2013304

Raw Data File: E2013304AE Survey Type: Personnel

Processed Filename: 2013304_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330402AC.pos	E021330401AC.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

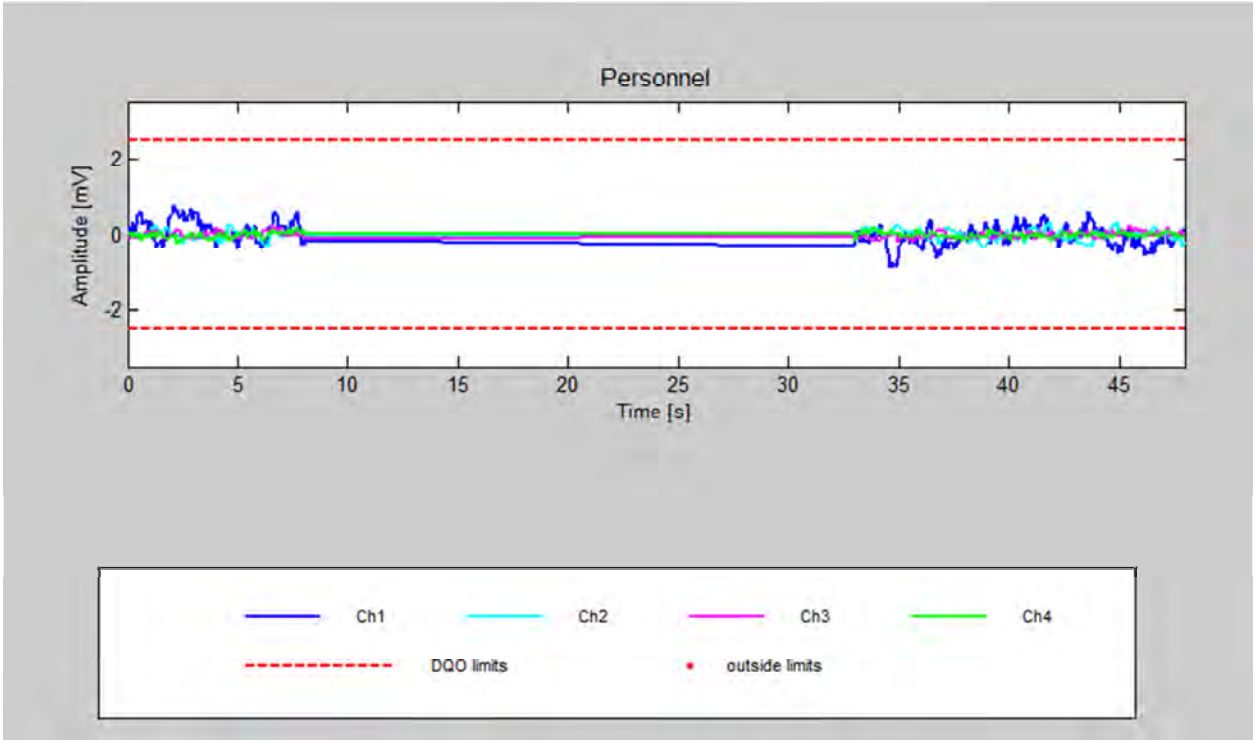
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/31/2013 Site:PACR Log Date: 2013304

Raw Data File: E2013304AE Survey Type: Personnel

Processed Filename: 2013304_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/31/2013 Site:PACR Log Date: 2013304

Raw Data File: E2013304AF Survey Type: Time Cal

Processed Filename: 2013304_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330402AF.pos	E021330401AF.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

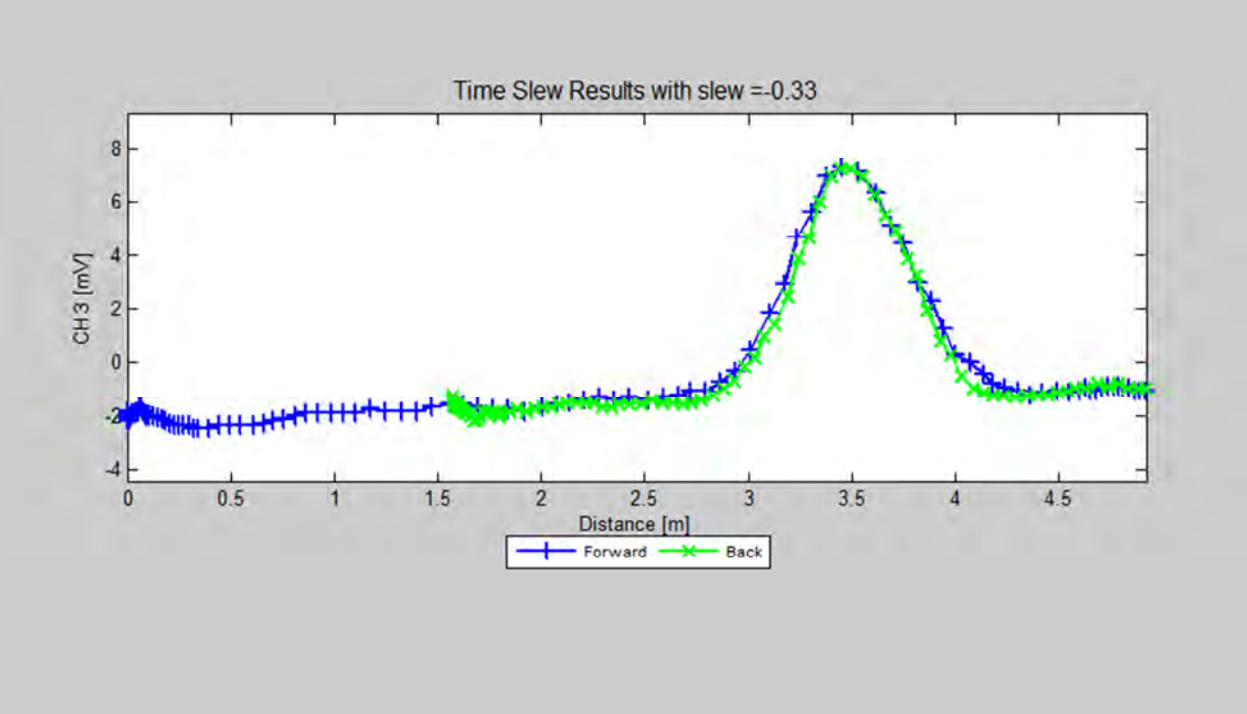
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/31/2013 Site:PACR Log Date: 2013304

Raw Data File: E2013304AF Survey Type: Time Cal

Processed Filename: 2013304_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/31/2013 Site:PACR Log Date: 2013304

Raw Data File: E2013304AG Survey Type: IVS/Noise

Processed Filename: 2013304_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330402AG.pos	E021330401AG.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

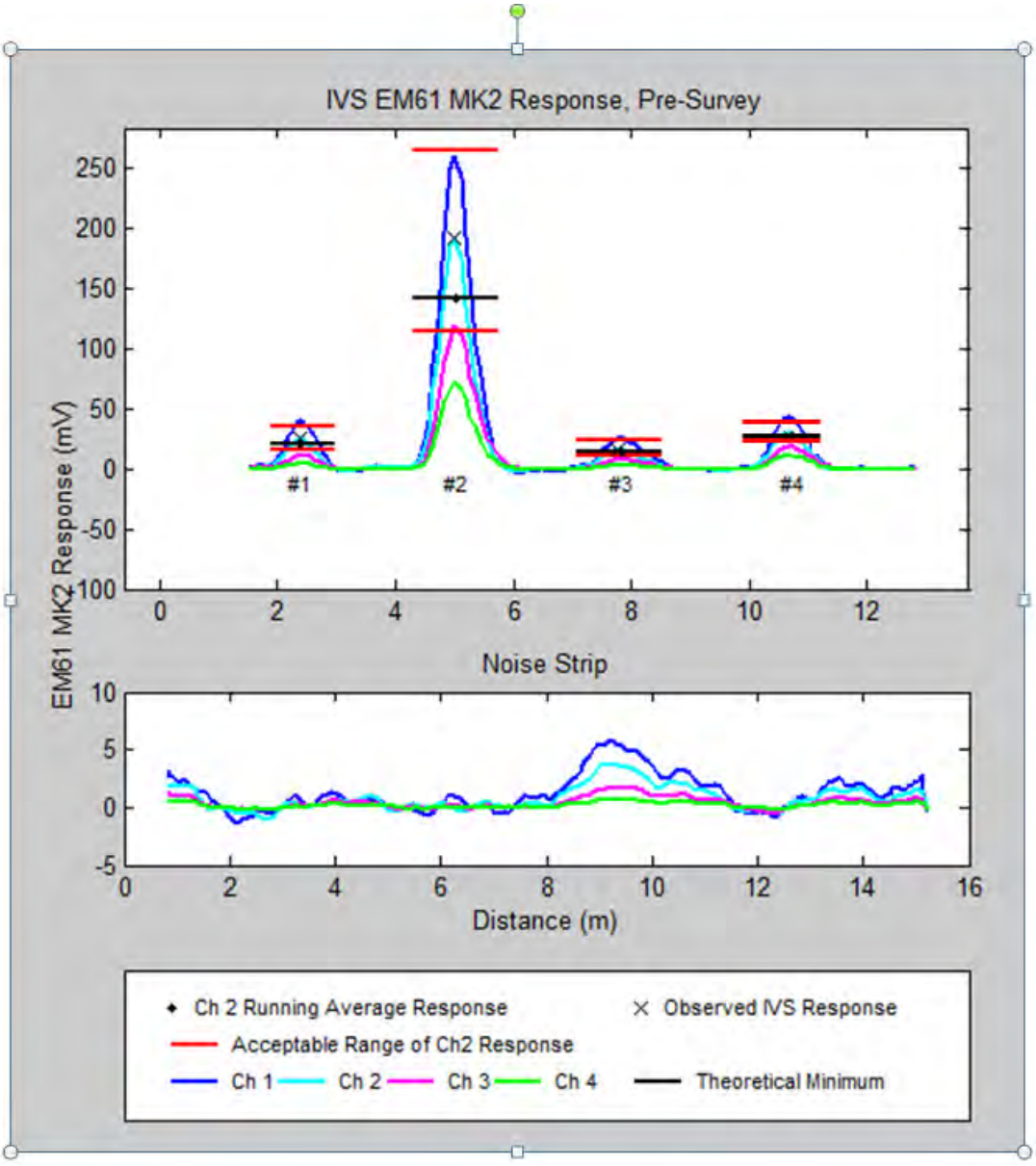
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/31/2013 Site:PACR Log Date: 2013304

Raw Data File: E2013304AG Survey Type: IVS/Noise

Processed Filename: 2013304_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/31/2013 Site:PACR Log Date: 2013304

Raw Data File: E2013304AI Survey Type: Survey

Processed Filename: 2013304_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330403AI.pos	E021330401AI.sen	-0.29	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/31/2013 Site:PACR Log Date: 2013304

Raw Data File: E2013304AK Survey Type: Static/Spike

Processed Filename: 2013304_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330402AK.pos	E021330401AS.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

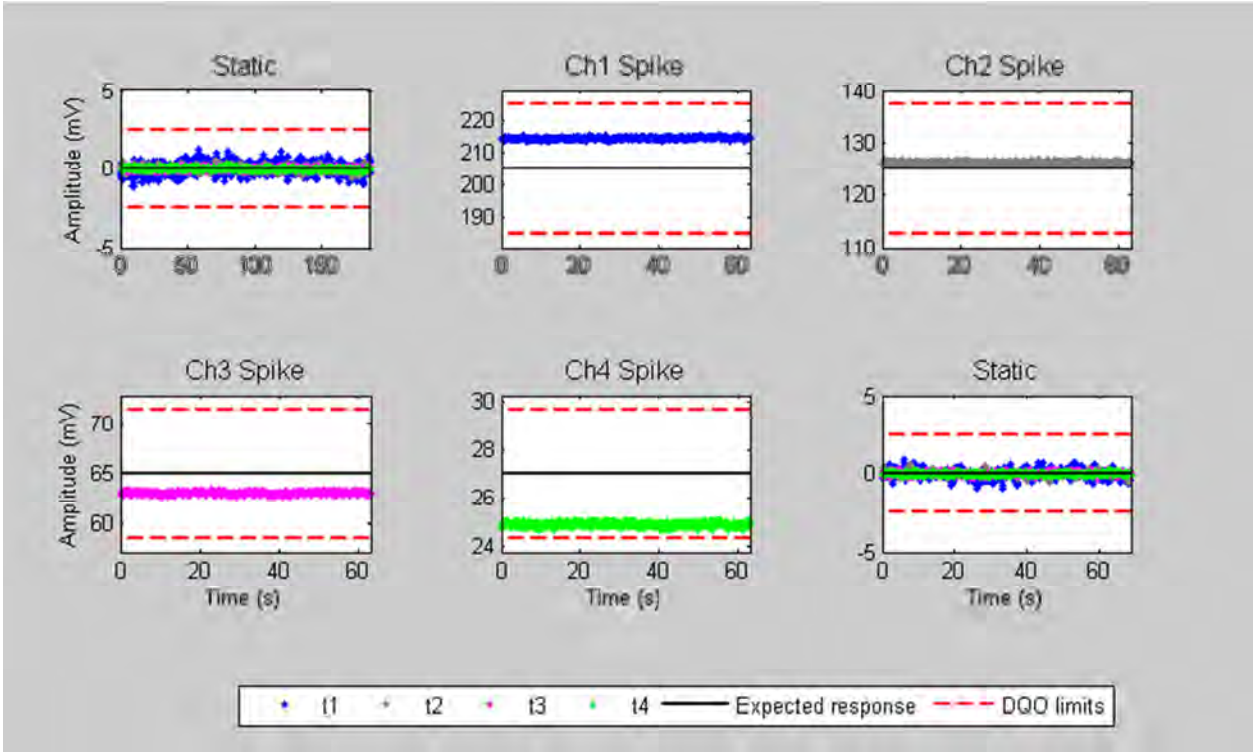
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/31/2013 Site:PACR Log Date: 2013304

Raw Data File: E2013304AK Survey Type: Static/Spike

Processed Filename: 2013304_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 10/31/2013 Site:PACR Log Date: 2013304

Raw Data File: E2013304AL Survey Type: IVS/Noise

Processed Filename: 2013304_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330402AL.pos	E021330401AT.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

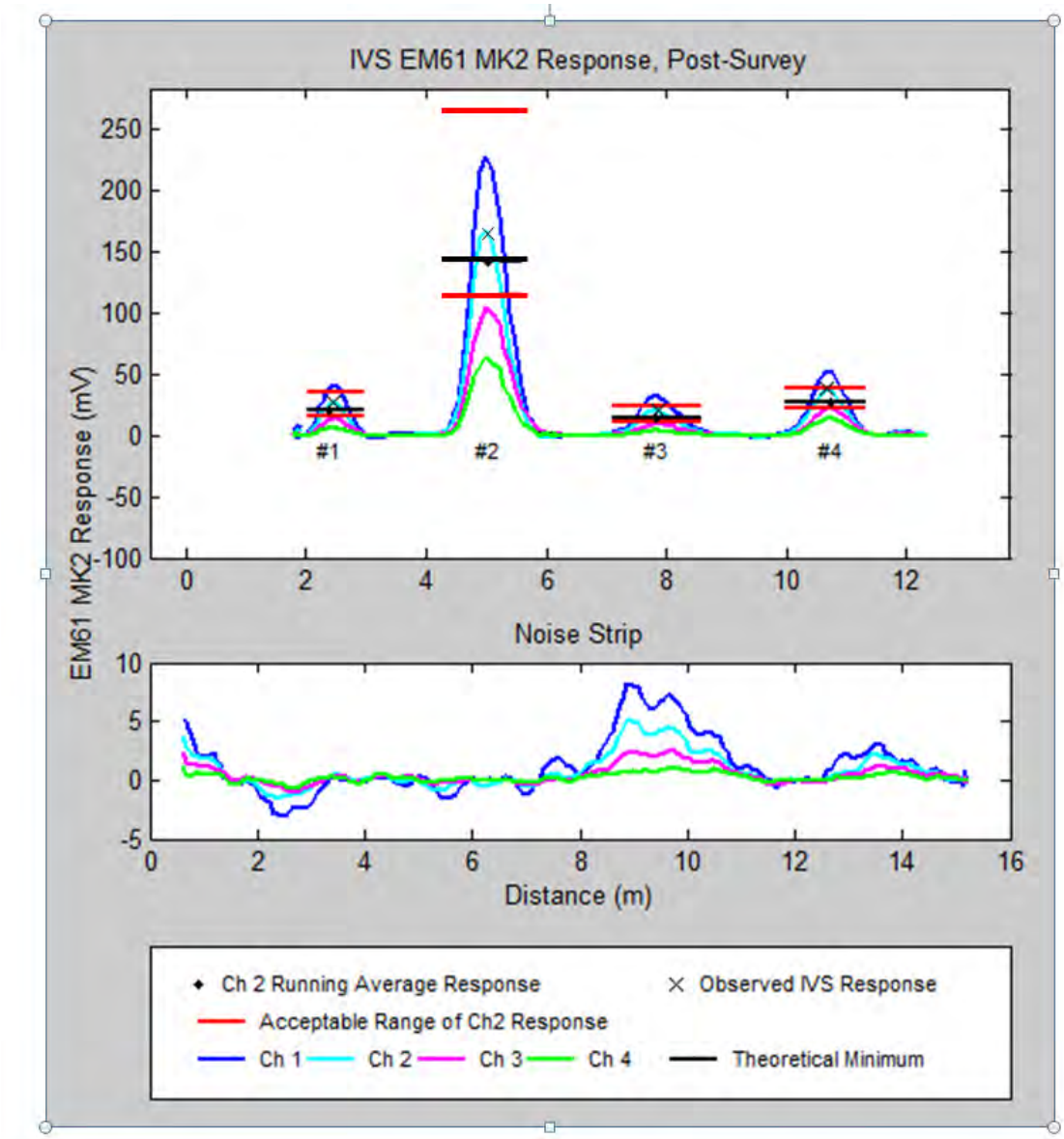
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 10/31/2013 Site:PACR Log Date: 2013304

Raw Data File: E2013304AL Survey Type: IVS/Noise

Processed Filename: 2013304_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AA Survey Type: Static/Spike

Processed Filename: 2013305_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330502AA.pos	E021330501AA.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

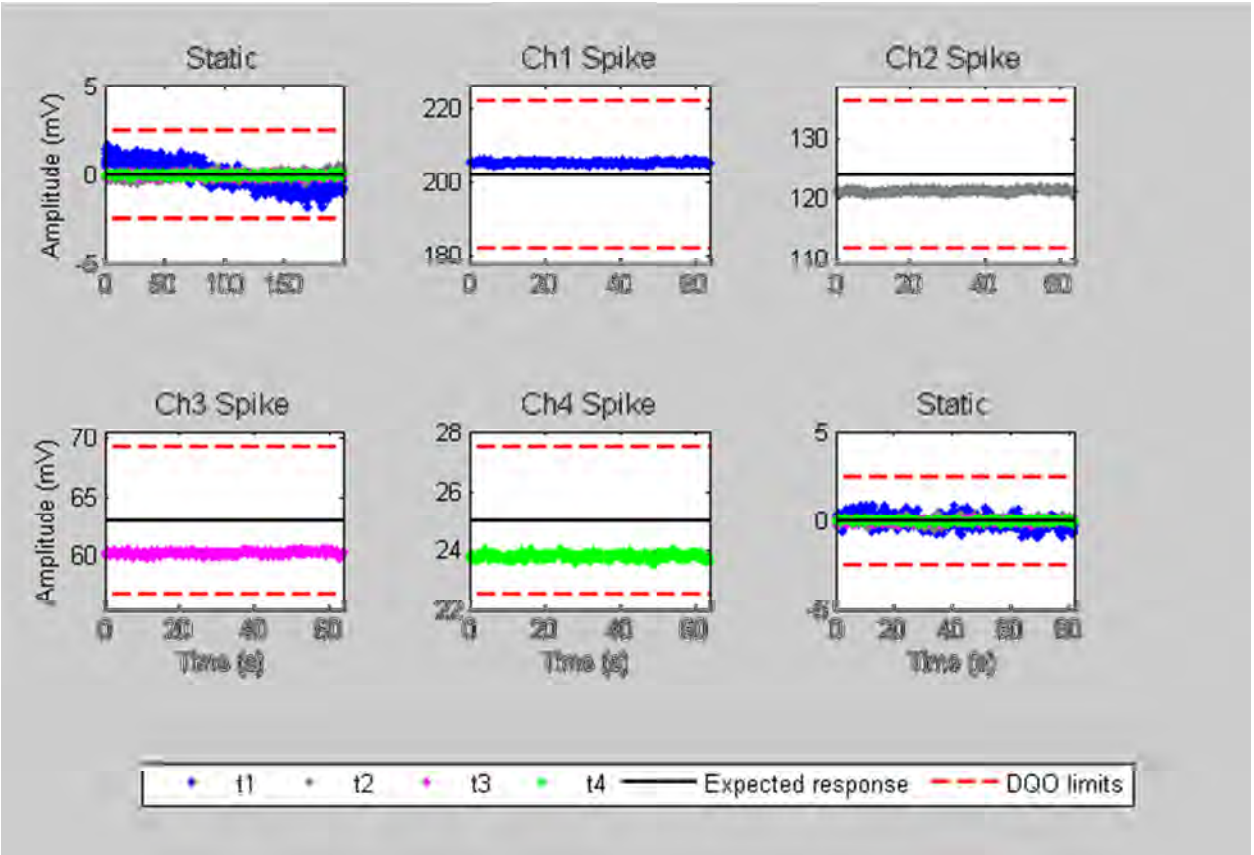
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AA Survey Type: Static/Spike

Processed Filename: 2013305_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AB Survey Type: Cable Shake

Processed Filename: 2013305_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330502AB.pos	E021330501AB.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

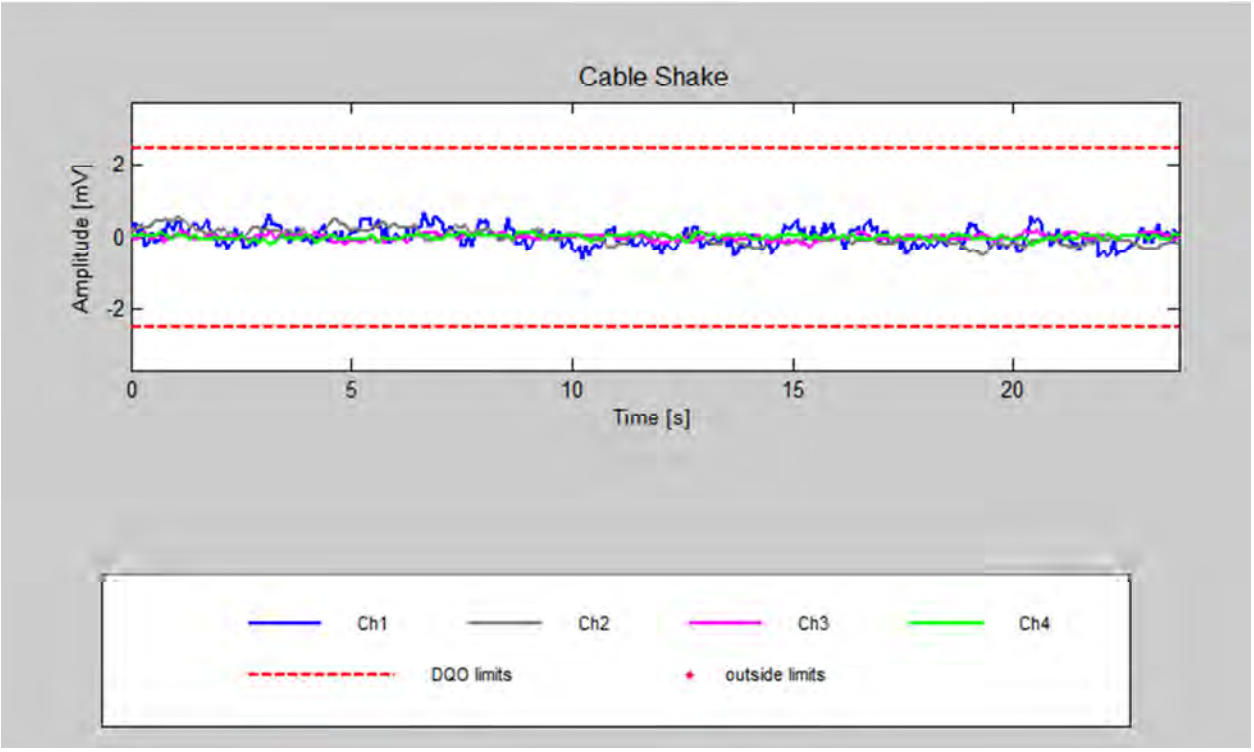
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AB Survey Type: Cable Shake

Processed Filename: 2013305_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AC Survey Type: Personnel

Processed Filename: 2013305_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330502AC.pos	E021330501AC.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

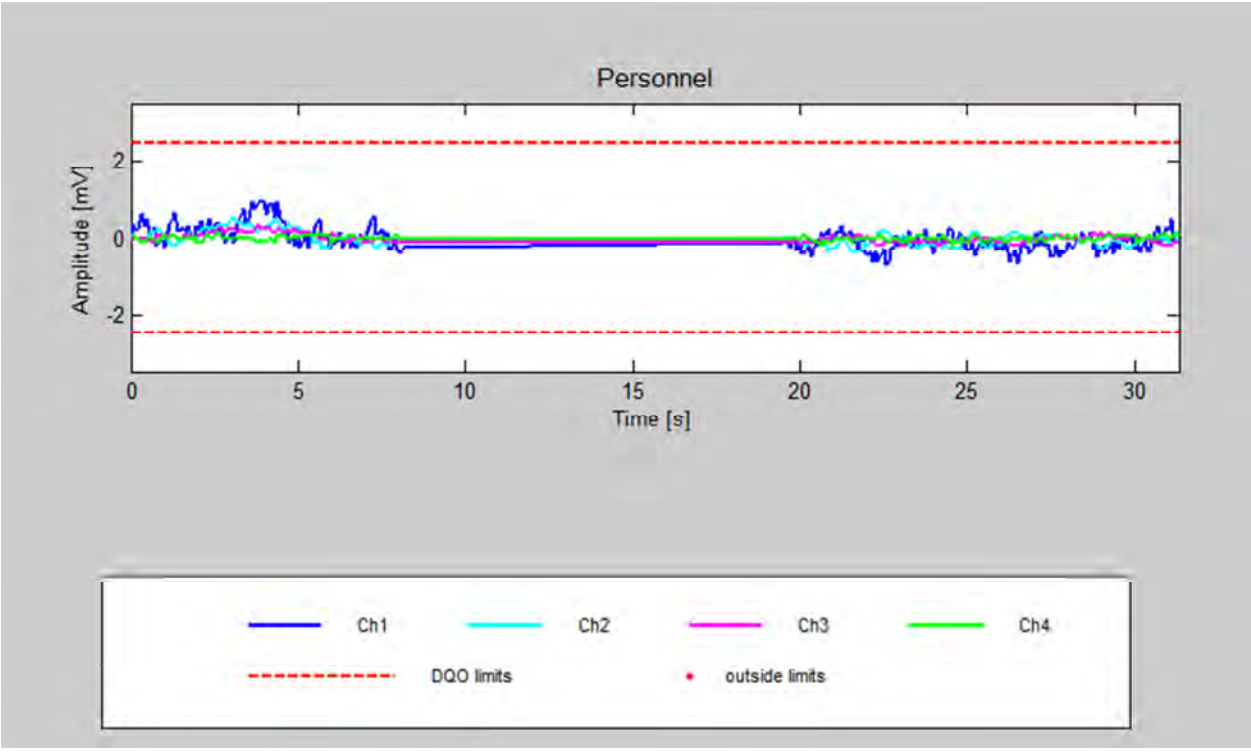
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AC Survey Type: Personnel

Processed Filename: 2013305_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AD Survey Type: Time Cal

Processed Filename: 2013305_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330502AD.pos	E021330501AD.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

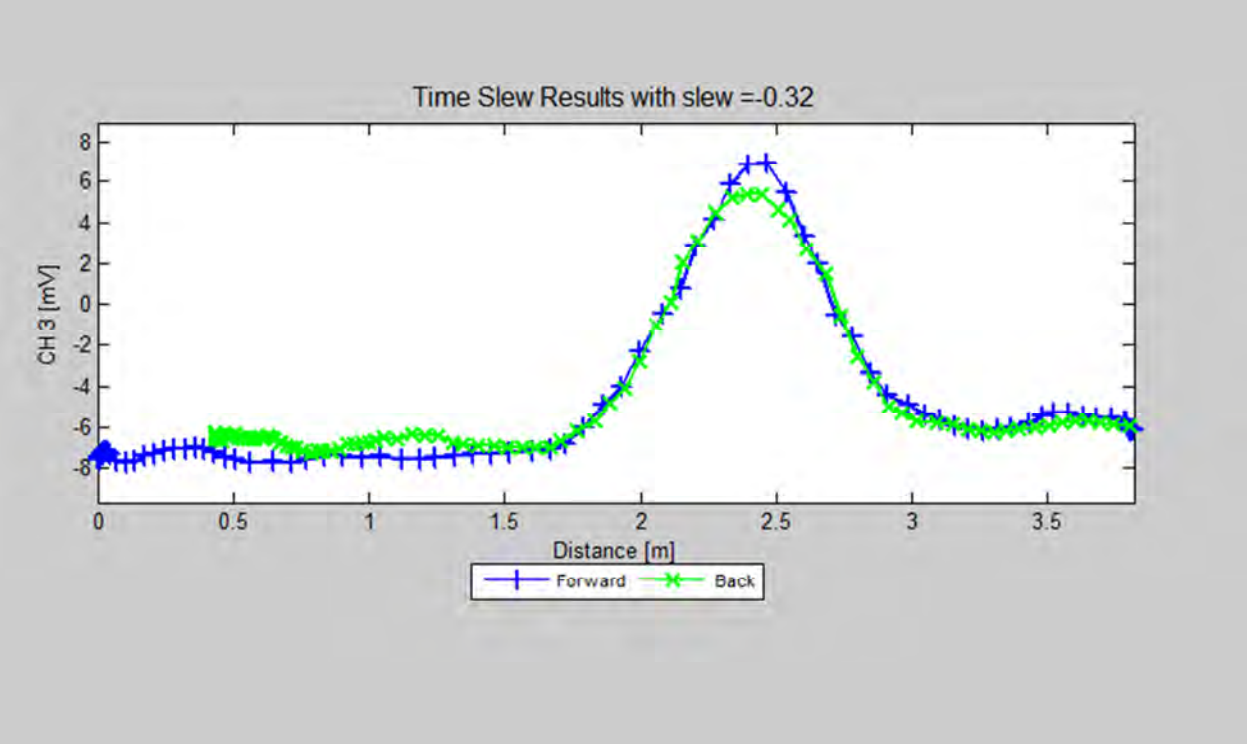
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AD Survey Type: Time Cal

Processed Filename: 2013305_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AE Survey Type: IVS/Noise

Processed Filename: 2013305_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330502AE.pos	E021330501AE.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

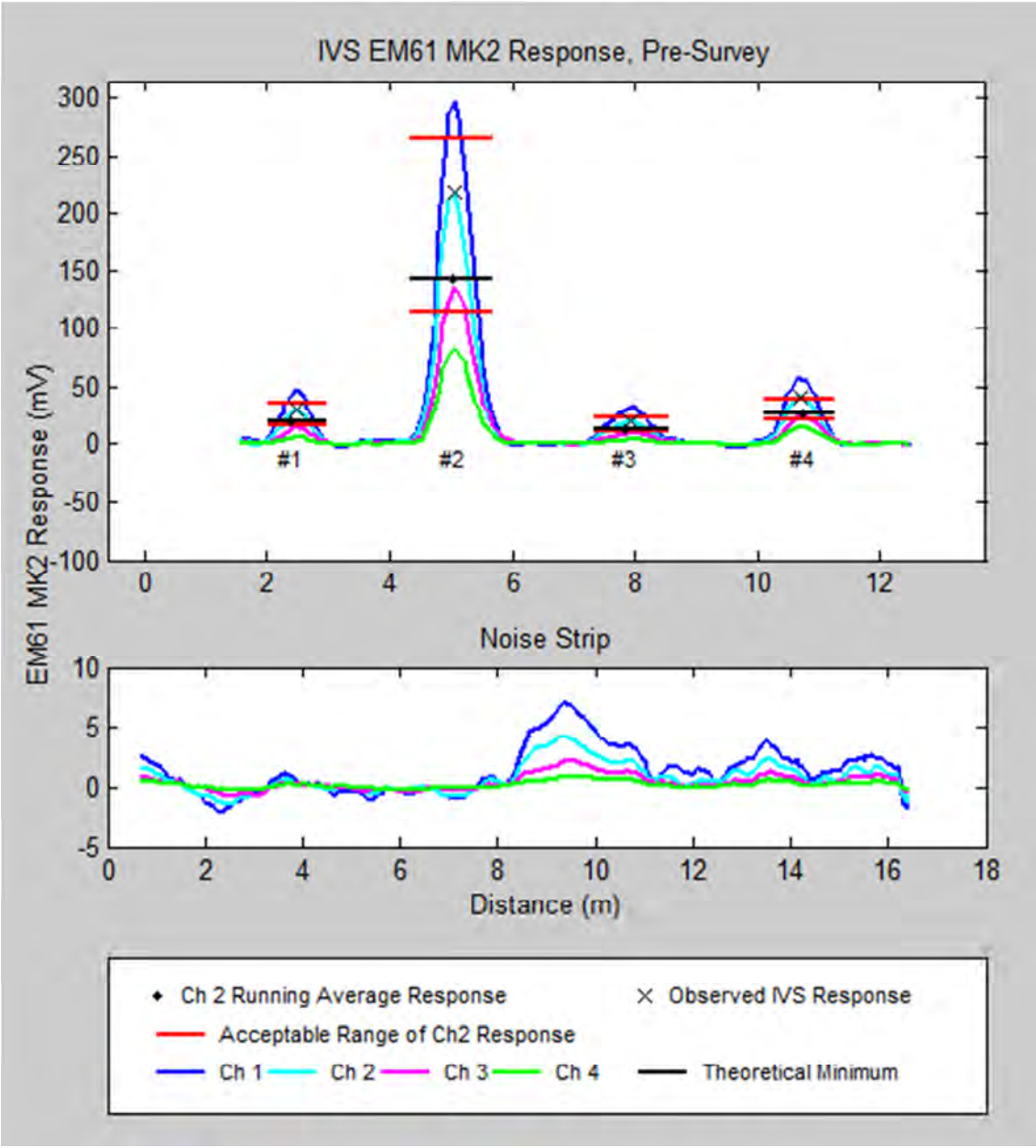
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AE Survey Type: IVS/Noise

Processed Filename: 2013305_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AG Survey Type: Survey

Processed Filename: 2013305_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330503AG.pos	E021330501AG.sen	-0.32	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AH Survey Type: Survey

Processed Filename: 2013305_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330503AH.pos	E021330501AH.sen	-0.32	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AI Survey Type: Survey

Processed Filename: 2013305_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330503AI.pos	E021330501AI.sen	-0.32	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AM Survey Type: Static/Spike

Processed Filename: 2013305_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330502AM.pos	E021330501AM.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

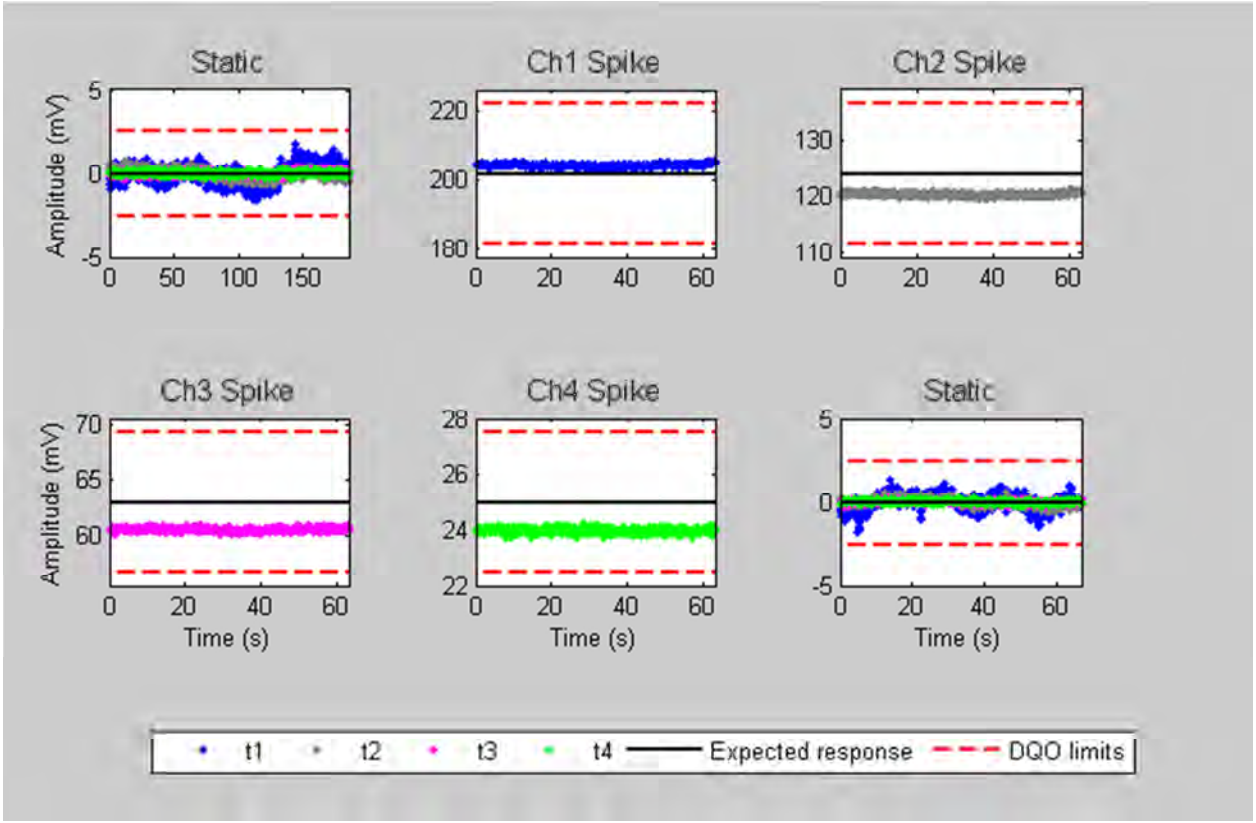
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AM Survey Type: Static/Spike

Processed Filename: 2013305_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AN Survey Type: IVS/Noise

Processed Filename: 2013305_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330502AN.pos	E021330501AN.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

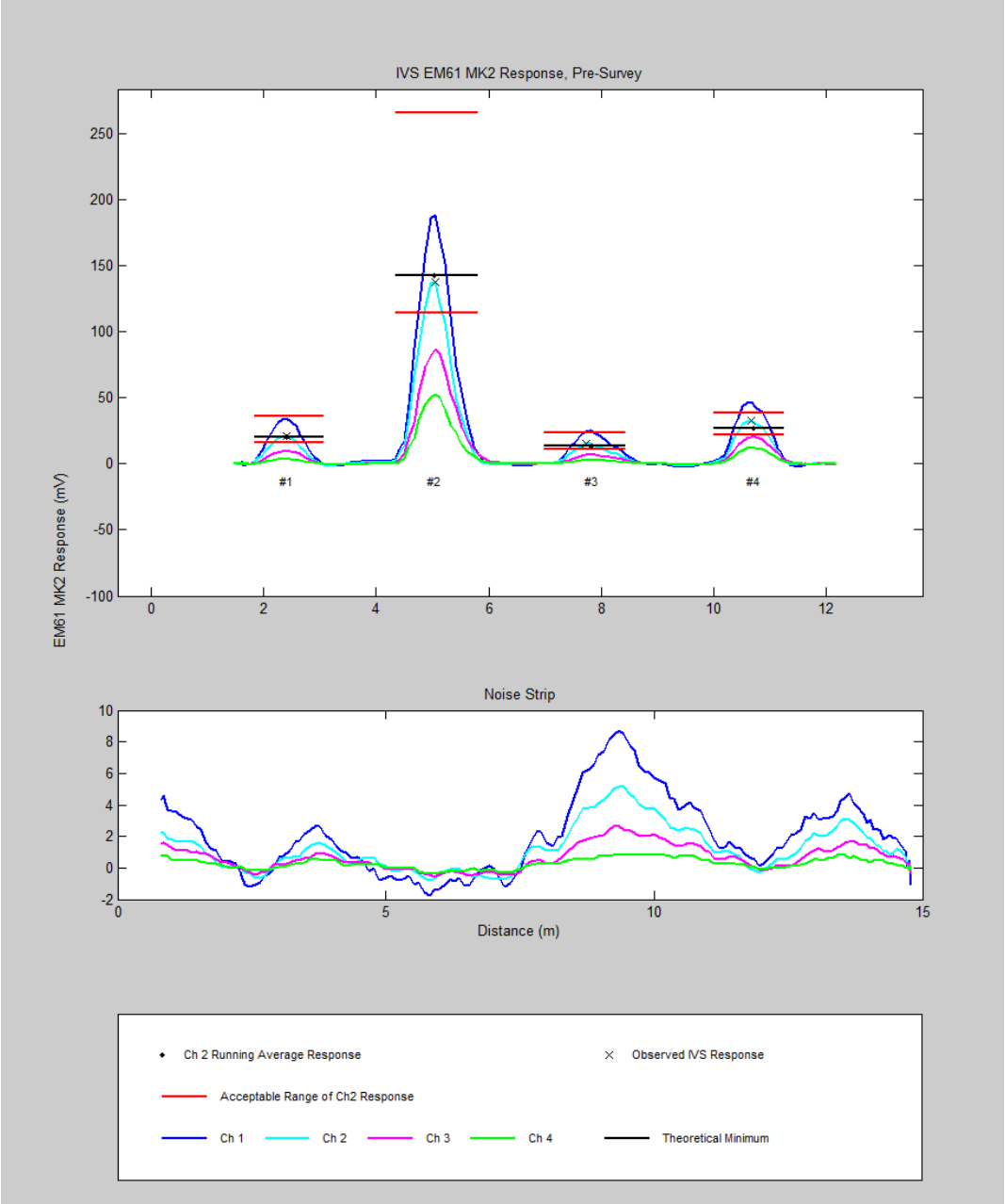
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/1/2013 Site:PACR Log Date: 2013305

Raw Data File: E2013305AN Survey Type: IVS/Noise

Processed Filename: 2013305_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AA Survey Type: Static/Spike

Processed Filename: 2013308_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330802AA.pos	E021330801AA.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

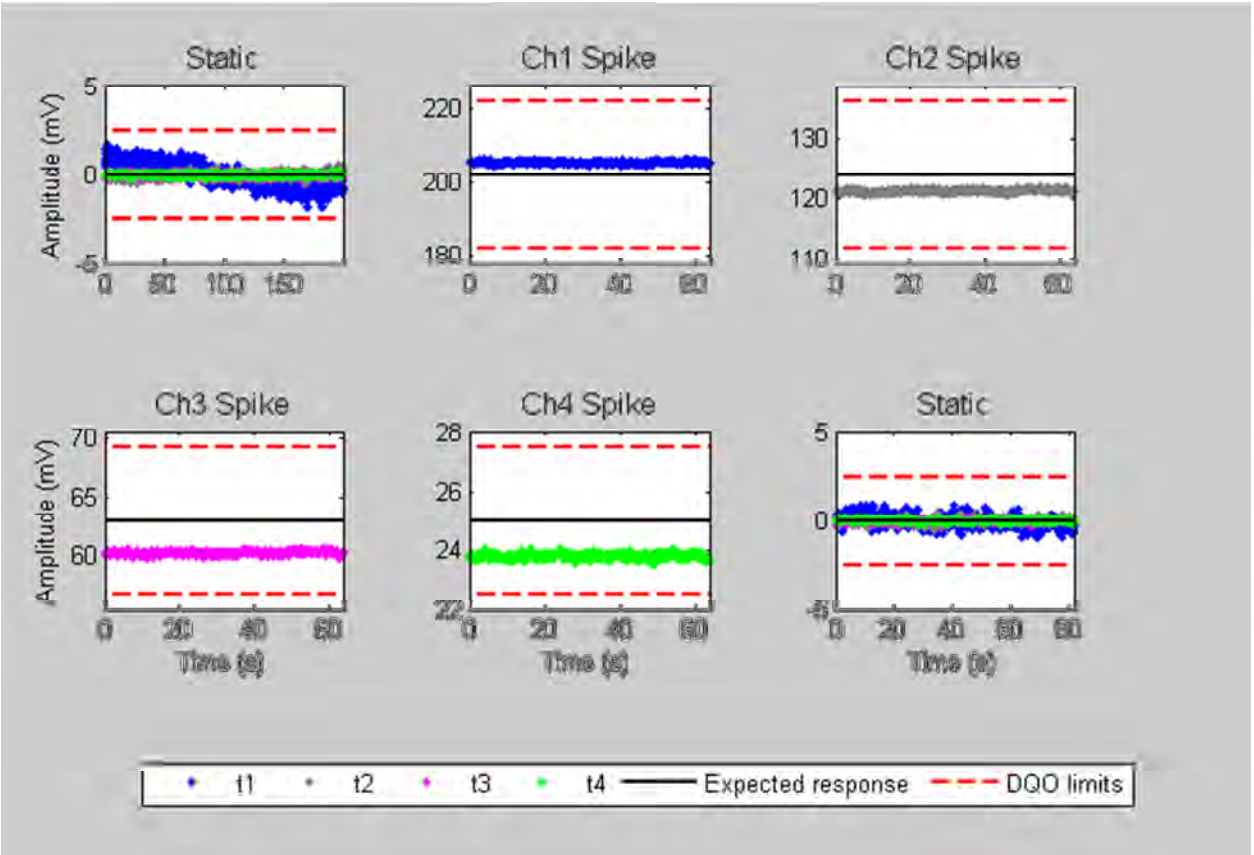
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AA Survey Type: Static/Spike

Processed Filename: 2013308_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AB Survey Type: Cable Shake

Processed Filename: 2013308_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330802AB.pos	E021330801AB.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

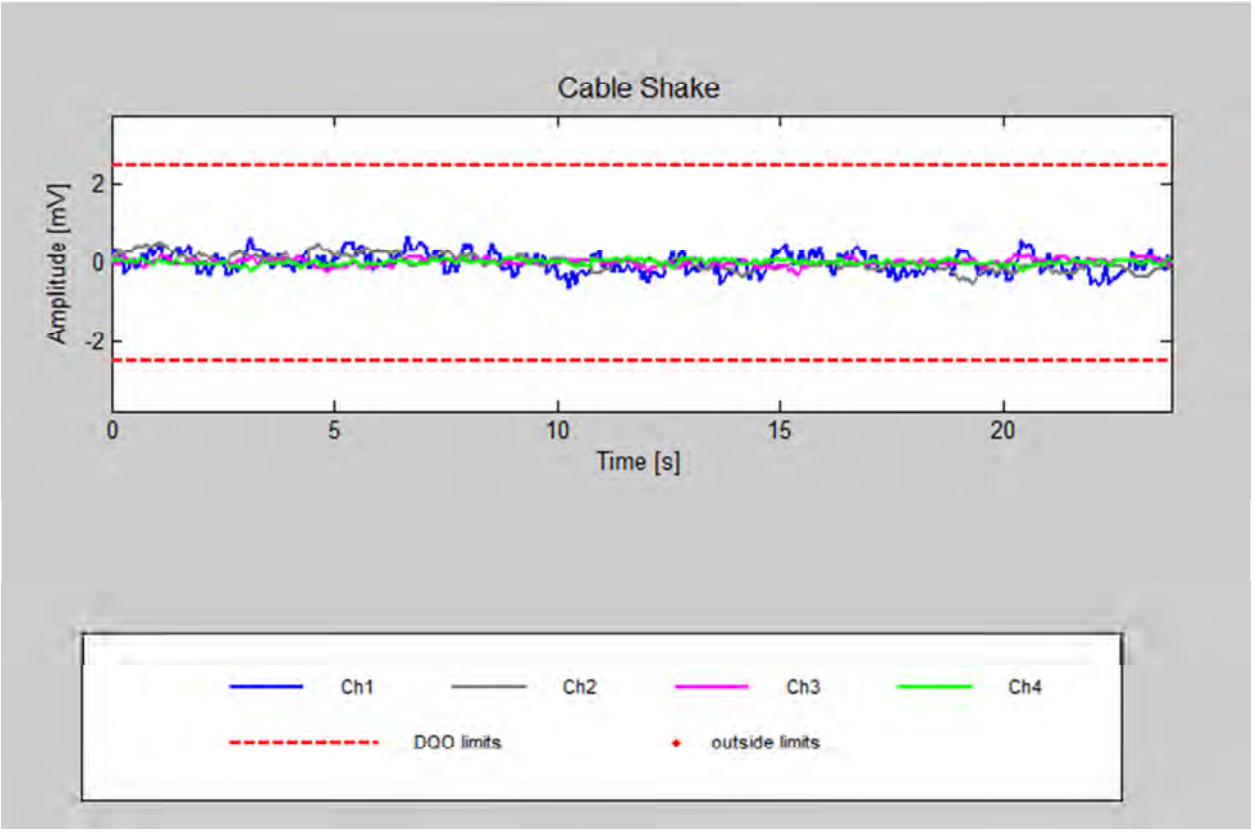
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AB Survey Type: Cable Shake

Processed Filename: 2013308_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AC Survey Type: Personnel

Processed Filename: 2013308_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330802AB.pos	E021330801AB.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

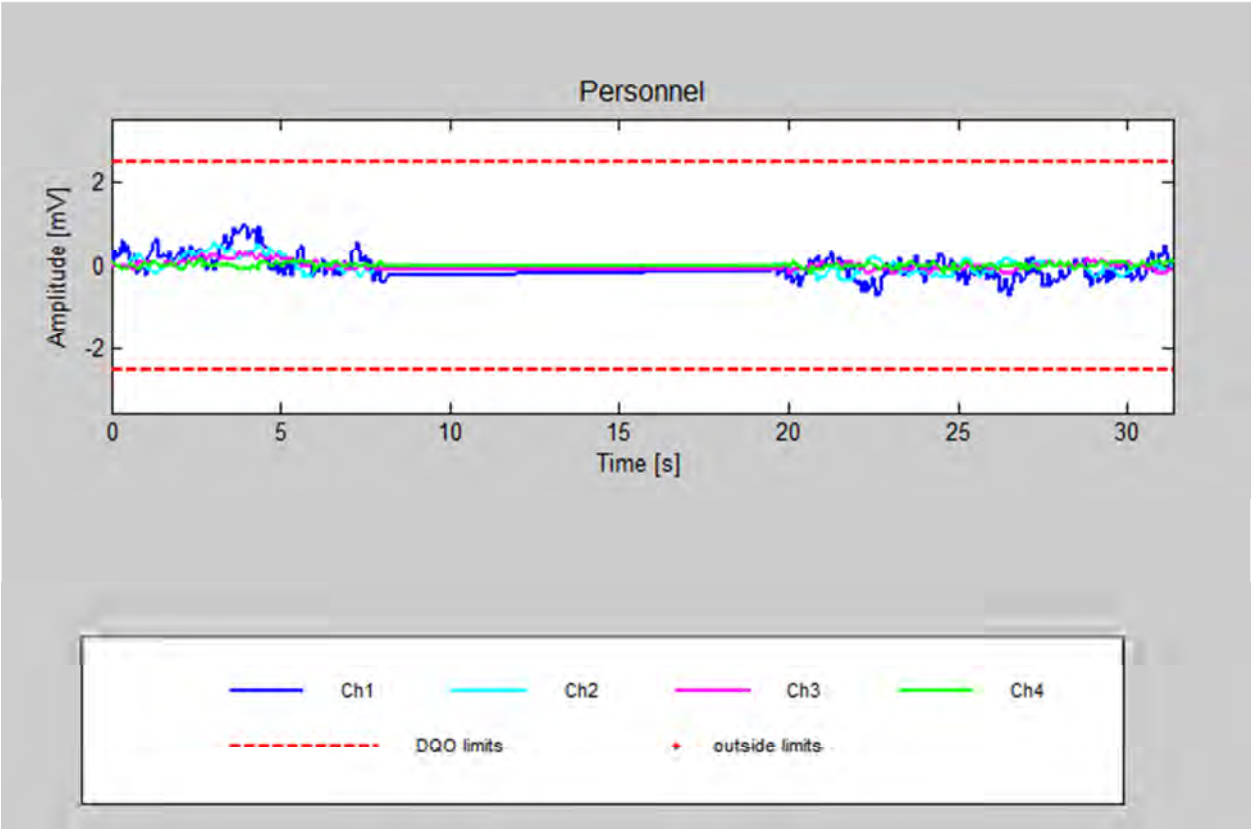
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AC Survey Type: Personnel

Processed Filename: 2013308_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AD Survey Type: Time Cal

Processed Filename: 2013308_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330802AD.pos	E021330801AD.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

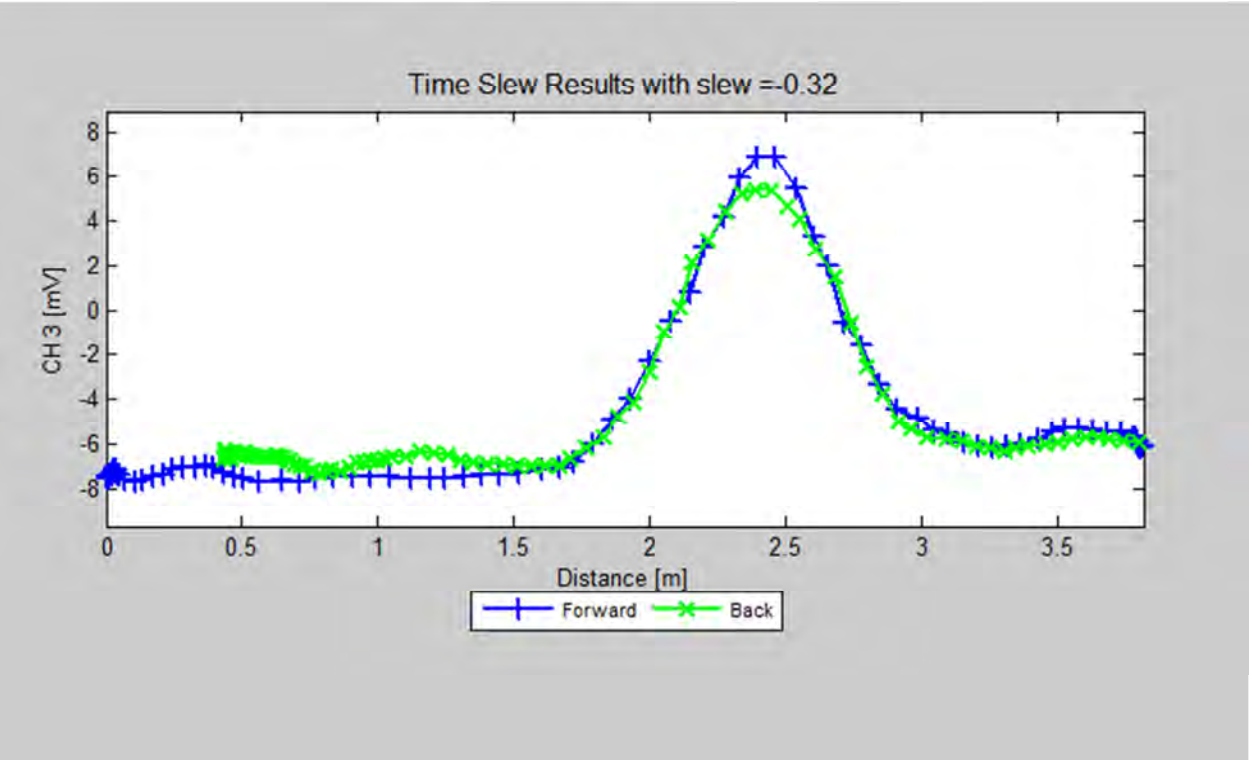
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AD Survey Type: Time Cal

Processed Filename: 2013308_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AE Survey Type: IVS/Noise

Processed Filename: 2013308_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330802AE.pos	E021330801AE.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

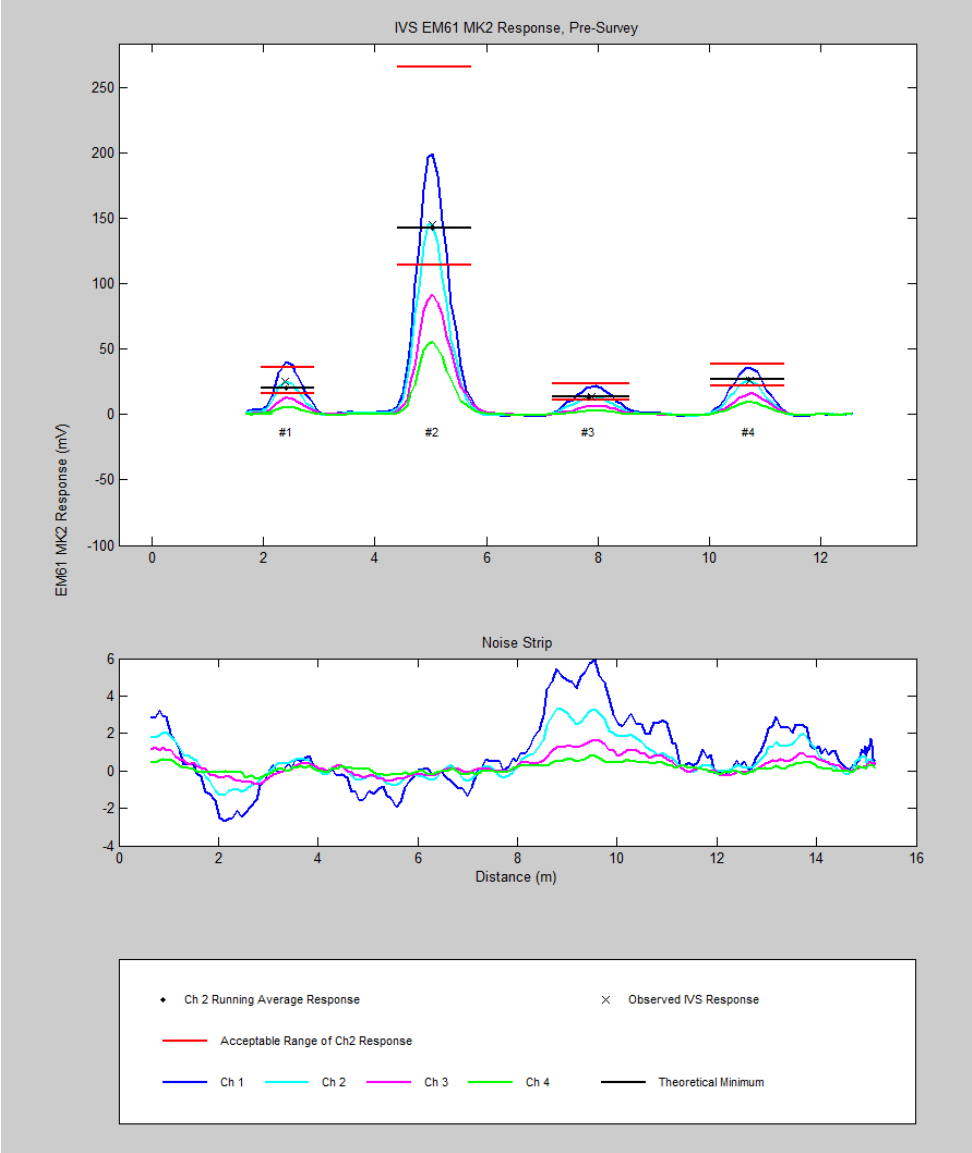
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AE Survey Type: IVS/Noise

Processed Filename: 2013308_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AF Survey Type: Survey

Processed Filename: 2013308_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330803AF.pos	E021330801AF.sen	-0.32	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AG Survey Type: Survey

Processed Filename: 2013308_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330803AG.pos	E021330801AG.sen	-0.32	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AH Survey Type: Survey

Processed Filename: 2013308_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330803AH.pos	E021330801AH.sen	-0.32	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AI Survey Type: Survey

Processed Filename: 2013308_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330803AI.pos	E021330801AI.sen	-0.32	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AJ Survey Type: Static/Spike

Processed Filename: 2013308_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330802AJ.pos	E021330801AJ.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

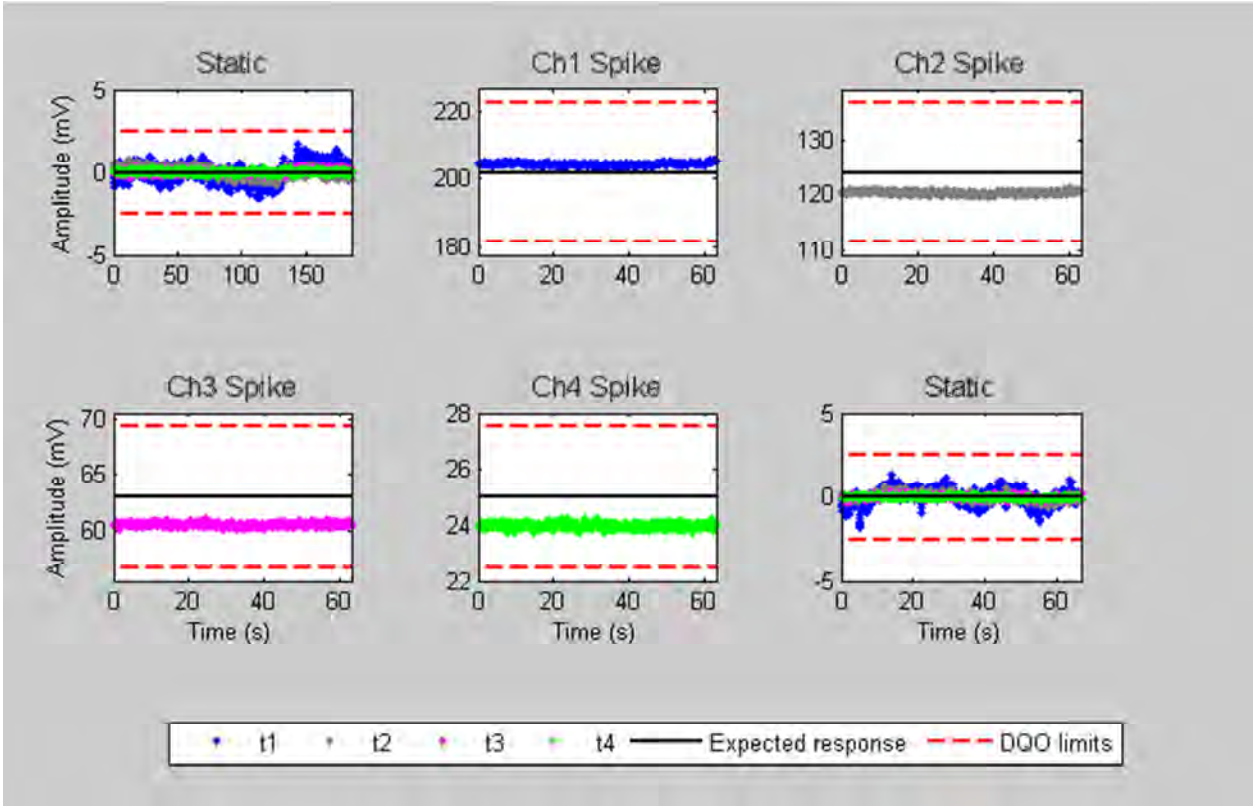
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AJ Survey Type: Static/Spike

Processed Filename: 2013308_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AK Survey Type: IVS/Noise

Processed Filename: 2013308_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330802AK.pos	E021330801AK.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

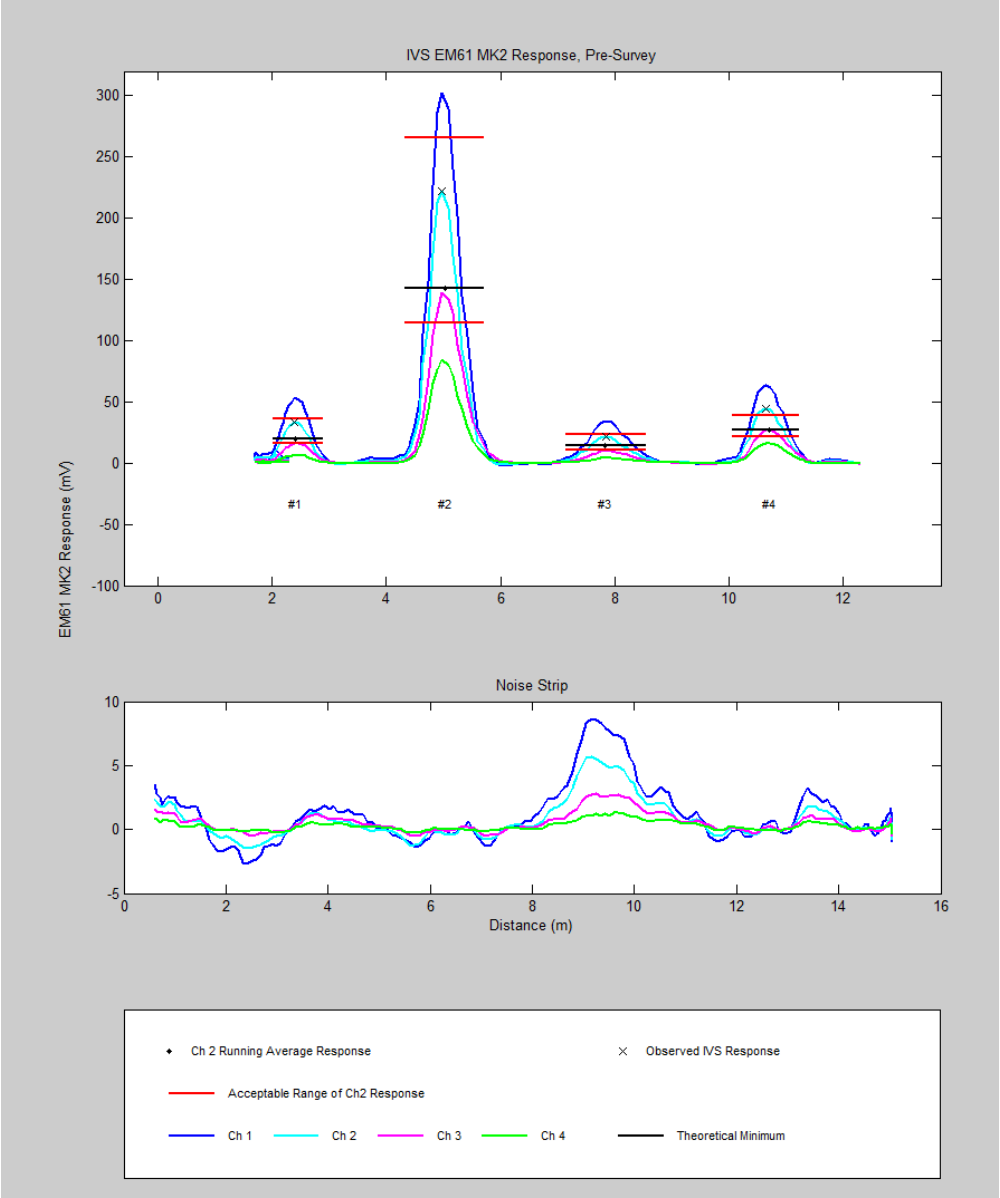
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/4/2013 Site:PABR Log Date: 2013308

Raw Data File: E2013308AK Survey Type: IVS/Noise

Processed Filename: 2013308_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AA Survey Type: Static/Spike

Processed Filename: 2013309_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330902AA.pos	E021330901AA.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

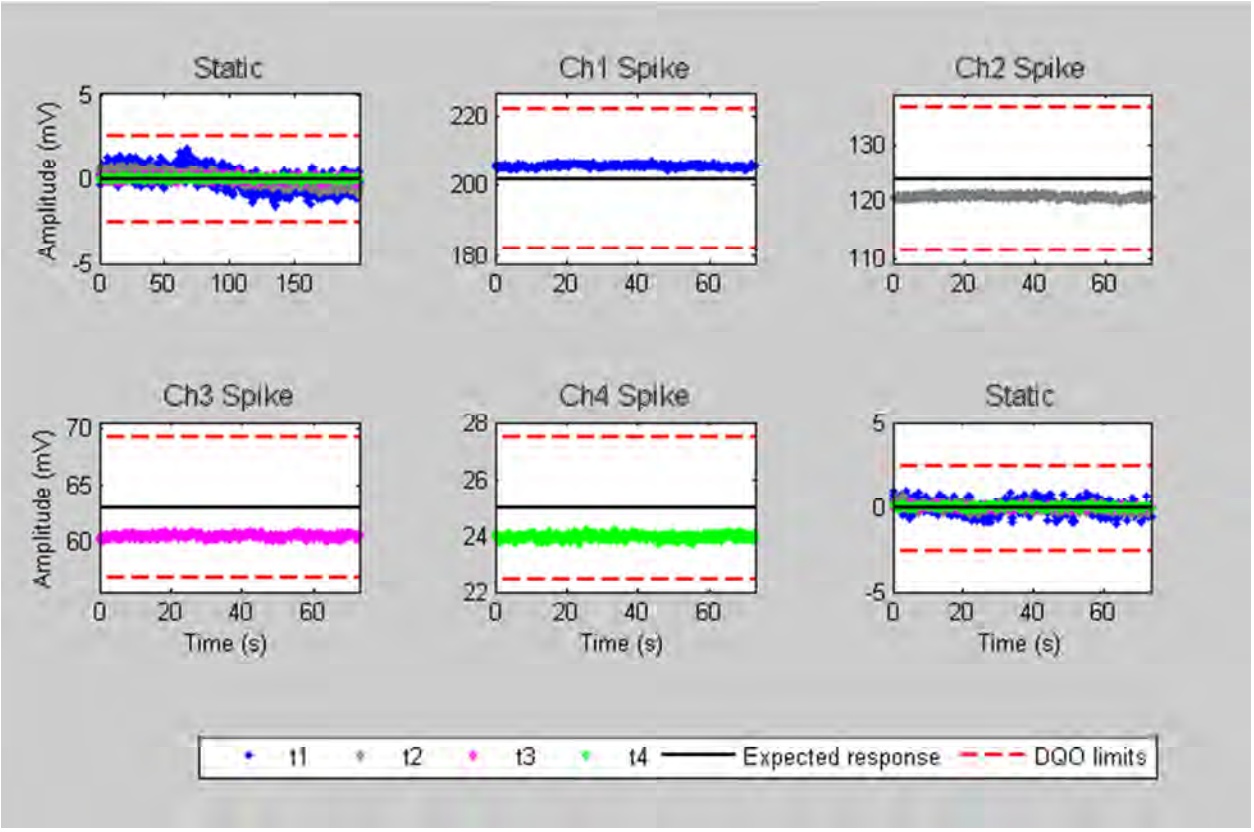
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AA Survey Type: Static/Spike

Processed Filename: 2013309_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AC Survey Type: Cable Shake

Processed Filename: 2013309_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330902AC.pos	E021330901AC.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

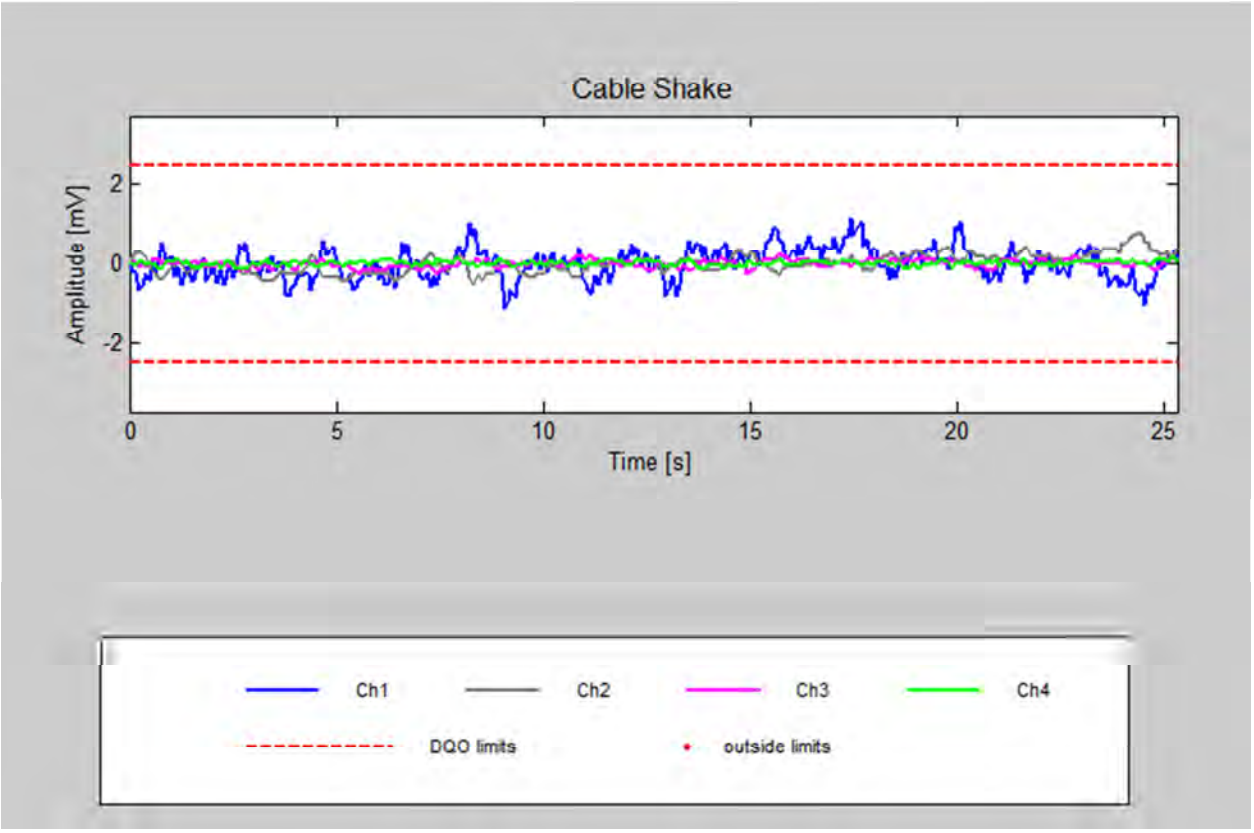
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AC Survey Type: Cable Shake

Processed Filename: 2013309_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AD Survey Type: Personnel

Processed Filename: 2013309_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330902AC.pos	E021330901AC.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

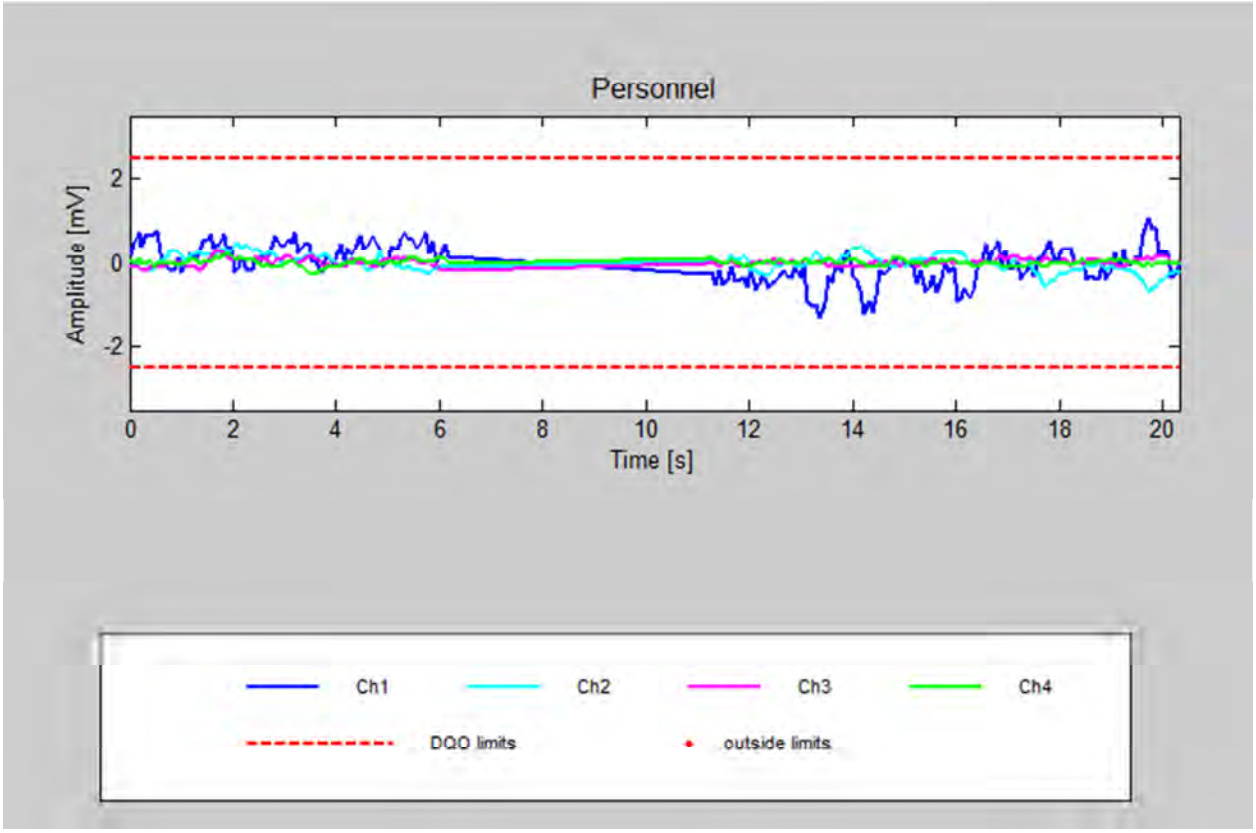
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AD Survey Type: Personnel

Processed Filename: 2013309_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AE Survey Type: Time Cal

Processed Filename: 2013309_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330902AE.pos	E021330901AE.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

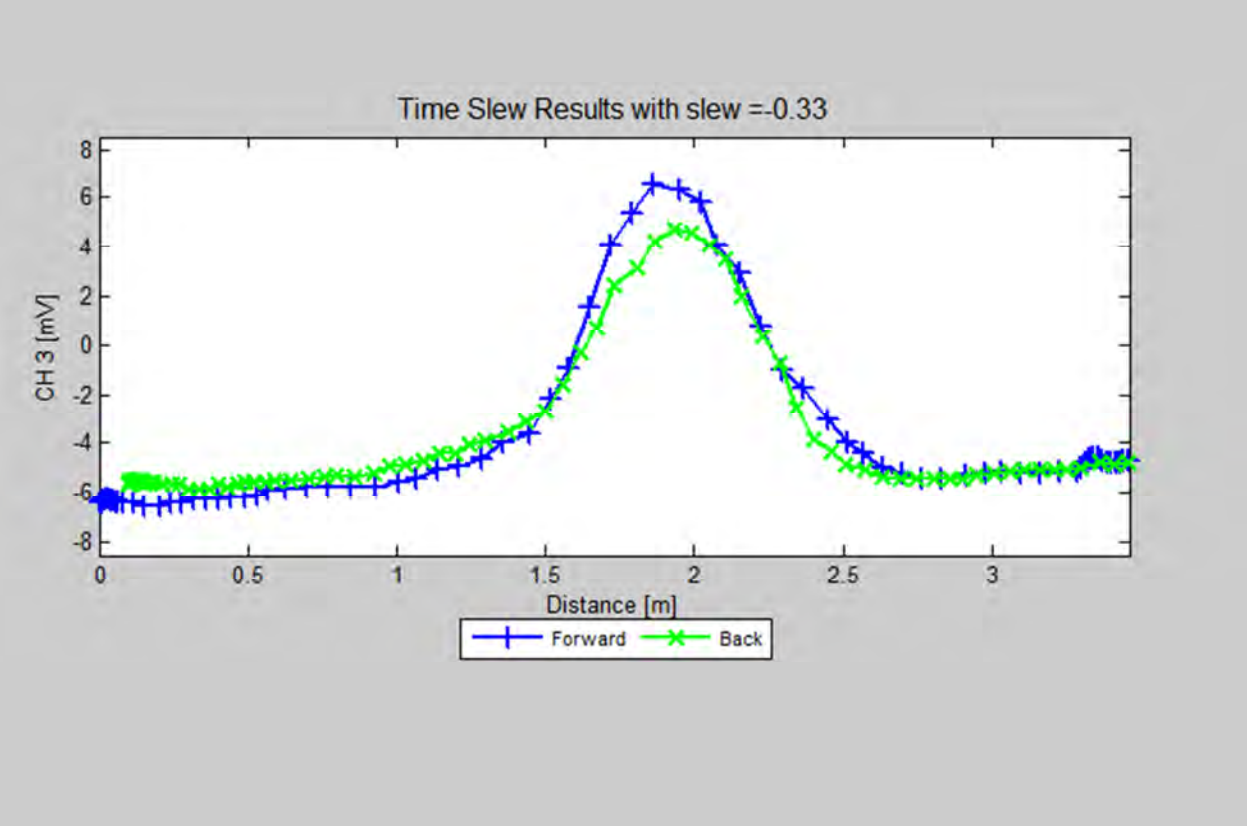
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AE Survey Type: Time Cal

Processed Filename: 2013309_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AF Survey Type: IVS/Noise

Processed Filename: 2013309_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330902AF.pos	E021330901AF.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

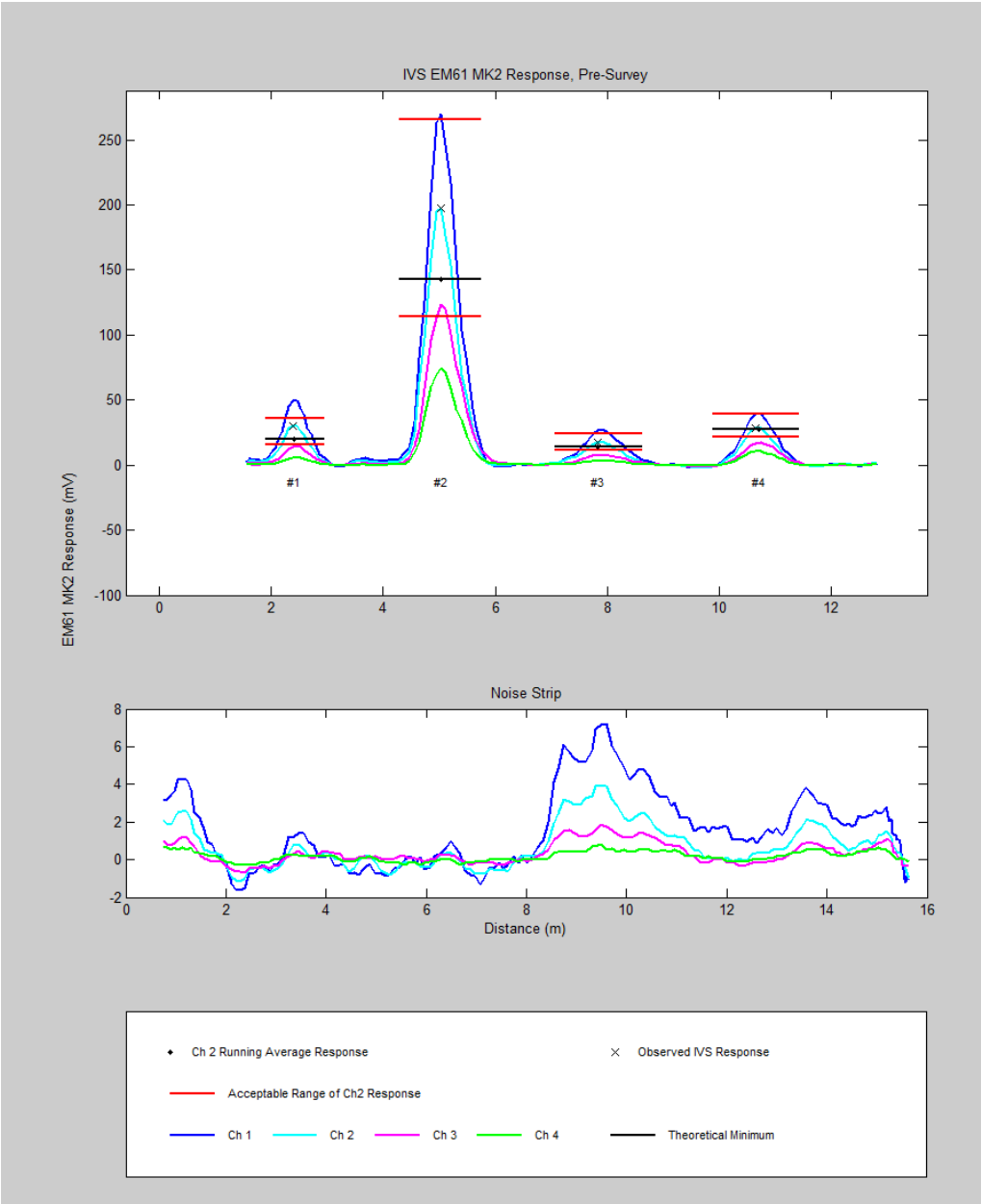
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AF Survey Type: IVS/Noise

Processed Filename: 2013309_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AG Survey Type: Survey

Processed Filename: 2013309_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330903AG.pos	E021330901AG.sen	-0.31	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AH Survey Type: Survey

Processed Filename: 2013309_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330903AH.pos	E021330901AH.sen	-0.31	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AI Survey Type: Survey

Processed Filename: 2013309_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330903AI.pos	E021330901AI.sen	-0.31	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AJ Survey Type: Survey

Processed Filename: 2013309_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330903AJ.pos	E021330901AJ.sen	-0.31	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AK Survey Type: Survey

Processed Filename: 2013309_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330903AK.pos	E021330901AK.sen	-0.31	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AM Survey Type: Static/Spike

Processed Filename: 2013309_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330902AM.pos	E021330901AM.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

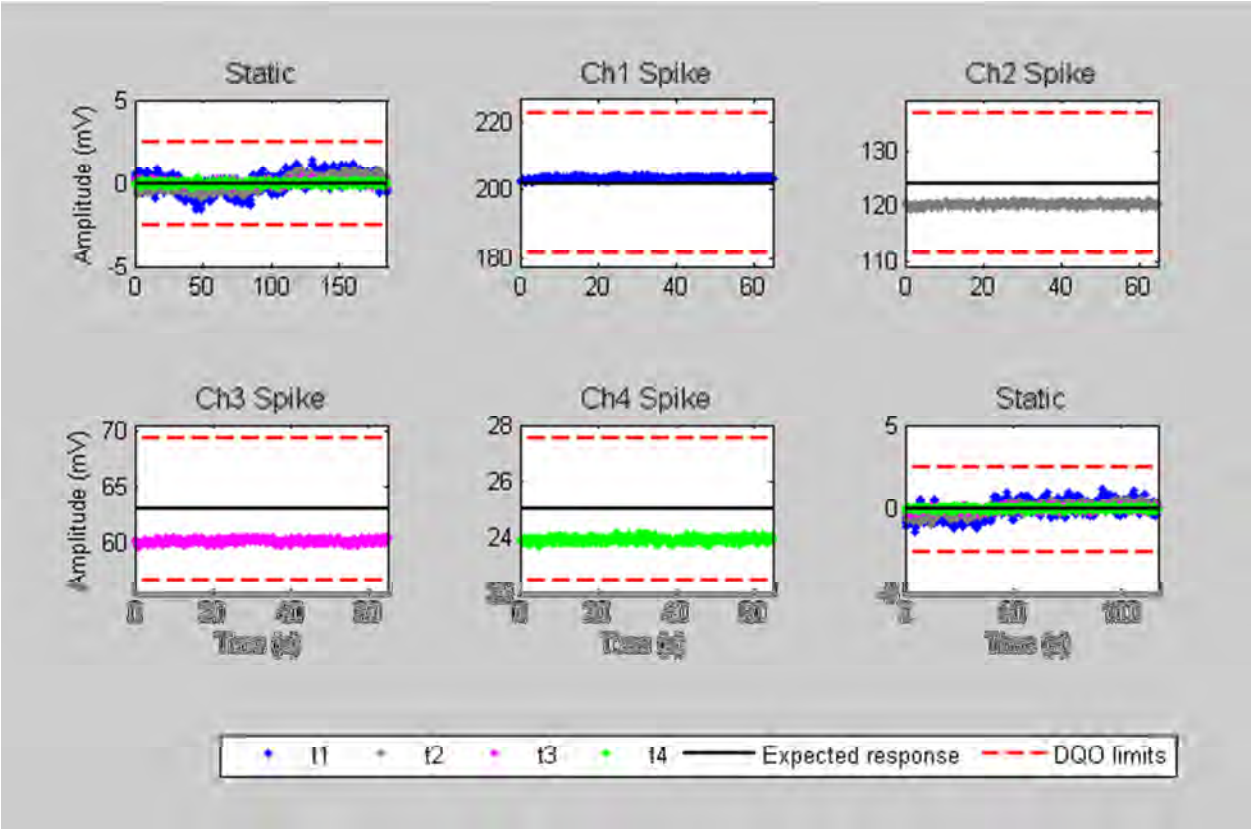
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AM Survey Type: Static/Spike

Processed Filename: 2013309_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AN Survey Type: IVS/Noise

Processed Filename: 2013309_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251330902AN.pos	E021330901AN.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

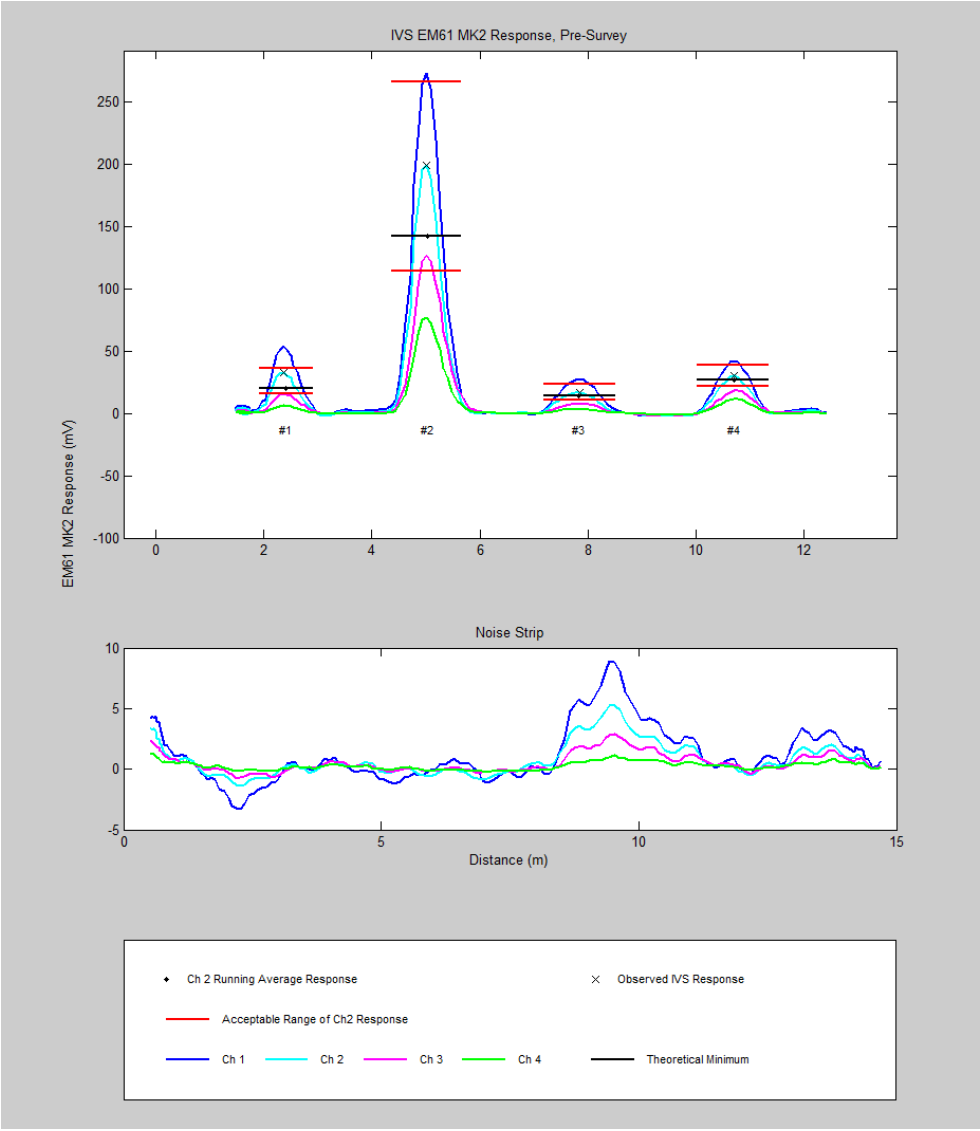
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/5/2013 Site: PACR Log Date: 2013309

Raw Data File: E2013309AN Survey Type: IVS/Noise

Processed Filename: 2013309_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/6/2013 Site:PACR Log Date: 2013310

Raw Data File: E2013310AB Survey Type: Static/Spike

Processed Filename: 2013310_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331002ab.pos	E021331001ab.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

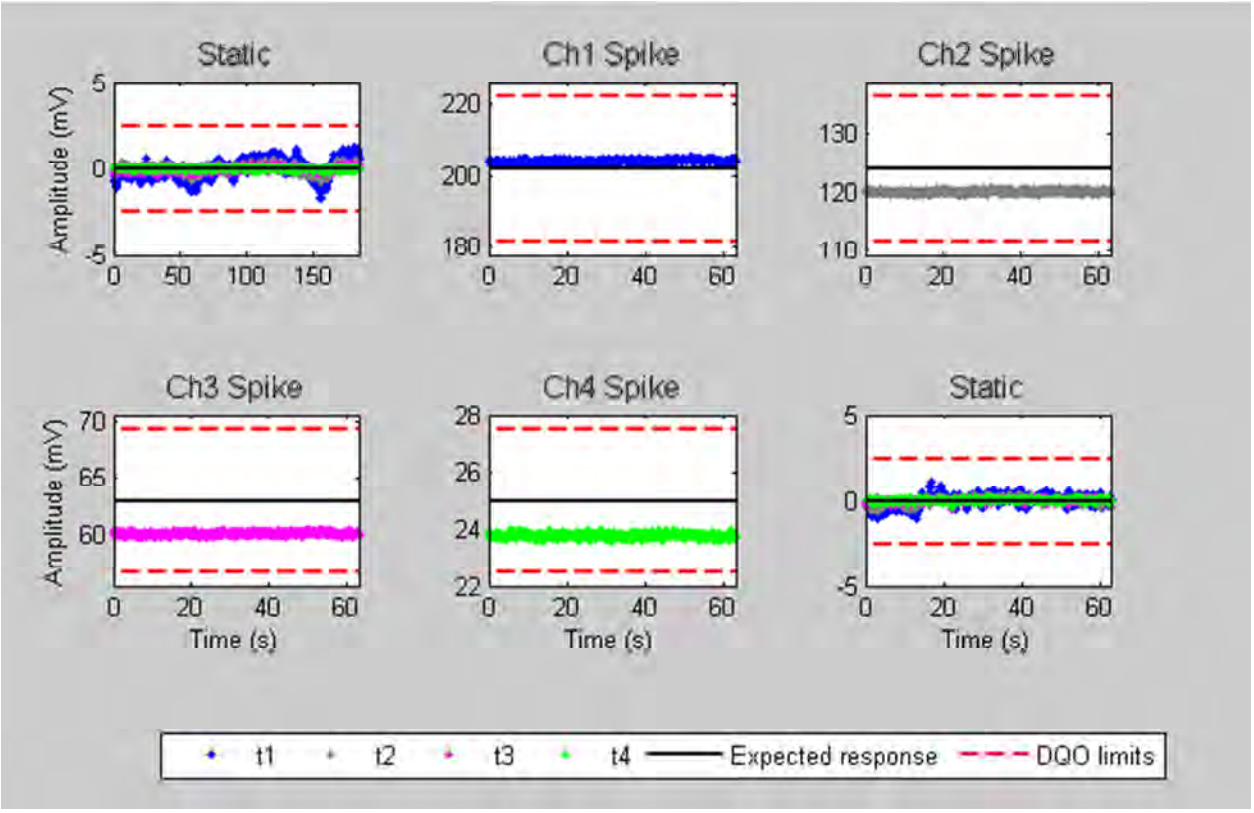
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/6/2013 Site:PACR Log Date: 2013310

Raw Data File: E2013310AB Survey Type: Static/Spike

Processed Filename: 2013310_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/6/2013 Site:PACR Log Date: 2013310

Raw Data File: E2013310AC Survey Type: Cable Shake

Processed Filename: 2013310_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331002AC.pos	E021331001AC.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

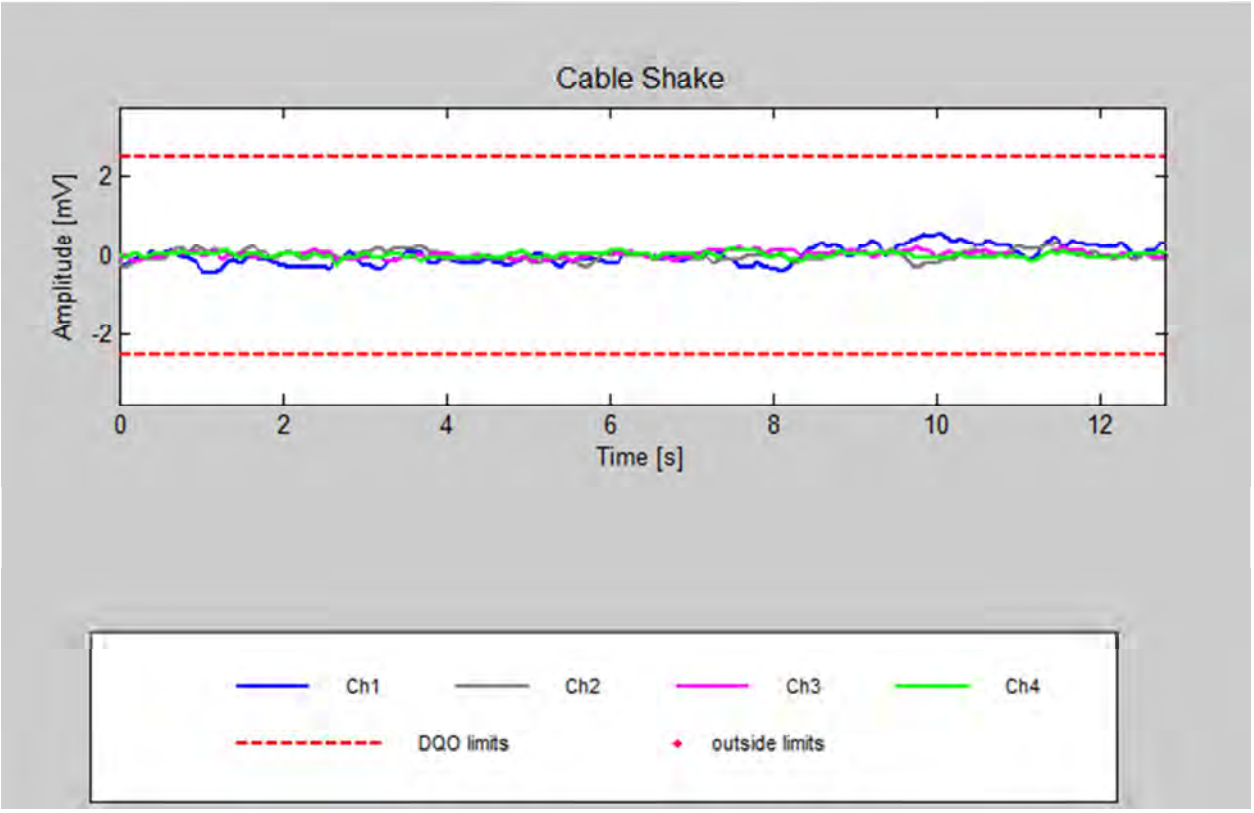
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/6/2013 Site:PACR Log Date: 2013310

Raw Data File: E2013310AC Survey Type: Cable Shake

Processed Filename: 2013310_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/6/2013 Site:PACR Log Date: 2013310

Raw Data File: E2013310AD Survey Type: Personnel

Processed Filename: 2013310_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331002AC.pos	E021331001AC.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

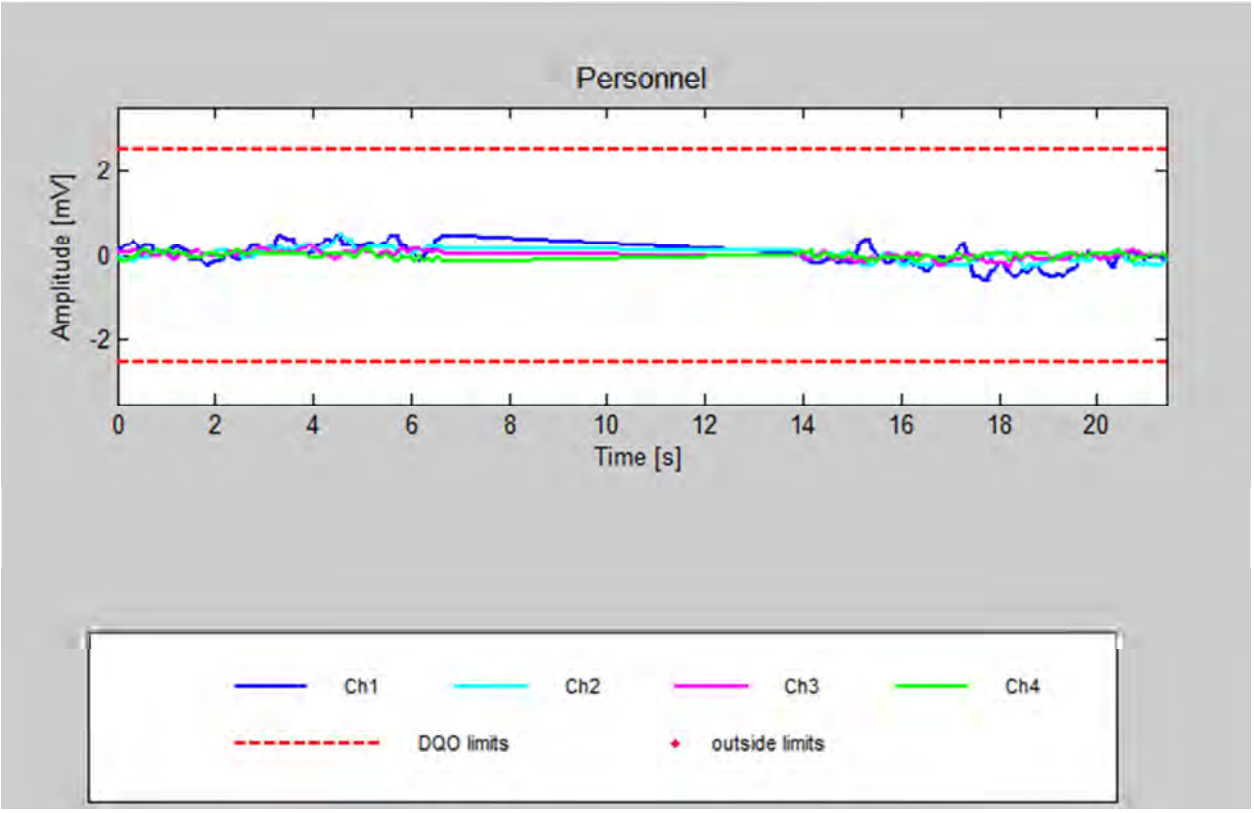
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/6/2013 Site:PACR Log Date: 2013310

Raw Data File: E2013310AD Survey Type: Personnel

Processed Filename: 2013310_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/6/2013 Site:PACR Log Date: 2013310

Raw Data File: E2013310AE Survey Type: Time Cal

Processed Filename: 2013310_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331002AE.pos	E021331001AE.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

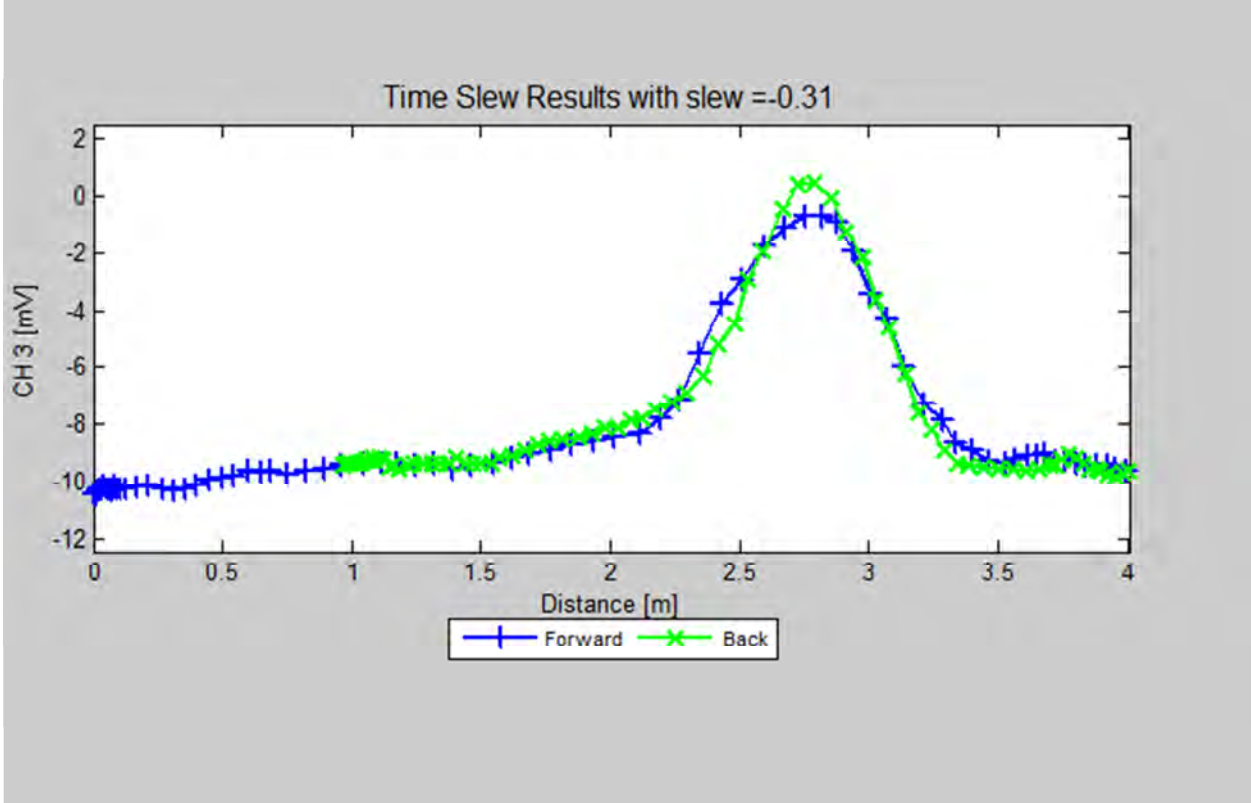
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/6/2013 Site:PACR Log Date: 2013310

Raw Data File: E2013310AE Survey Type: Time Cal

Processed Filename: 2013310_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/6/2013 Site:PACR Log Date: 2013310

Raw Data File: E2013310AF Survey Type: IVS/Noise

Processed Filename: 2013310_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331002AF.pos	E021331001AF.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

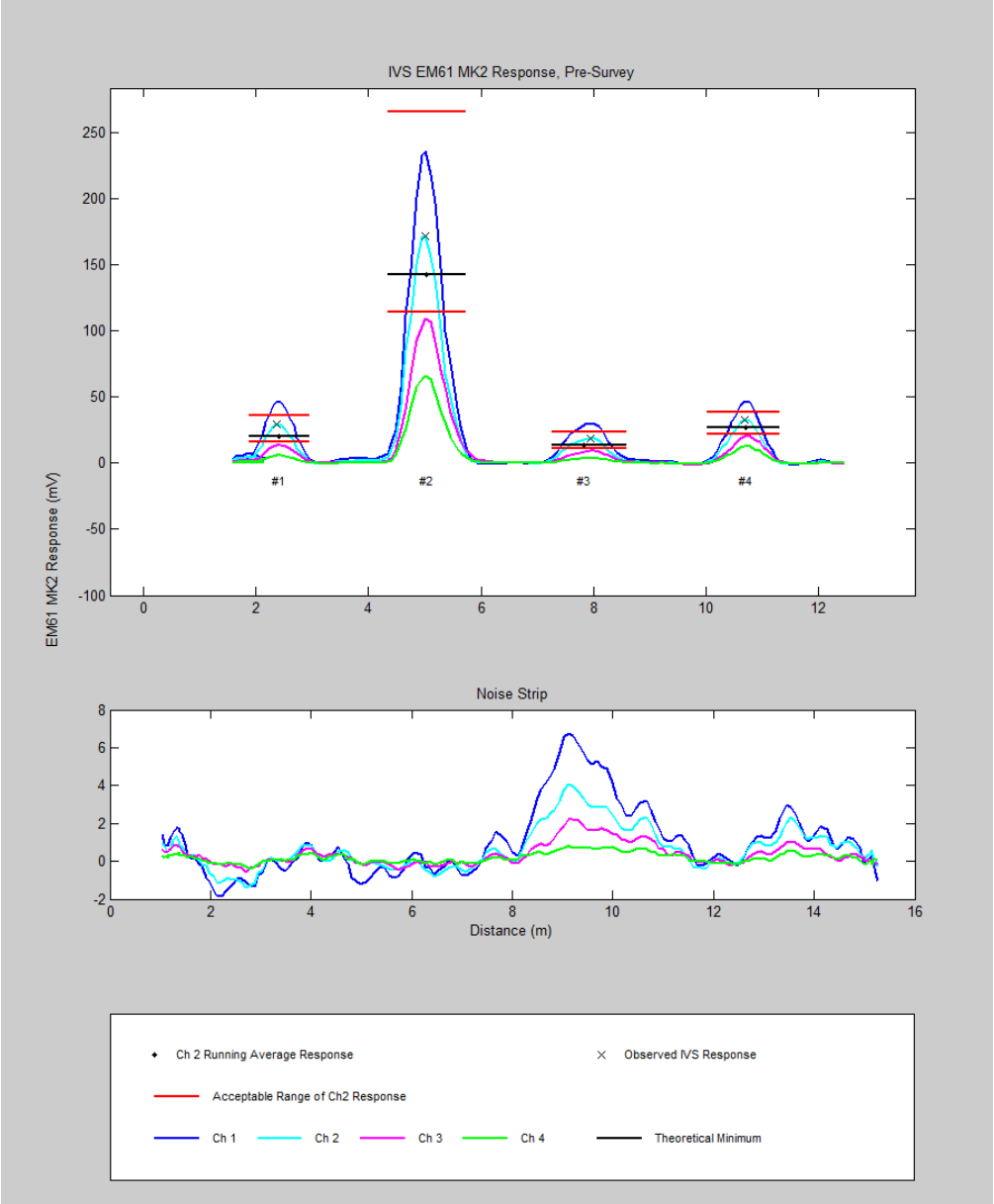
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/6/2013 Site:PACR Log Date: 2013310

Raw Data File: E2013310AF Survey Type: IVS/Noise

Processed Filename: 2013310_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/6/2013 Site:PACR Log Date: 2013310

Raw Data File: E2013310AG Survey Type: Survey

Processed Filename: 2013310_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251331003AG.pos	E021331001AG.sen	-0.31	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/6/2013 Site:PACR Log Date: 2013310

Raw Data File: E2013310AK Survey Type: Static/Spike

Processed Filename: 2013310_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331002AK.pos	E021331001AK.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

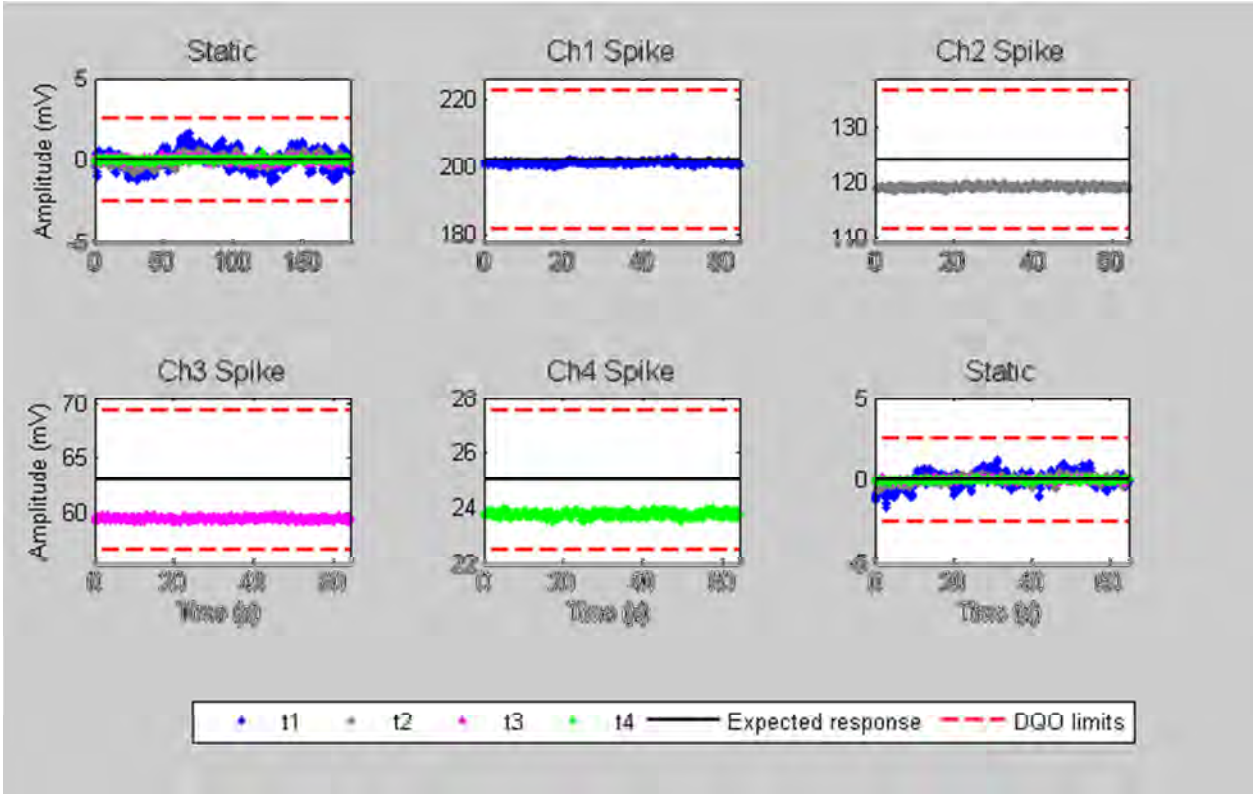
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/6/2013 Site:PACR Log Date: 2013310

Raw Data File: E2013310AK Survey Type: Static/Spike

Processed Filename: 2013310_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/6/2013 Site:PACR Log Date: 2013310

Raw Data File: E2013310AL Survey Type: IVS/Noise

Processed Filename: 2013310_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331002AL.pos	E021331001AL.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

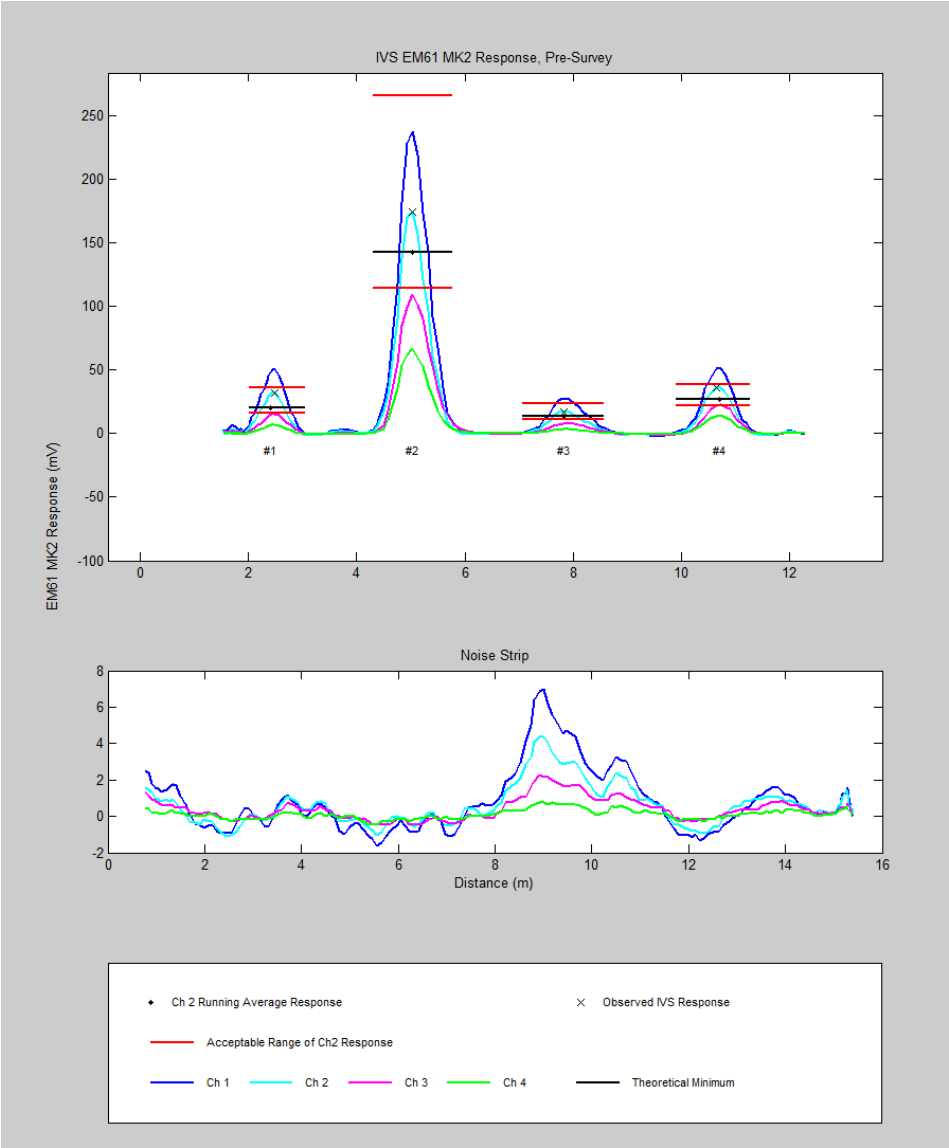
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/6/2013 Site:PACR Log Date: 2013310

Raw Data File: E2013310AL Survey Type: IVS/Noise

Processed Filename: 2013310_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AA Survey Type: Static/Spike

Processed Filename: 2013315_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331502AA.pos	E021331501AA.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

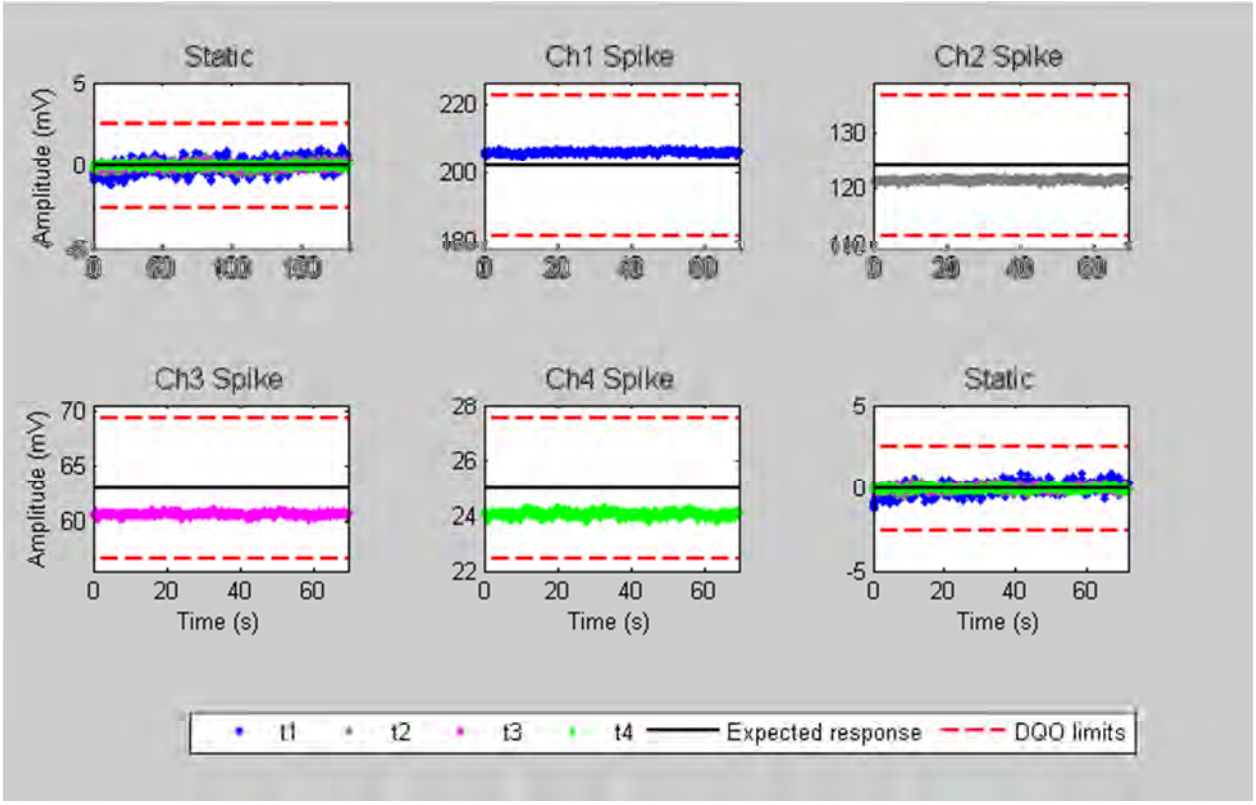
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AA Survey Type: Static/Spike

Processed Filename: 2013315_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AB Survey Type: Cable Shake

Processed Filename: 2013315_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331502AC.pos	E021331501AB.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

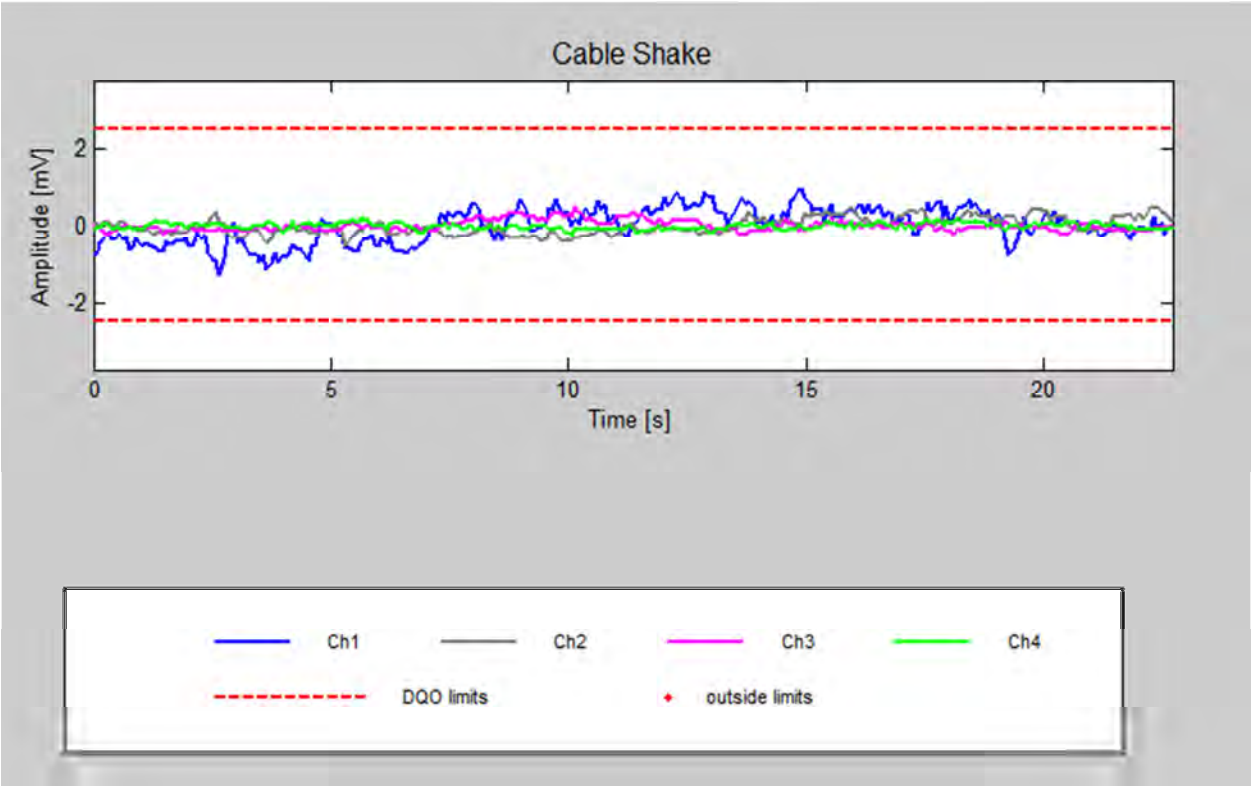
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AB Survey Type: Cable Shake

Processed Filename: 2013315_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AC Survey Type: Personnel

Processed Filename: 2013315_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331502AC.pos	E021331501AC.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

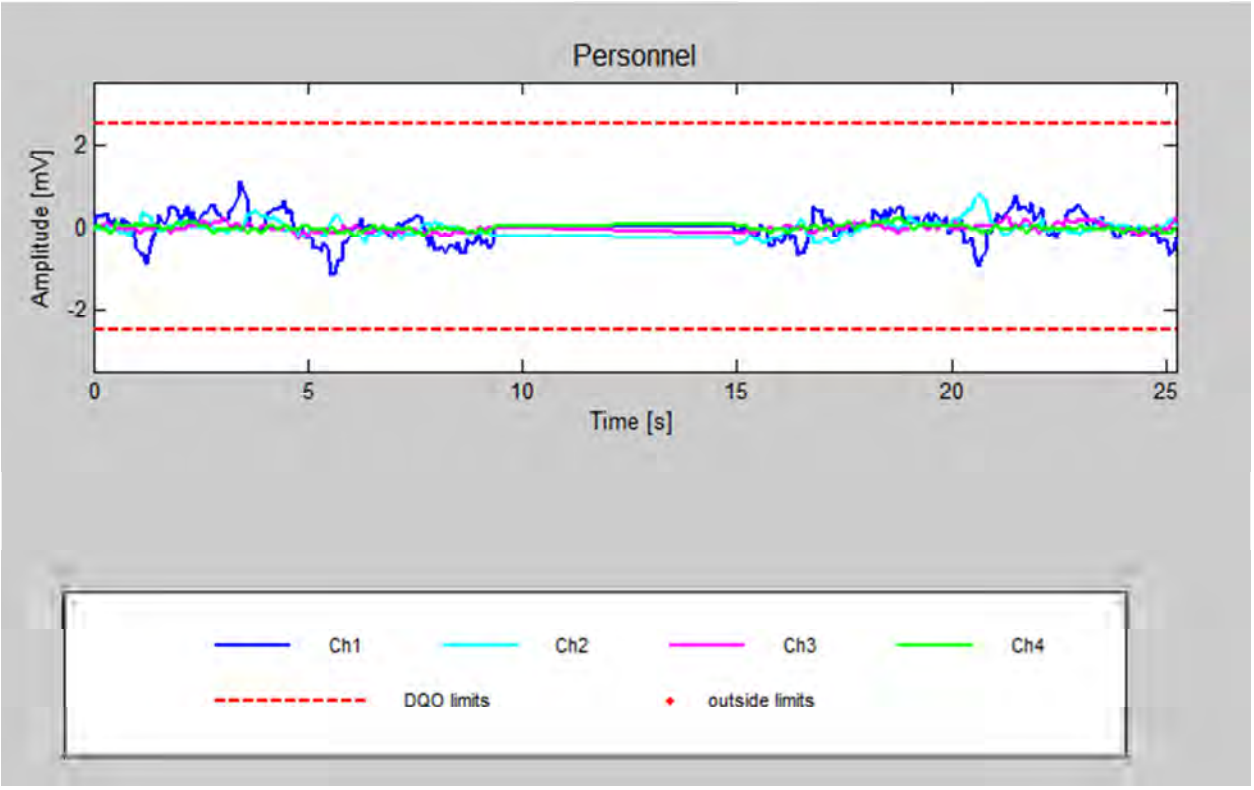
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AC Survey Type: Personnel

Processed Filename: 2013315_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AD Survey Type: Time Cal

Processed Filename: 2013315_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331502AD.pos	E021331501AD.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

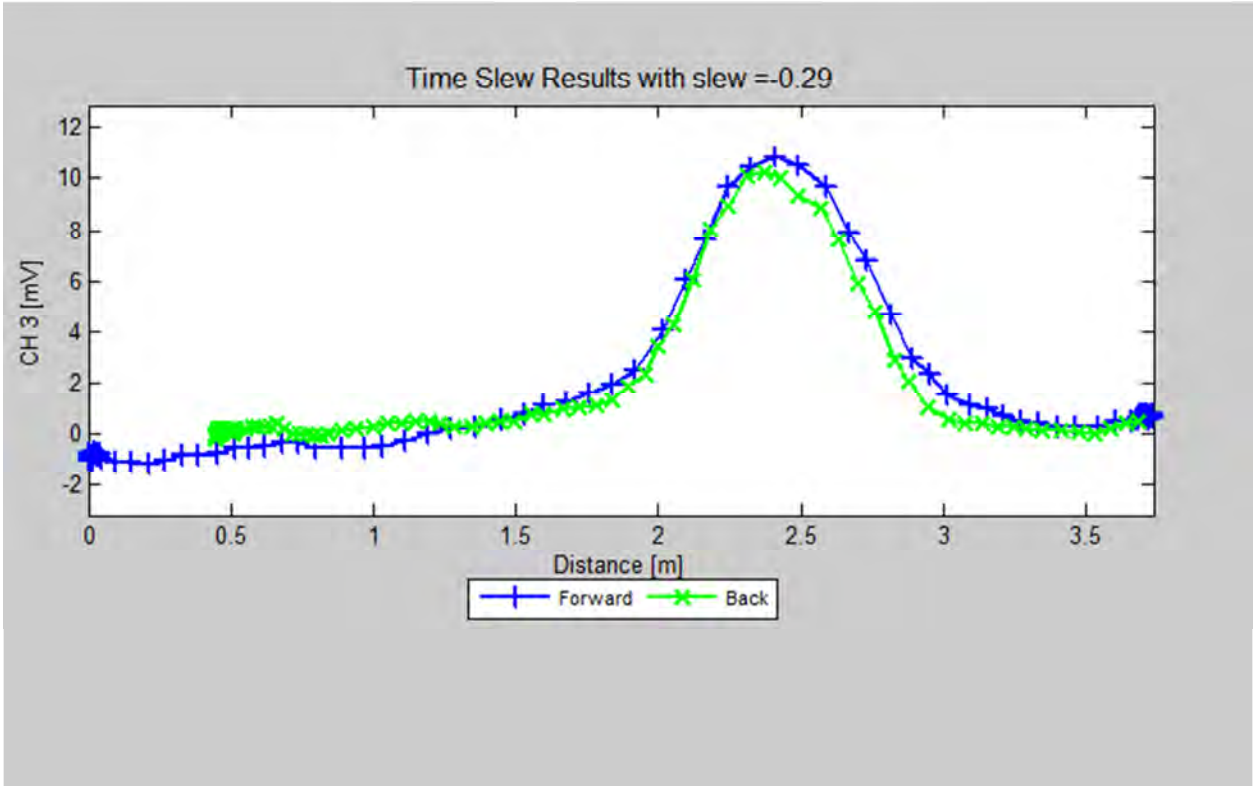
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AD Survey Type: Time Cal

Processed Filename: 2013315_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AE Survey Type: IVS/Noise

Processed Filename: 2013315_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331502AE.pos	E021331501AE.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

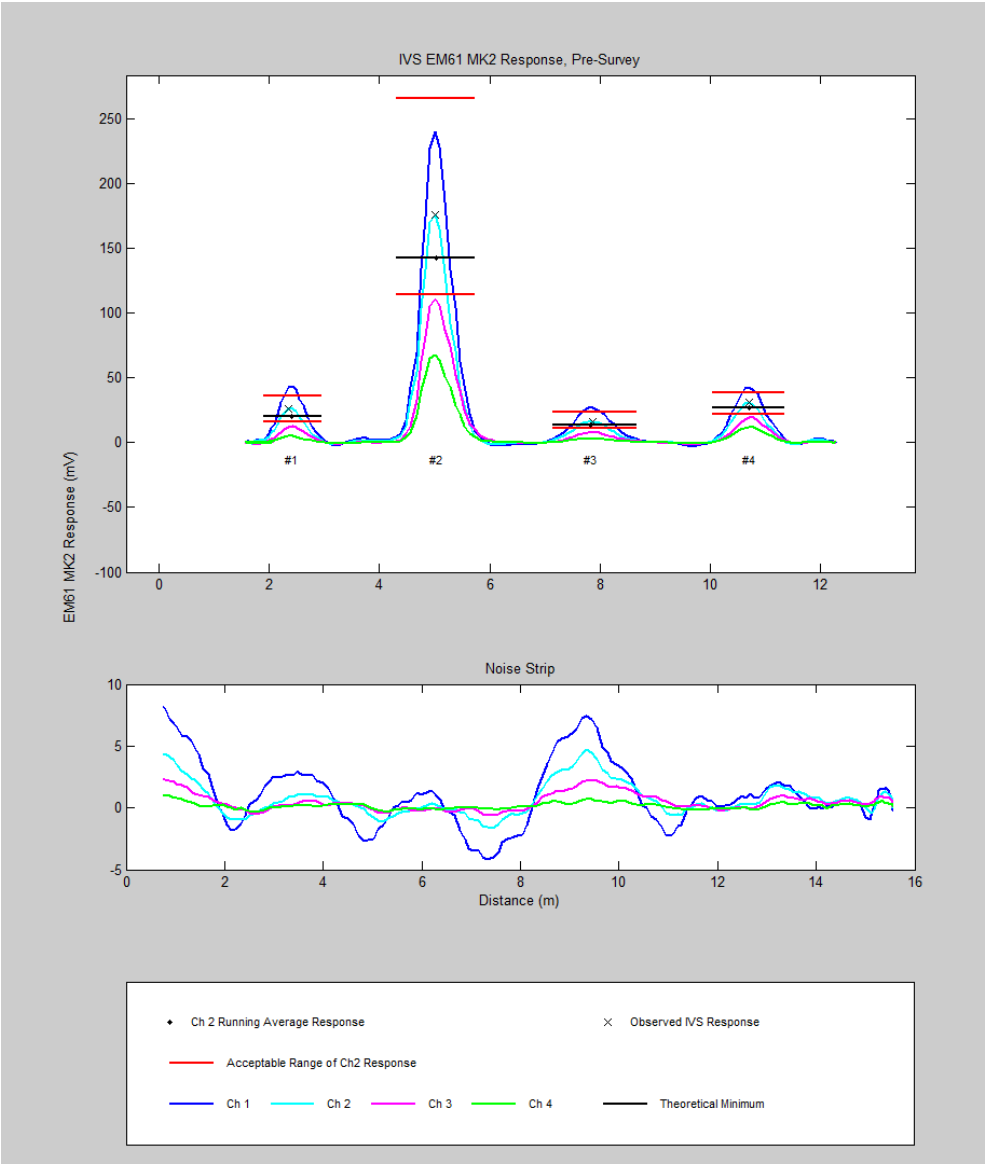
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AE Survey Type: IVS/Noise

Processed Filename: 2013315_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AF Survey Type: Survey

Processed Filename: 2013315_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330903AF.pos	E021330901AF.sen	-0.30	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AG Survey Type: Survey

Processed Filename: 2013315_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330903AG.pos	E021330901AG.sen	-0.30	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AH Survey Type: Survey

Processed Filename: 2013315_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330903AH.pos	E021330901AH.sen	-0.30	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AJ Survey Type: Static/Spike

Processed Filename: 2013315_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331502AJ.pos	E021331501AJ.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

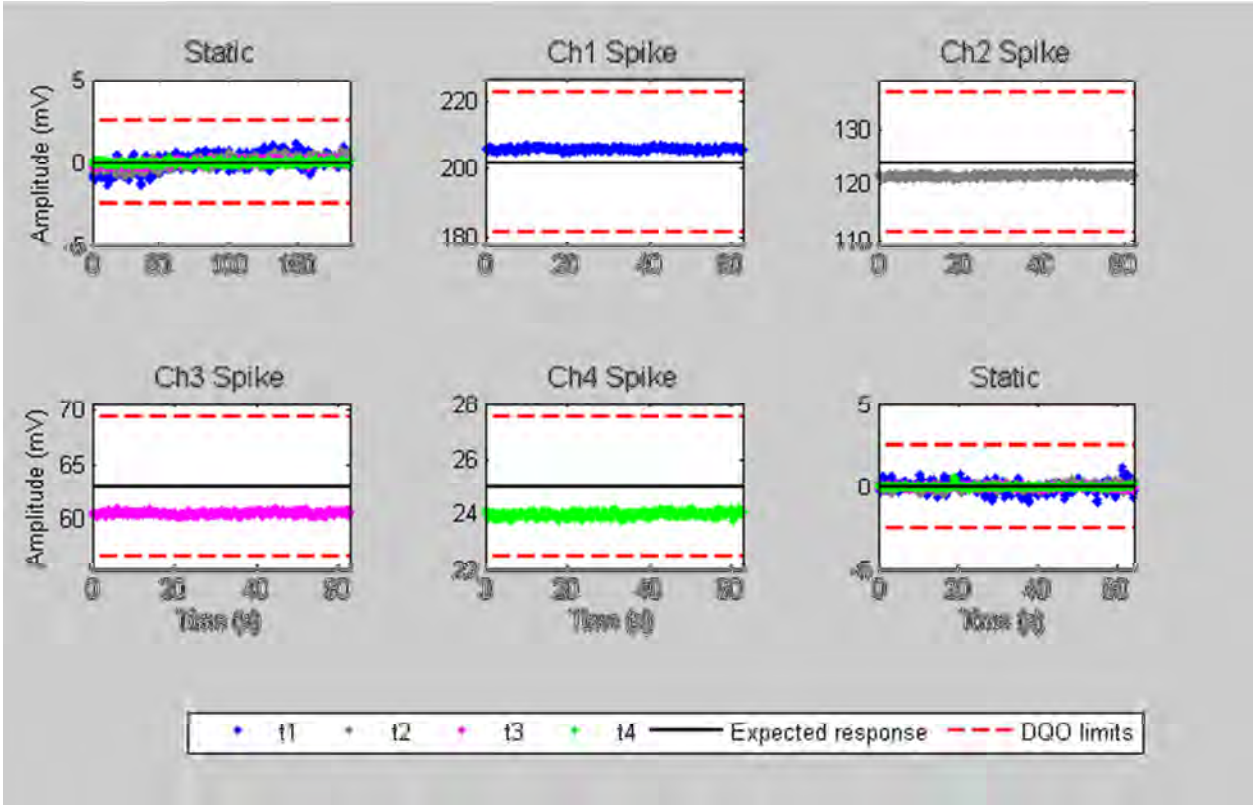
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AJ Survey Type: Static/Spike

Processed Filename: 2013315_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AK Survey Type: IVS/Noise

Processed Filename: 2013315_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331502AK.pos	E021331501AK.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

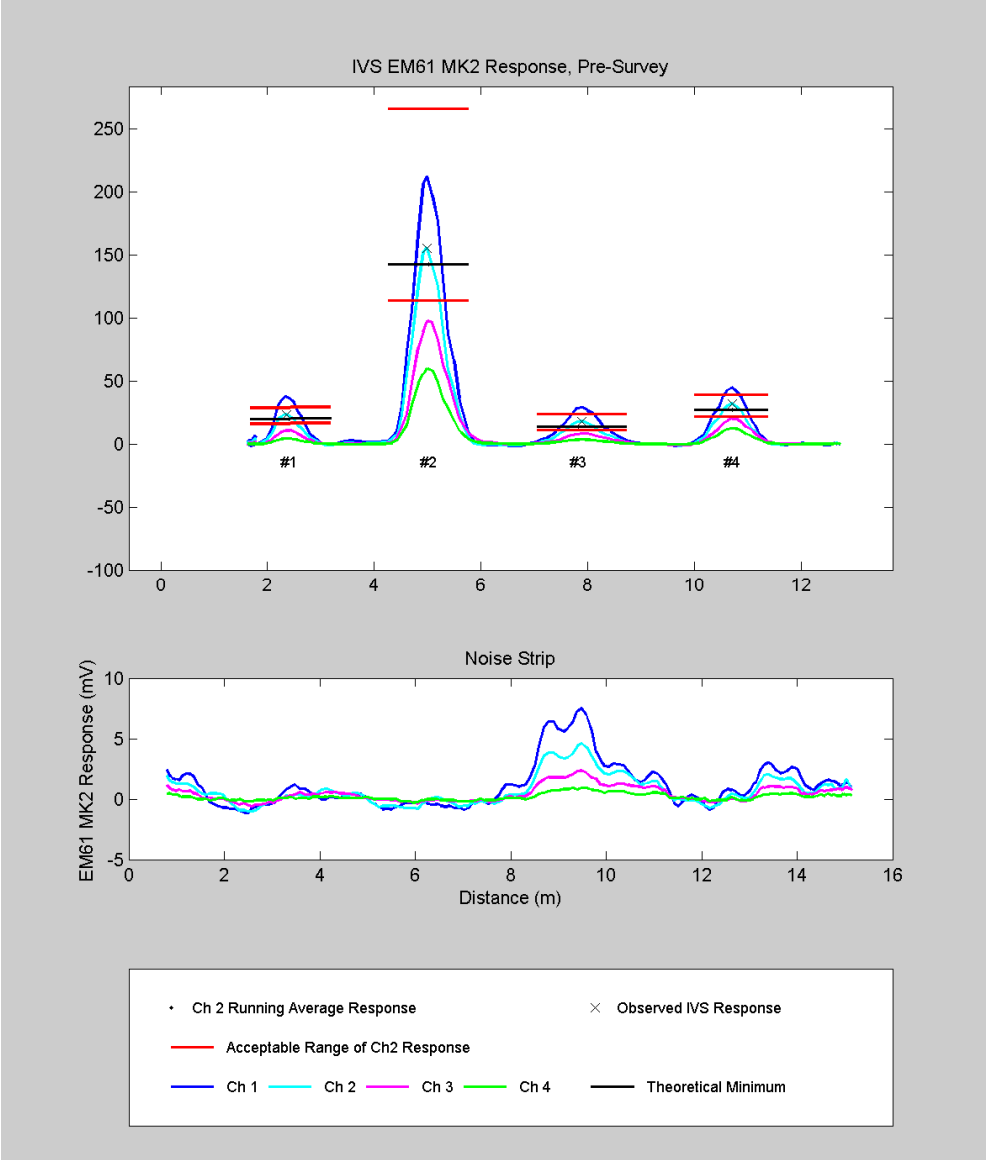
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/11/2013 Site: PACR Log Date: 2013315

Raw Data File: E2013315AK Survey Type: IVS/Noise

Processed Filename: 2013315_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AI Survey Type: Static/Spike

Processed Filename: 2013316_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331602AI.pos	E021331601AI.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Failed

Processing Comments: Channel one shows drift in pre-spike statc with most in tolerance except for a large spike. Spikes on each sensor are well within range and other tests prove consistent. Should not affect target picking.

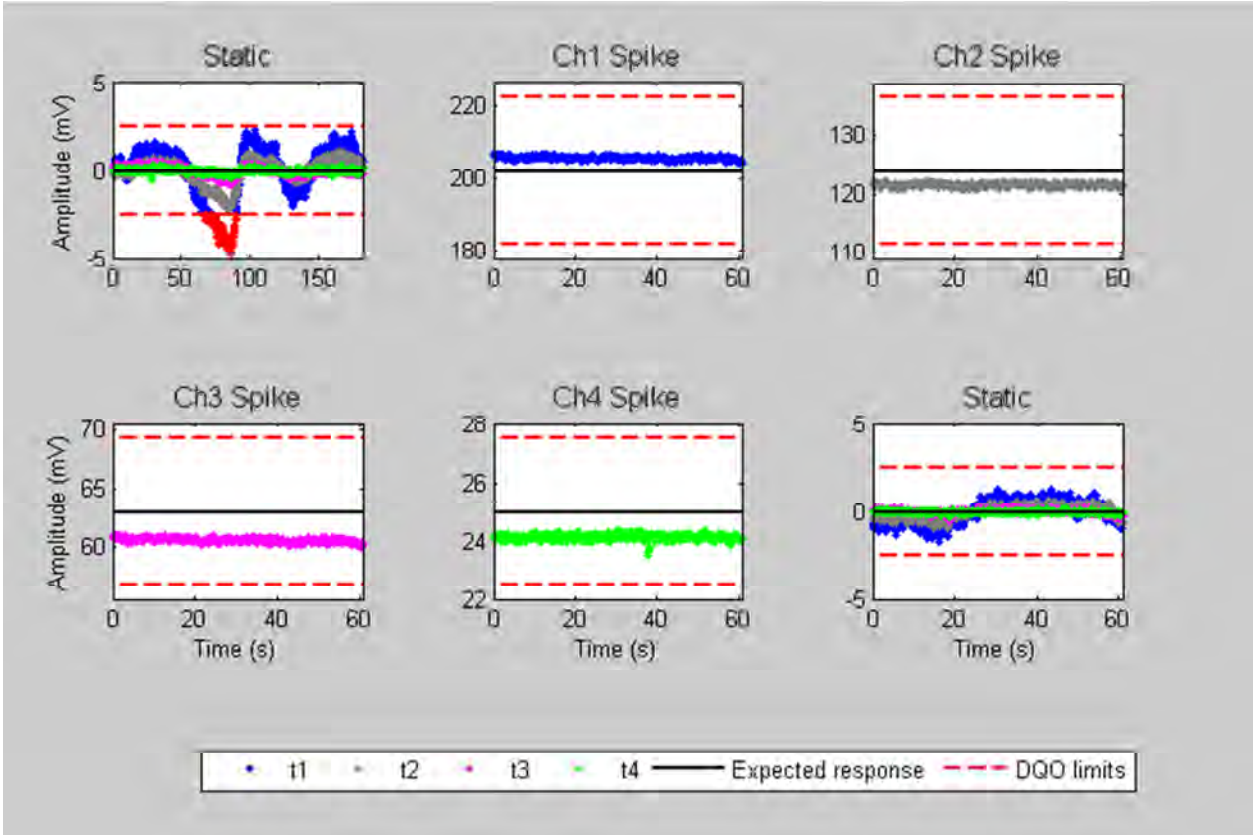
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AI Survey Type: Static/Spike

Processed Filename: 2013316_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AF Survey Type: Time Cal

Processed Filename: 2013316_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331602AF.pos	E021331601AF.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

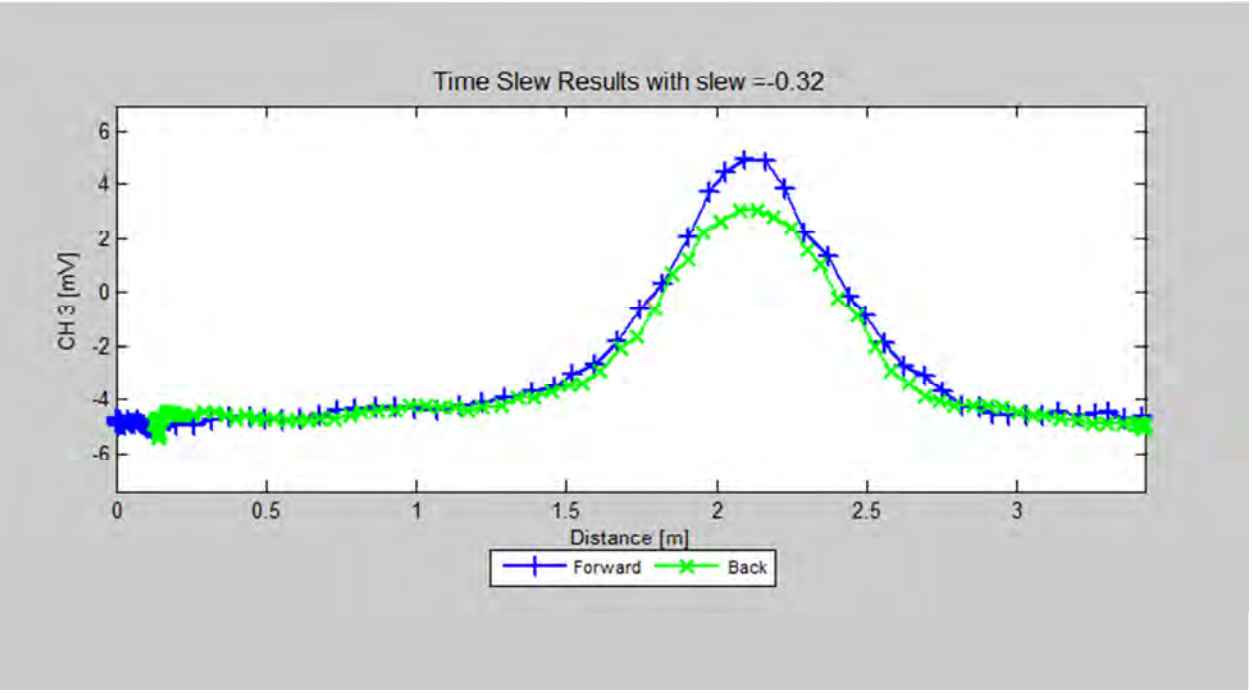
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AF Survey Type: Time Cal

Processed Filename: 2013316_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AG Survey Type: Cable Shake

Processed Filename: 2013316_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331602AG.pos	E021331601AG.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

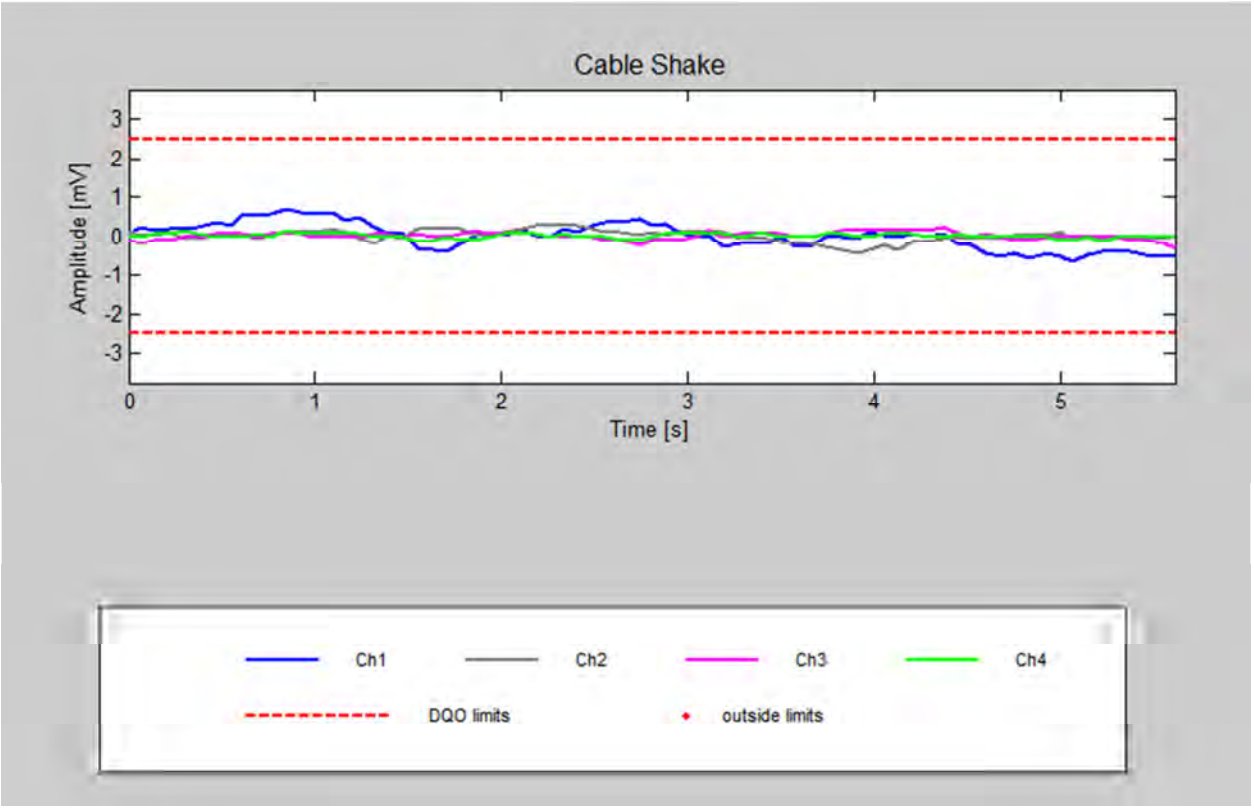
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AG Survey Type: Cable Shake

Processed Filename: 2013316_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AH Survey Type: Personnel

Processed Filename: 2013316_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331602AH.pos	E021331601AH.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

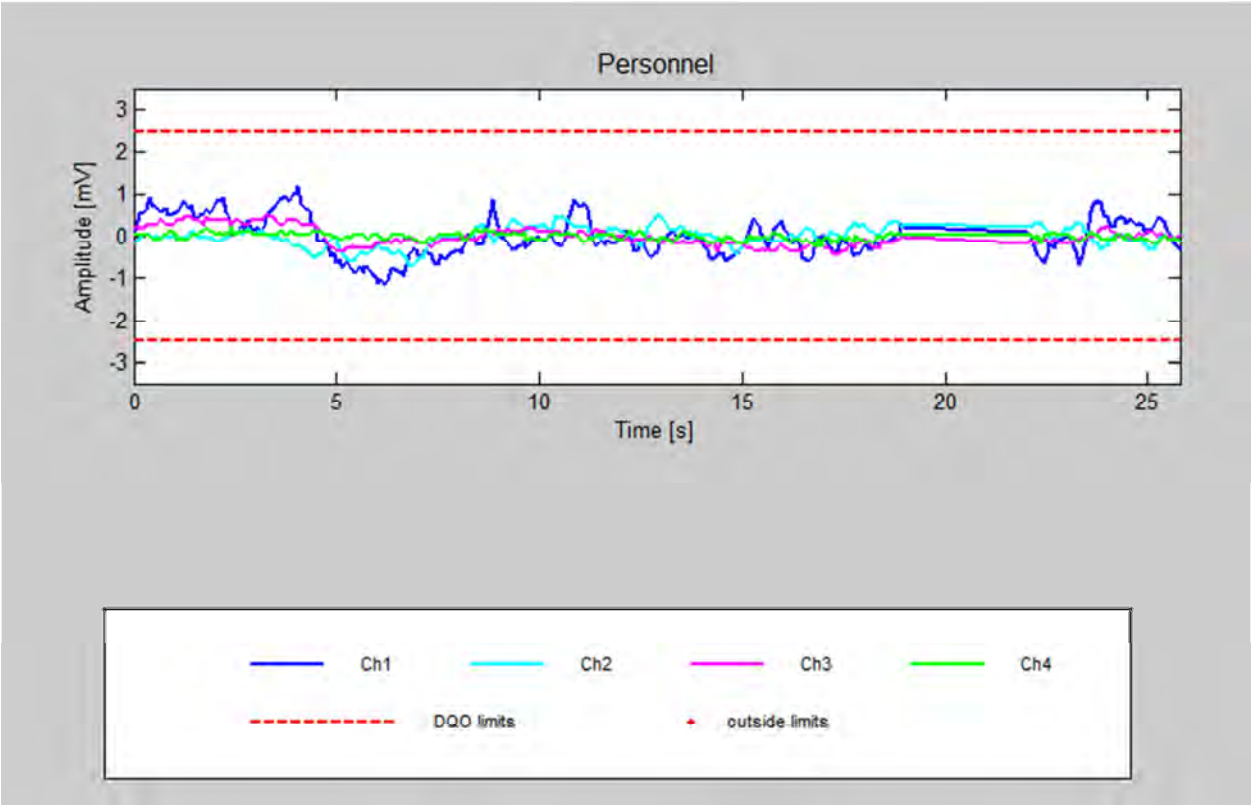
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AH Survey Type: Personnel

Processed Filename: 2013316_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AI Survey Type: IVS/Noise

Processed Filename: 2013316_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331602AI.pos	E021331601AI.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

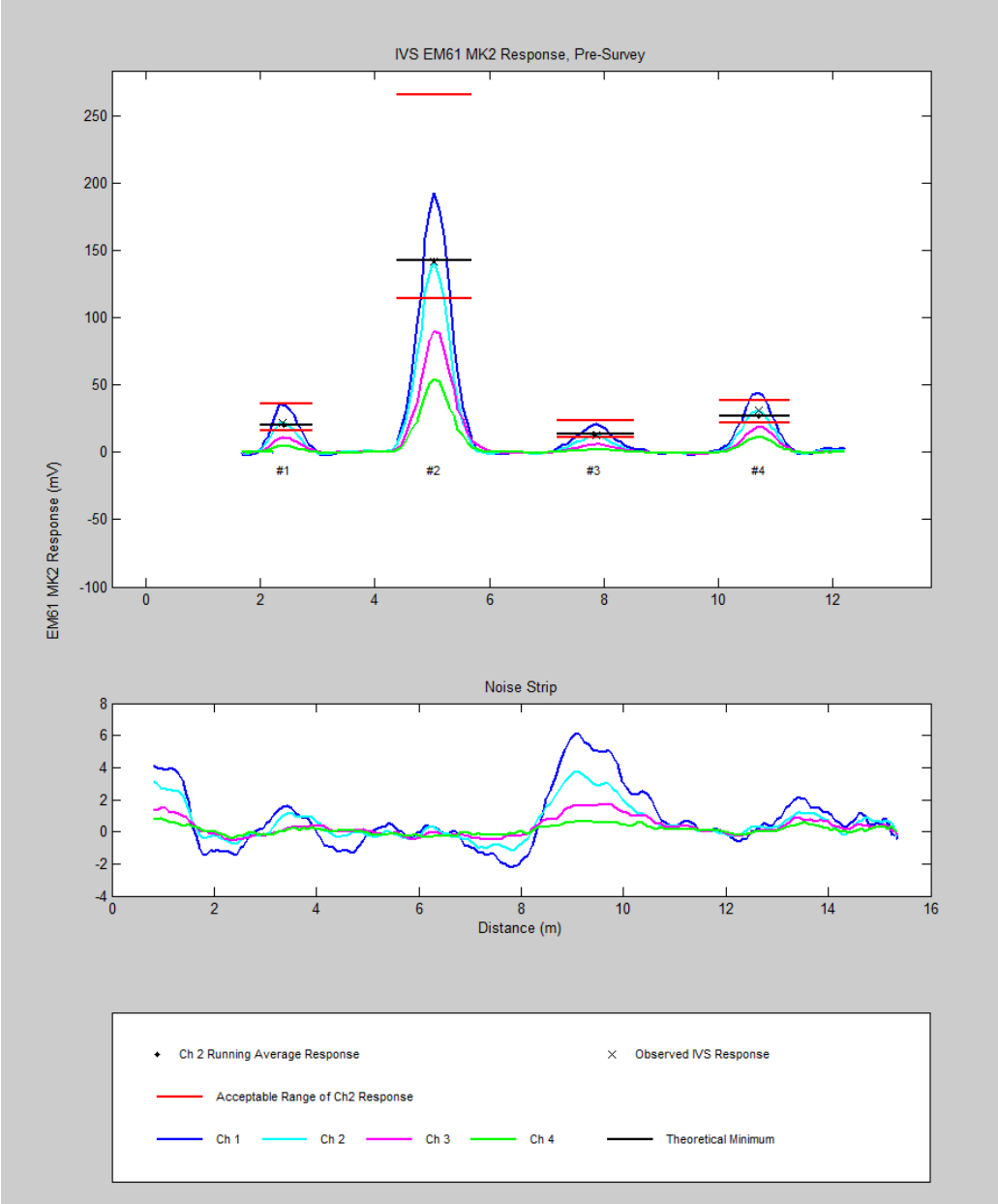
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AI Survey Type: IVS/Noise

Processed Filename: 2013316_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AJ Survey Type: Survey

Processed Filename: 2013316_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330903AJ.pos	E021330901AJ.sen	-0.32	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AL Survey Type: Survey

Processed Filename: 2013316_Litter1_Survey.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Time Slew	Forward Offset	Lateral Offset
1	P251330903AL.pos	E021330901AL.sen	-0.32	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments: Points removed for GPS fix and PDOP.

QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AN Survey Type: Static/Spike

Processed Filename: 2013316_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331602AN.pos	E021331601AN.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Failed

Processing Comments: Channel 1 shows drift in the pre-spike static. All of the spike tests are well within range for each channel. The remaining tests, such as IVS , are consistent. Survey data does not show any issues. Should not affect target picking.

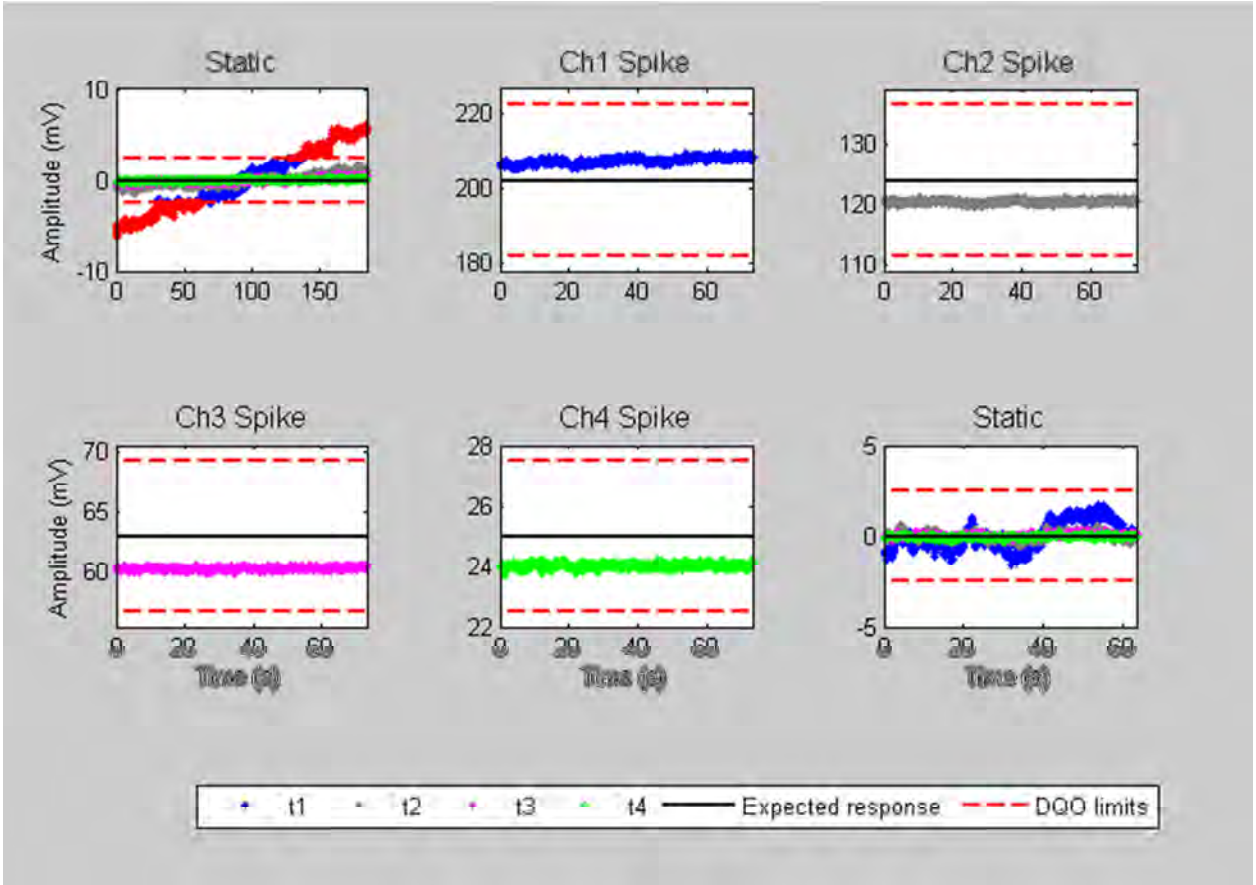
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AN Survey Type: Static/Spike

Processed Filename: 2013316_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AP Survey Type: IVS/Noise

Processed Filename: 2013316_Litter1_Stand.xyz

Merging Parameters

Sensor Position	Position File	Sensor File	Forward Offset	Lateral Offset
1	P251331602AP.pos	E021331601AP.sen	0	0

Processor Name: Stuart Bancroft Processing Status: Passed

Processing Comments:

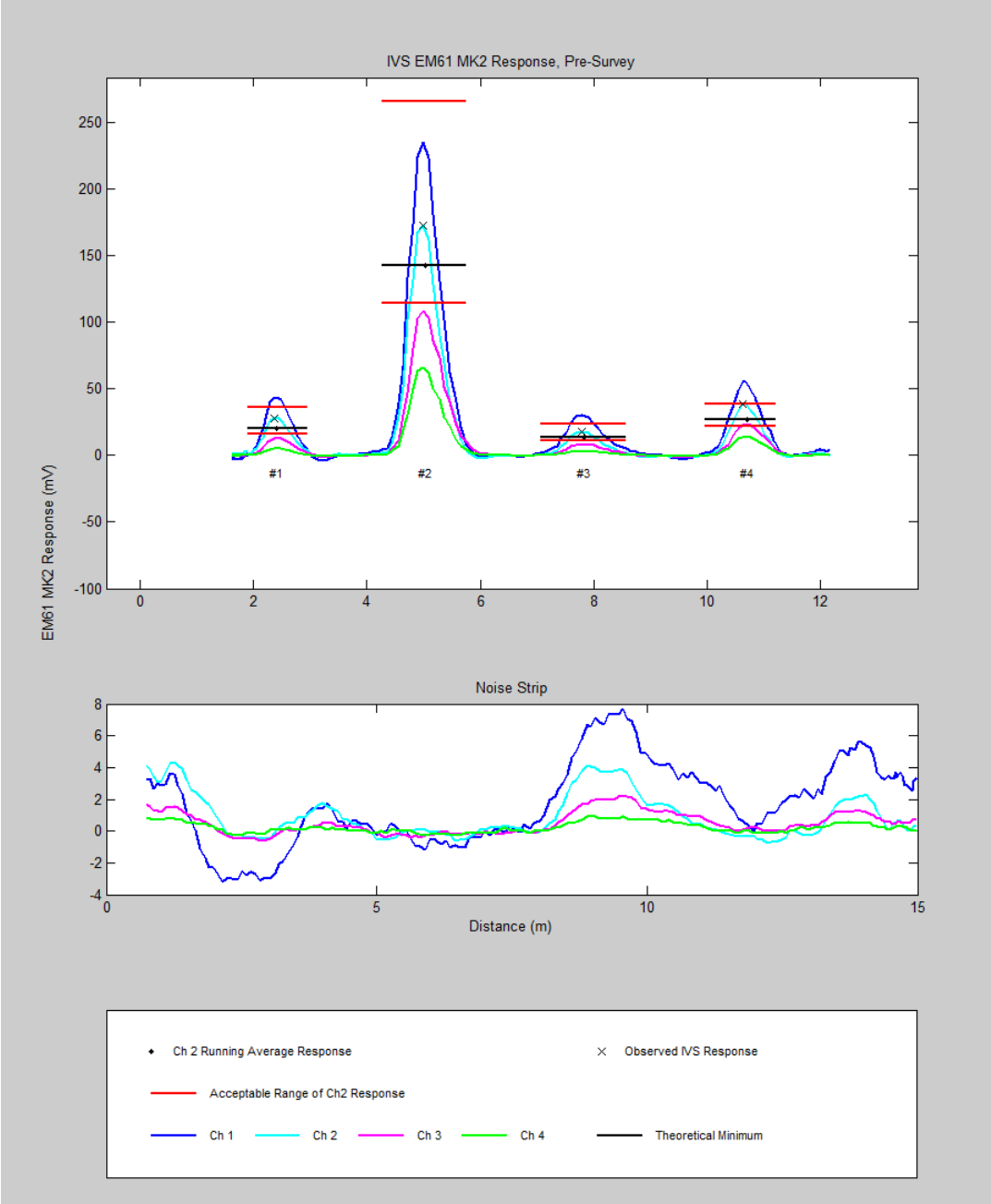
QC Name: Andrew Schrag

Daily Survey and Processing Summary

Survey Date: 11/12/2013 Site: PACR Log Date: 2013316

Raw Data File: E2013316AP Survey Type: IVS/Noise

Processed Filename: 2013316_Litter1_Stand.xyz



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APPENDIX

Instrument Verification Memorandum

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Port Angeles Combat Range, Washington

Formerly Used Defense Sites

Remedial Investigation

Instrument Verification Memorandum

November 2013

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1.0 Introduction

This document details the Instrument Verification Strip (IVS) activities executed by HDR Inc., supporting the Remedial Investigation at Port Angeles Combat Range. The methods and instrumentation tested at the IVS support Digital Geophysical Mapping (DGM) at the Port Angeles Combat Range, Technical Approach Area 2. The purpose of the data collected at the IVS was to verify the proper performance of equipment (sensors, positioning systems, and geophysical equipment).

2.0 IVS Equipment and Personnel

Staff from HDR installed and performed data collection surveys over the IVS located east of the Open Area within the Technical Approach Area 2 on Monday, October 21, 2013.

The geophysical sensor system consisted of a single EM61-MK2 coil attached to a fiberglass frame that allows two geophysical team members to hold the coil, suspended above the ground, while maintaining a distance away from the coil large enough to prevent personnel interference.

The coils height above the ground surface is 12 inches (30 cm). An RTK GPS antenna is positioned directly above the center of the coil. Both the GPS antenna and the EM61-MK2 coil are powered by portable batteries located inside of the GPS antenna and backpack worn by the geophysical team member supporting the rear end of the litter. This backpack also contains the EM61 control box. The AVS Team member supporting the front end of the litter platform wears a harness with a laptop computer attached and is responsible for navigating to the survey lines and controlling the DAS. The AVS Team members also wear a waist strap with loops that attach to the litter platform handles to help maintain a fixed coil height and to allow occasional hands free operation when the front end team member is operating the computer.

The field team consists of Geophysical Lead Jon Jacobson and geophysical technician Robert Nelson. UXO technicians Byron Cook and Rick St Amand escorted the field team for anomaly avoidance.

3.0 IVS Objectives

The objective of the IVS is to validate proper functioning of the em61 litter system for the Technical Approach Area 2 in the PACR MRS.

4.0 IVS Layout

The IVS was installed east of the Open Area in a location free of tree canopy (**Figure 1**). Prior to the installation, the field team, escorted by two qualified UXO technicians, performed visual reconnaissance of the potential IVS area. Scrap surface metal was removed. Several areas were investigated with the UXO technicians and small non-MEC scrap metal such as nails and bits of wire were often found.

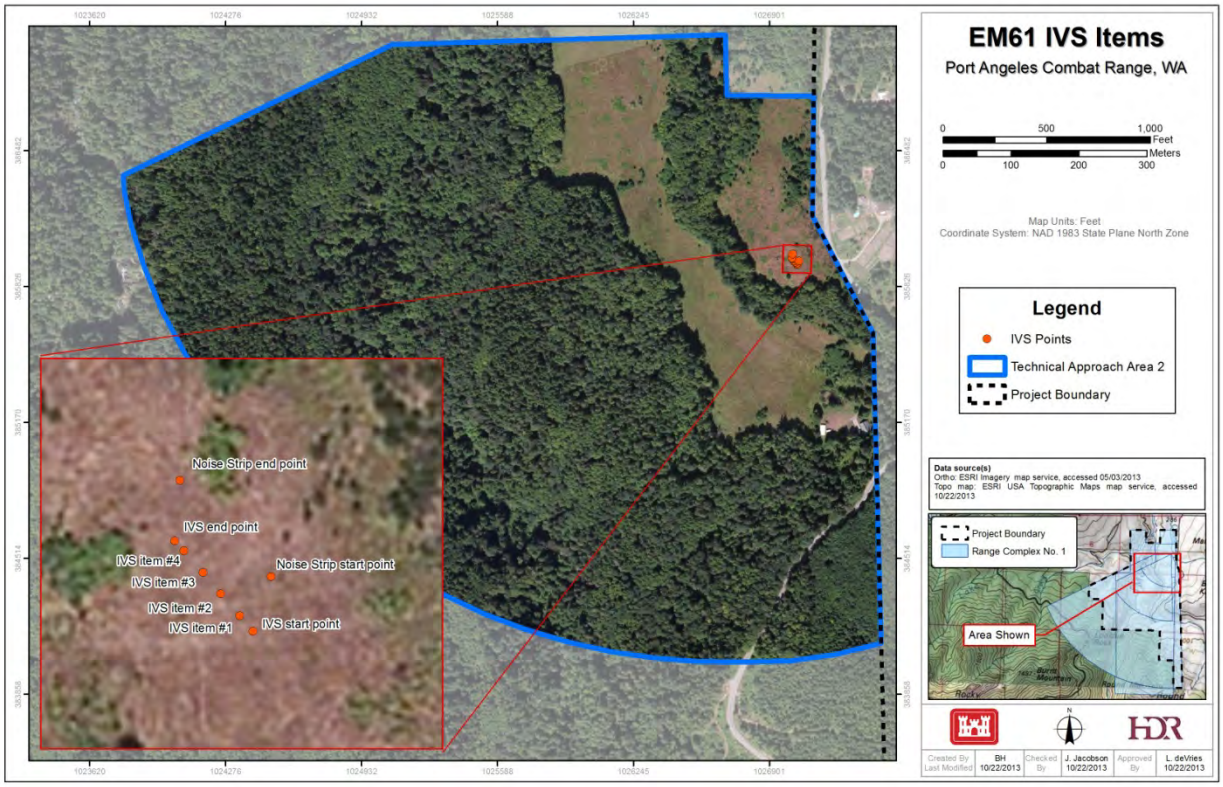
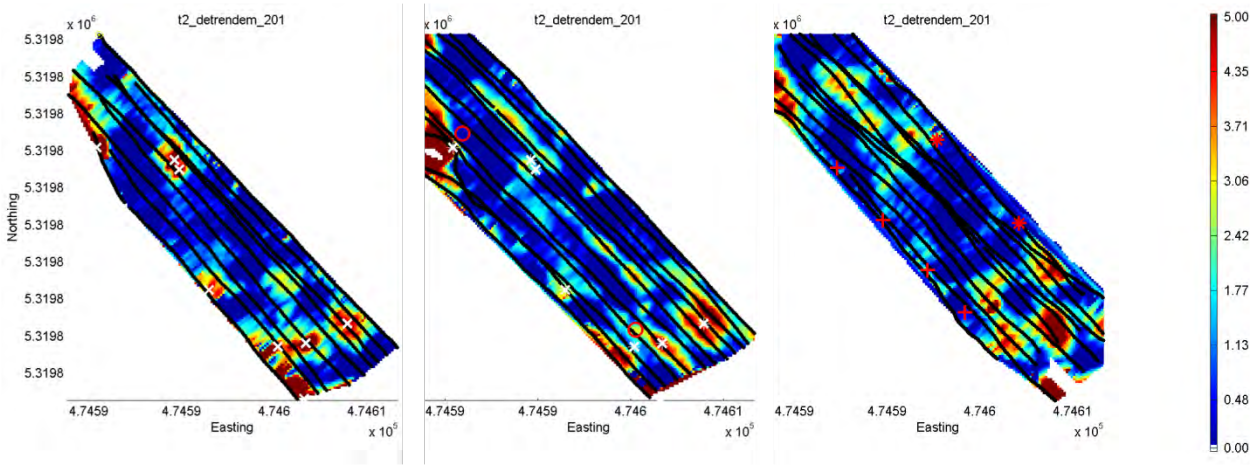


Figure 1 Location of IVS within Technical Approach Area 2

Following the visual reconnaissance, a full coverage survey was performed with the litter to locate a geophysical clean area. Prior and post survey calibration tests were performed. From the full coverage data (**Figure 2a**) anomalies were picked for investigation by the UXO technicians. Scrap metal was found and removed at anomaly locations and a second full coverage survey was performed over the same area (**Figure 2b**) to verify anomalies were removed. A lane was identified from the second survey large enough for the IVS and adjacent additional anomalies were identified and then investigated by the UXO technicians. After scrap metal was located at the anomaly locations and removed, a third full coverage survey was conducted and an area was identified where noise had been sufficiently reduced for IVS installation. The third full coverage survey (**Figure 2c**) covered the same area as the previous surveys, but extended further NE to allow for more options in placing the noise strip with adequate separation distance from the IVS lane.

Within the IVS area, HDR selected locations for seed items within a lane 1.5m wide by 12.5m, allowing sufficient space for the EM61 to return to noise level between items. Another lane was identified as suitable for the IVS noise strip. These locations were reacquired using RTK-GPS.



(a) Initial Full Coverage Survey

(b) After removal of scrap metal. IVS endpoints identified (red circle)

(c) A third full coverage survey to identify a noise strip (red asterisks). Red '+' are IVS item locations

Figure 2 Full Coverage Survey to Determine IVS Location. Anomalies identified from the initial full coverage survey (white X's) were investigated. A team of UXO technicians removed scrap metal at anomaly locations.

Seeds used for the IVS were 37mm projectiles. The IVS was constructed with item spacing of three meters to ensure the sensor response will return to background between item responses. Positions of the items were staked out using RTK GPS. Two seed items were placed at 6-inch depth and two were placed at 12-inch depth. For each depth, items were positioned one horizontally in an across track orientation and one vertical. Depths were measured to the center of mass for each 37mm. Before the seeds were buried, RTK-GPS measurements were made (**Table 1**) and photos were taken for each IVS item (**Photos 1 and 2**).

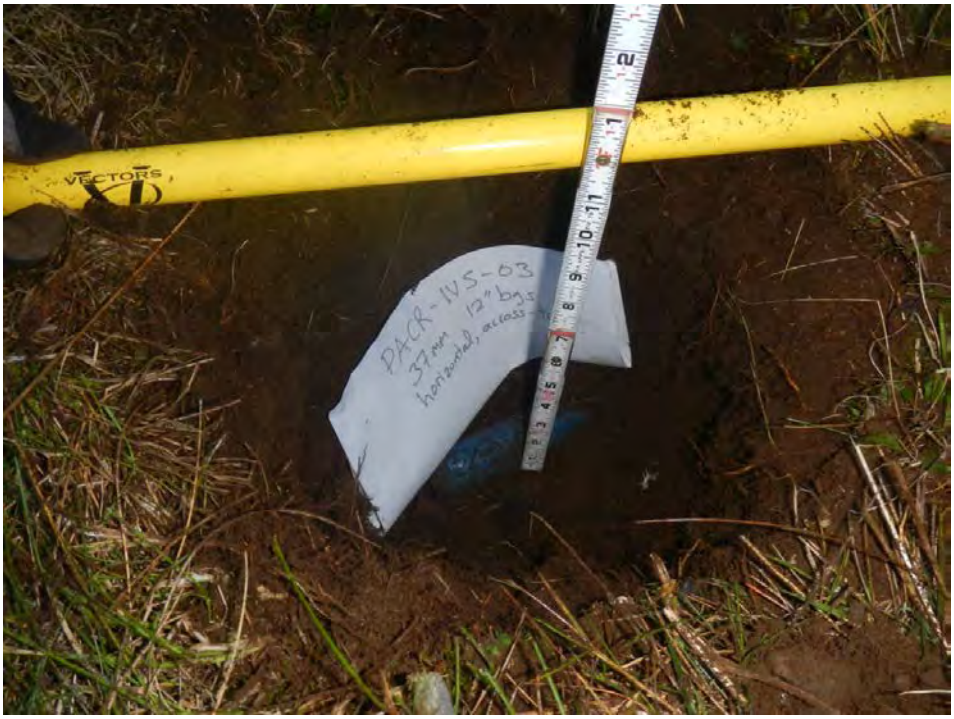
Table 1 Location of IVS seed items

IVS Item Number	Easting (m)	Northing (m)	Depth (inches)	Orientation
1	474599.19	5319761.22	6	Horizontal, Across-Track
2	474597.22	5319763.5	6	Vertical
3	474595.39	5319765.7	12	Horizontal, Across-Track
4	474593.38	5319767.95	12	Vertical

Photo 1 **IVS Item 2 oriented vertically at 6 inch depth**



Photo 2 **IVS Item 3 oriented horizontally at 12 inch depth**



5.0 IVS Data Collection

Data from the EM61 metal detectors were collected using the litter system as described in **Section 2.0**. Multiple passes in alternating directions of collection were conducted on October 21, 2013.

The litter was assembled onsite and equipment was sufficiently warmed up to minimize sensor drift. Standardization tests were performed prior to and after data collection. Both DGM systems passed the standardization tests per DQOs. Standardization test results are presented in Attachment A. After post-survey standardization tests were completed with one litter system, a second system was assembled and allowed to warm up for 15 minutes prior to standardization tests and data collection over the IVS. After data collection, the data were digitally delivered to the data processor for processing and data quality checks.

6.0 Data Analysis

The electromagnetic datasets were analyzed with the objective of verifying proper instrument response. The data sets were analyzed in UXOLab as well as Geosoft's Oasis Montaj, using the same data processing procedures outlined in Chapter 3, Section 3.4.8 Data Processing, of the PACR work plan. **Table 2** presents the summary of data collected for each of the four seed items at the PACR IVS.

Table 2 Channel 2 responses of the Litter EM61

	Line	IVS Item 1	IVS Item 2	IVS Item 3	IVS Item 4
Litter 1	1	18.88	140.63	14.4	31.26
	2	27.37	232.69	17.49	32.14
	3	22.16	136.17	15.85	29.23
	4	26.71	223.44	16.14	30.33
	5	21.6	157.03	15.74	28.23
	6	30.12	202.52	19.3	32.7
	7	22.25	178.61	15.34	31.75
	8	25.34	209.14	19.75	30.93
	9	21.86	169.15	15.56	32.05
	10	27.28	234.16	21.21	32.32
	11	21.08	132.83	12.84	24.6
	12	31.36	186.62	19.39	28.47
	13	23.19	153.29	13.43	26.22
	14	32.03	192.69	16.18	26.36
	15	21.6	155.59	14.09	29.68
	16	30.38	216.33	19.94	33.93
	17	19.94	146.93	15.89	28.36
	18	28.77	217.77	21.91	33.47
Litter 2	1	25.92	168.59	16.34	29.31
	2	26.32	218.66	22.47	32.99
	3	24.47	138.87	14.74	27.93
	4	26.53	224.87	20	29.34
	5	27.21	190.03	14.85	29.31
	6	32.9	261.32	19.18	34.99
	7	25.08	178.91	16.86	29.27
	8	26.49	210.31	20.17	31.18
	9	23.93	180.53	15.73	30.8
	10	26.81	226.32	21.71	33.9
	11	23.08	171.47	15.22	29.82
	12	26.65	203.99	20.82	34.75
	13	27.61	151.59	17.69	29.53
	14	34.14	235.37	22.51	35.58
	15	24.91	167.36	16.88	29.44
	16	34.34	250.01	21.8	32.8
	17	27.38	158.34	15.7	31.36
	18	25.34	200.18	20.23	28.35
Litter 1 Average		25.10667	182.5328	16.91389	30.11278
Litter 2 Average		27.17278	196.4844	18.49444	31.14722
Average		26.13972	189.5086	17.70417	30.63
Standard Deviation		3.875119	35.03604	2.821199	2.562357
Litter 1 Minimum		18.88	132.83	12.84	24.6
Litter 2 Minimum		23.08	138.87	14.74	27.93
Litter 1 Maximum		32.03	234.16	21.91	33.93
Litter 2 Maximum		34.34	261.32	22.51	35.58

The data in **Table 2** shows consistent responses from both systems, within 10%, but indicates a difference in values depending on direction of travel. Even line numbers represent data collected in a northwest direction of travel and odd line numbers a southeast direction of travel. When divided into direction of travel, the responses become more consistent:

Table 3 Litter 1 Channel 2 EM61 Responses over IVS Item 1

	NW direction responses (mV)	SE direction responses (mV)
1st pass	18.88	27.37
2nd pass	22.16	26.71
3rd pass	21.6	30.12
4th pass	22.25	25.34
5th pass	21.86	27.28
6th pass	21.08	31.36
7th pass	23.19	32.03
8th pass	21.6	30.38
9th pass	19.94	28.77
Average	21.39556	28.81778
Standard Deviation	1.293253	2.28906
Minimum	18.88	25.34
Maximum	23.19	32.03

Motion of the backpack can add noise to sensor readings from unsecured electronic components. The sensor battery used is a Li-ion, smaller and lighter than Geonics manufacturer's battery, and was securely fastened to the backpack. As well, survey over the IVS was performed at walking speed at a steady pace that was consistent in both directions.

If the sensor is not kept in a level orientation, readings will deviate from expected responses and can result in directional bias. This can happen when surveying over steep or difficult terrain. As the terrain over the IVS was smooth and clear of obstacles, difficult terrain was not a factor and, aside from variations in height due to bounce from walking, the sensor was kept in a level orientation.

Given the litter's variable response due to handling variability inherent in man-portable platforms, such as height above ground fluctuations due to bounce, tilt of sensor and side-to-side sensor position relative to the target, the range of expected values will vary greater than more stable platforms such as a towed array. The accepted variation for these more stable platforms is +/-25%. The litter will produce a wider variability. **Figure 3** displays the slope-corrected plot of sensor elevation for line one of litter one, with the vertical axis exaggerated. Position is recorded using Glonass-compatible RTK GPS. While GPS vertical position is not as accurate as horizontal, the relative position can be used to show the variation in sensor height above ground due to bounce while walking. The response of the sensor to IVS item one during this pass was low even for the north-heading line direction. The coil is approximately 7 cm

higher than the lowest height above ground, resulting in a lower than predicted response. The coil is functioning correctly, however variability in sensor height above ground results in a wider range of expected responses. We estimate a +/- 5 cm variation in height during dynamic survey.

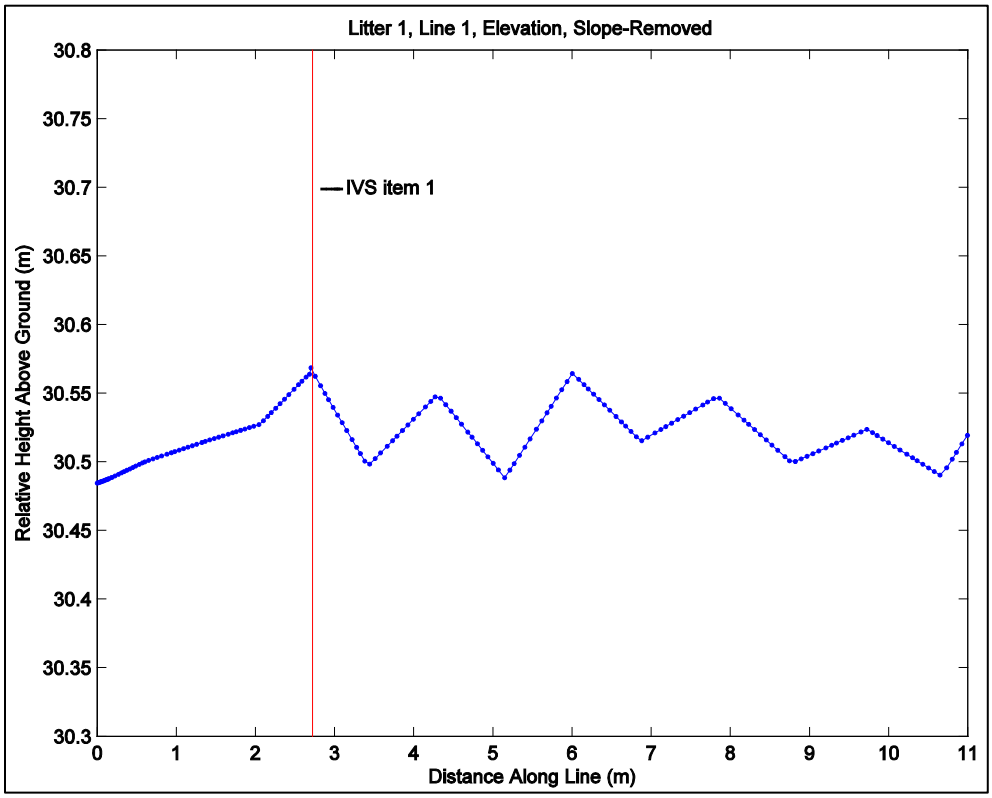


Figure 3 Fluctuations in sensor height during survey

Errors in the IVS item depth measurements could also contribute to deviations from the expected responses. Achieving accuracy of depth measurements is difficult due to a variety of factors, including estimation of location of center of mass, repositioning of the item due to resettling within the soil, and frost heaving of the item after burial. We have estimated that these factors contribute an error of +/- 5 cm in item depth measurements.

Small variations in depth yield a large variation in mV response. For example, a depth difference of 4cm shallower from our measured depth would result in an expected response of 223.5mV.

Daily QC checks will involve verifying that IVS item measurements are falling within PACR proposed limits. As well, daily quality tests, as outlined in Table 3-6 of the PACR Work Plan, will be used to verify system functionality and repeatability.

Figure 4 displays the IVS strip item mean peak responses and the NRL response curves for items in the most and least favorable orientation.

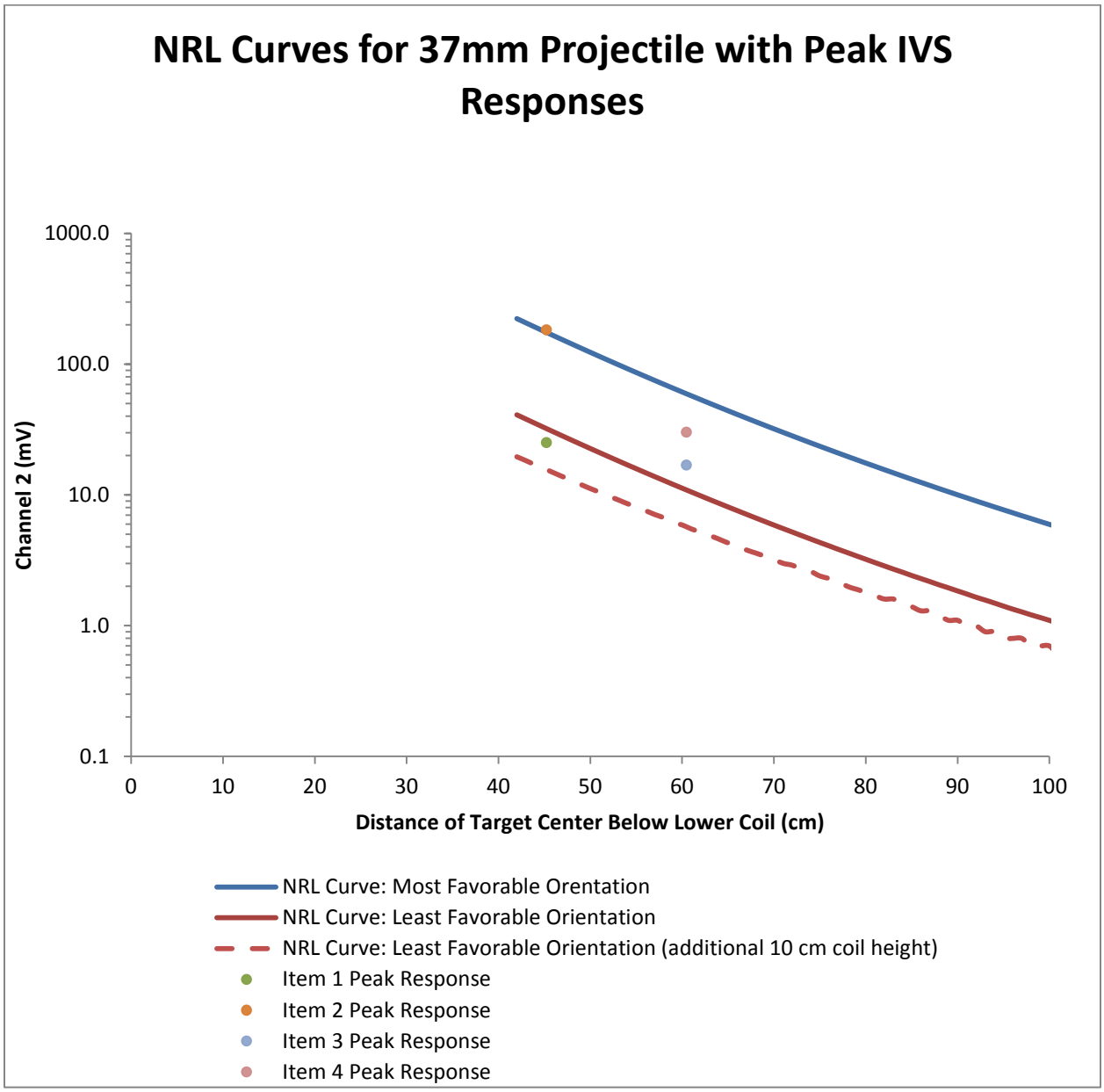


Figure 4 NRL Curves and IVS Responses

Table 4 presents the combined responses obtained by litter 1 and litter 2. HDR proposes using the predicted response presented here for each IVS item as the Data Quality Objective for the twice-daily IVS test for DGM at PACR. Response limits were based on the NRL predicted responses for a 37mm at each respective depth and on anticipated variation in distance from the coil inherent in litter motion as well as accuracy limits of measuring depth to COM of IVS items. Responses from the north line direction transects were used for comparison given that we will be collecting IVS data twice daily in this direction

Table 4 Combined Litter Observed and Expected Responses For PACR IVS Lane (ch2)

IVS number	Observed Mean	Observed Min	Observed Max	Predicted Response	PACR proposed low limit	PACR proposed high limit
1	23.45	18.88	27.61	30.4	14.8	44.4
2	159.77	132.83	190.03	165.5	114.9	241.2
3	15.40	12.84	17.69	10.5	7.6	21.1
4	29.34	24.6	32.05	57.4	22.2	57.4

Because the expected ordnance items and item depths are unknown, anomalies above noise level will be selected as items of interest. The noise level is determined by computing the mean and standard deviation for the data, and applying the following formula: Noise threshold = mean + 3 × standard deviation.

The background values used for threshold determination in production will be based on transect background levels. The threshold determined from background levels over planned transects was determined to be 12mV sum-channel response, based on the sum of all 4 channels. Noise levels will be reassessed for each transect and thresholds changed if there are changes in noise levels, pending concurrence with USACE.

With a 12mV threshold, the maximum depth of detection for a 37mm in its least favorable orientation is approximately 29cm (11.4 inches) below ground surface (**Figure 5**).

The 37mms were accurately mapped by each litter system, within the 30-centimeter allowable offset, and results are presented in **Figure 6**.

Background data obtained from the noise strip (**Figure 7**), surveyed in conjunction with the IVS, are at levels slightly higher than typical noise ranges at benign sites (ESTCP, 2009). Possible contributions for the slightly higher noise levels could be from local ferrous geology.

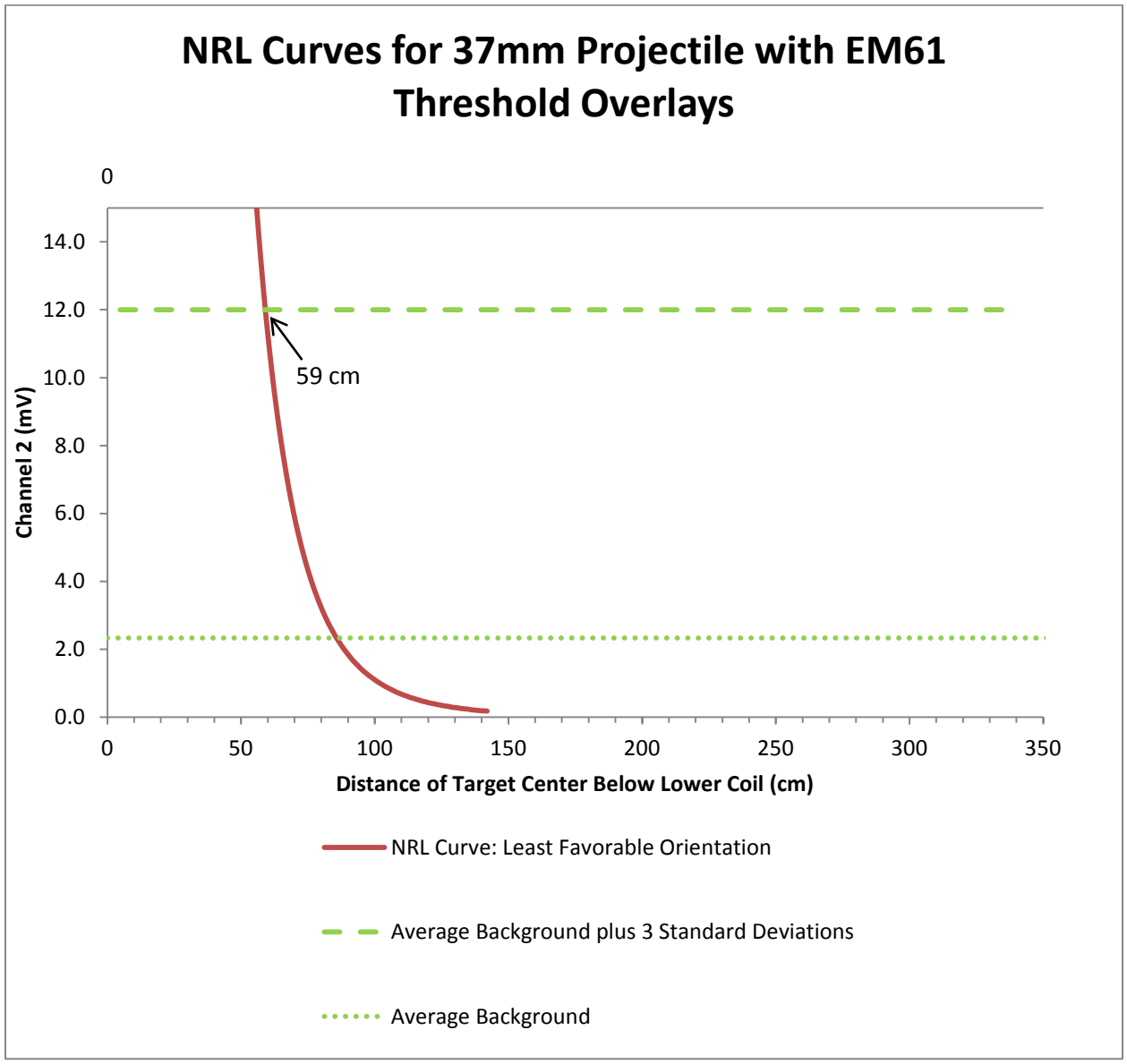


Figure 5 NRL Curves and Background Noise

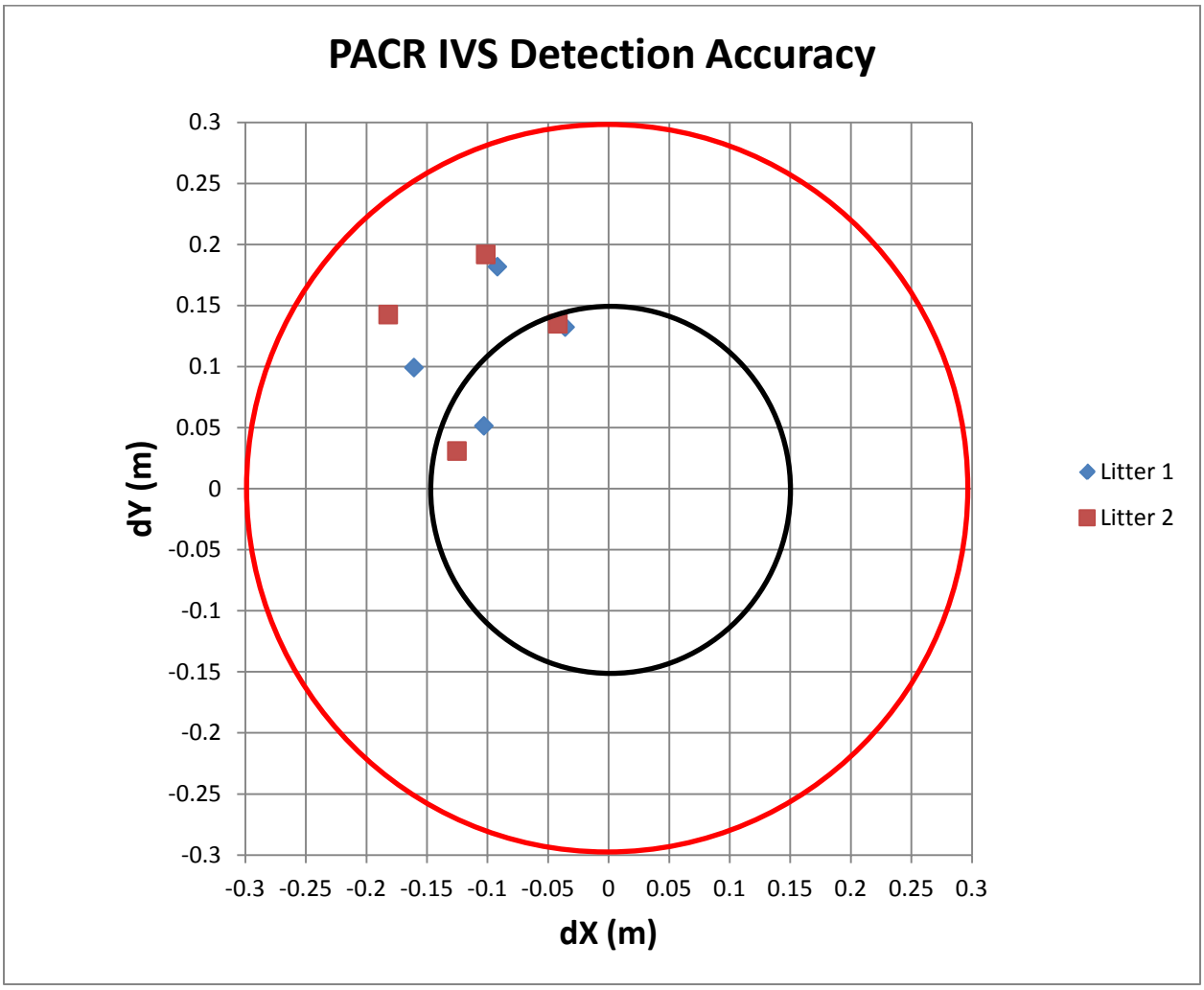


Figure 6 Scatter Plot of Mapped vs As-built positions of IVS Items

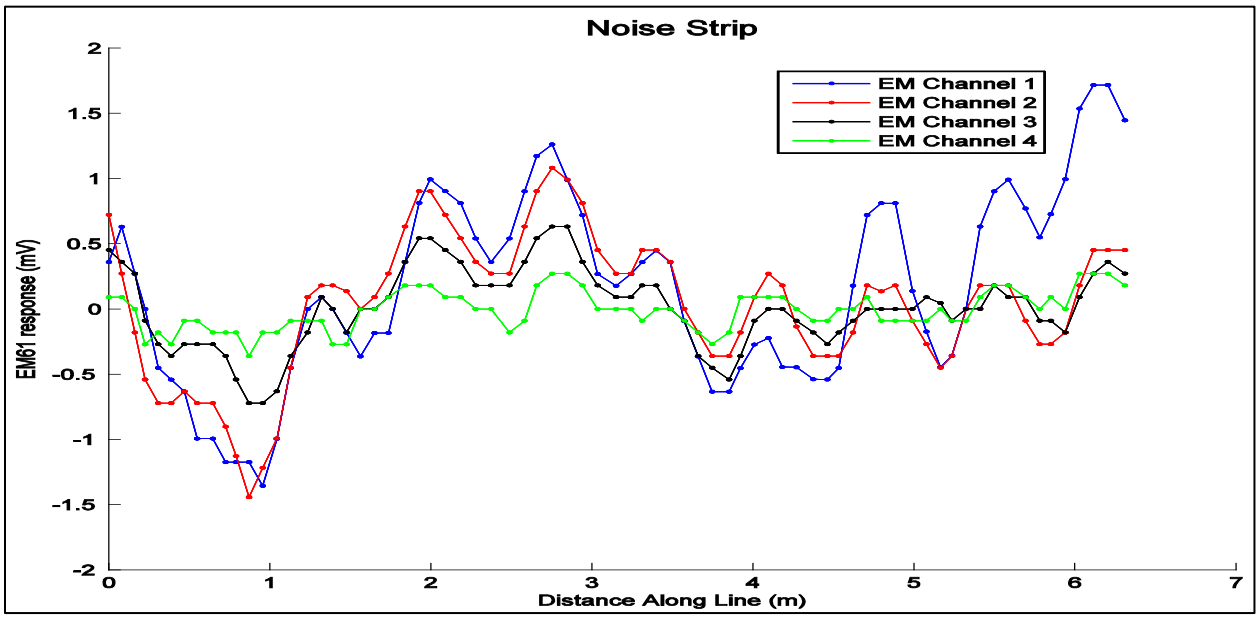


Figure 7 **Profiles of EM61 Litter Noise Strip**

Table 5 **EM Channel 2 values (mV) of Noise Strip**

	Channel 1	Channel 2	Channel 3	Channel 4
Peak-To-Peak	3.071985	2.526055	1.353183	0.631686
Mean	0.154547	0.020448	0.005744	-0.01121
RMS	0.722791	0.582844	0.318576	0.150697

7.0 Conclusions and Recommendations

Repeatability of sensor response verifies that both litter systems are functioning properly.

Responses over items fall within NRL most favorable and least favorable predicted responses.

Values obtained over the noise strip show that the conservative approach of selecting anomalies above noise will be appropriate given limitations of depth of detection.

Sensor responses should be reviewed daily to verify that responses are consistent within limits of PACR proposed limits.

8.0 Data Quality Objectives

Daily quality control checks will be performed before and after daily collection. The following are the DQOs for daily standardization tests and geophysical surveys conducted by HDR.

Table 6 Digital Geophysical Data Quality Objectives

Data Quality Objective	Test Method	Measurement Performance Criteria
Equipment warm-up (minimum 15 minutes)	A power on, conduct real time monitoring of EM61-MK2 instrument readings. Data is not recorded; this will be a visual check by the field team prior to starting calibration tests.	Drift of less than 3 mV over 3 minutes
Repeatable static data are being obtained from the DGM system	At the beginning and end of day, conduct a static background and spike test for each coil. Data will be collected for at least 60 seconds for each test.	Less than 2.5 mV peak to peak for static background, spike ±10% of standard item response after background corrections
Prevent noise related to loose pins or cable connectors	At the beginning of the day, conduct a cable shake test. Each cable will be tested for at least 5 seconds while monitored by the sensor operator.	Less than 2.5 mV peak to peak
Ensure instrument operators are not carrying any metallic objects that can interfere with the EM61-MK2 readings	At the beginning of the day, conduct a personnel test (applicable to single coil cart systems only).	Less than 2.5 mV peak to peak
Position of GPS is accurate	At the beginning of the day, the GPS unit's position will be compared with a known point during a point position test. Positions will be recorded for at least 60 seconds.	Within 10 cm of known values for point position test. Only positions with a PDOP below 4 will be accepted for DGM. Brief spikes of PDOP below 6 may be accepted in limited cases
Repeatable dynamic data are being obtained from the DGM system	At the beginning and end of the day, the geophysical instruments will collect data over an IVS.	± 25% of prior response; position of anomalies repeatable within 10 cm
Positioning of detected anomalies is accurate	Anomalies selected will be compared with known seed item locations to ensure compliance.	100% of all anomaly locations lie within a 3-6 ft. (1-2m) radius of a point on the ground surface directly above the source of the anomaly. For seeds outside of the 3-6 ft. (1-2m) radius, a corrective action will be conducted to determine the appropriate amount of failed data.
Down-line data density is sufficient to detect MEC items	Results of DGM surveys will be evaluated to ensure compliance.	100% of the data will not exceed 0.5 ft. (0.15m) except for areas that are unsurveyable because of cultural features. Lot size is the survey file.

Data Quality Objective	Test Method	Measurement Performance Criteria
Consistent detection of blind seed items during dynamic survey	Transects with fixed RTK GPS coverage will be seeded with ISOs or seed items and surveyed by geophysical personnel.	95% of the ISOs or seed items will be detected. Any misses will results in a root cause analysis and may result in a resurvey of all or a portion of the transect.

Attachment A

Daily Survey and Processing Summary

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Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 1

Raw Data File: E2013294AB Survey Type: Static/Spike

Processed Filename: 2013294_Litter1_Stand.xyz

erging Parameters

Sensor Position	Position File	Sensor File	Forward ffset	ateral Offset
1	P251329402AB.pos	E021329401AB.sen	0	0

Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC ame: J n Jac bs n QC Status: Passed

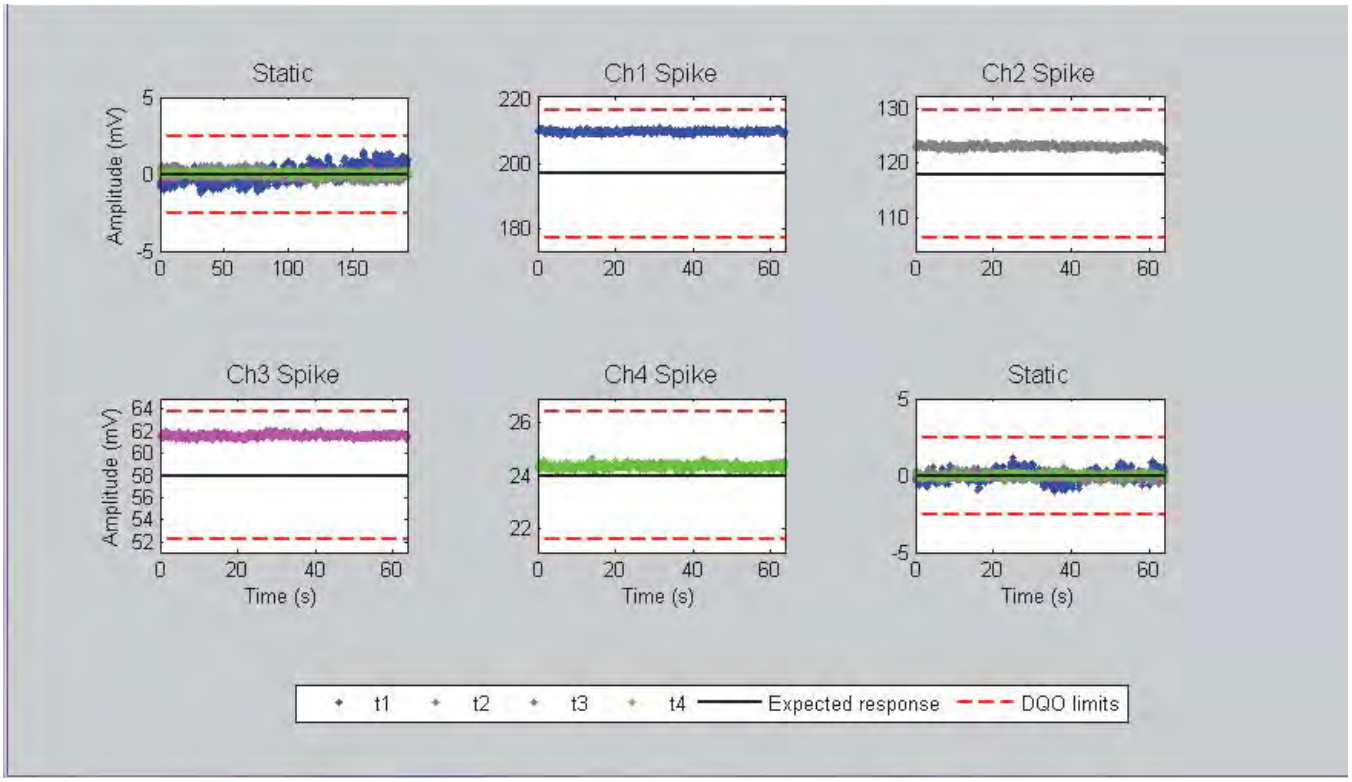
Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 1

Raw Data File: E2013294AB Survey Type: Static/Spike

Processed Filename: 2013294_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

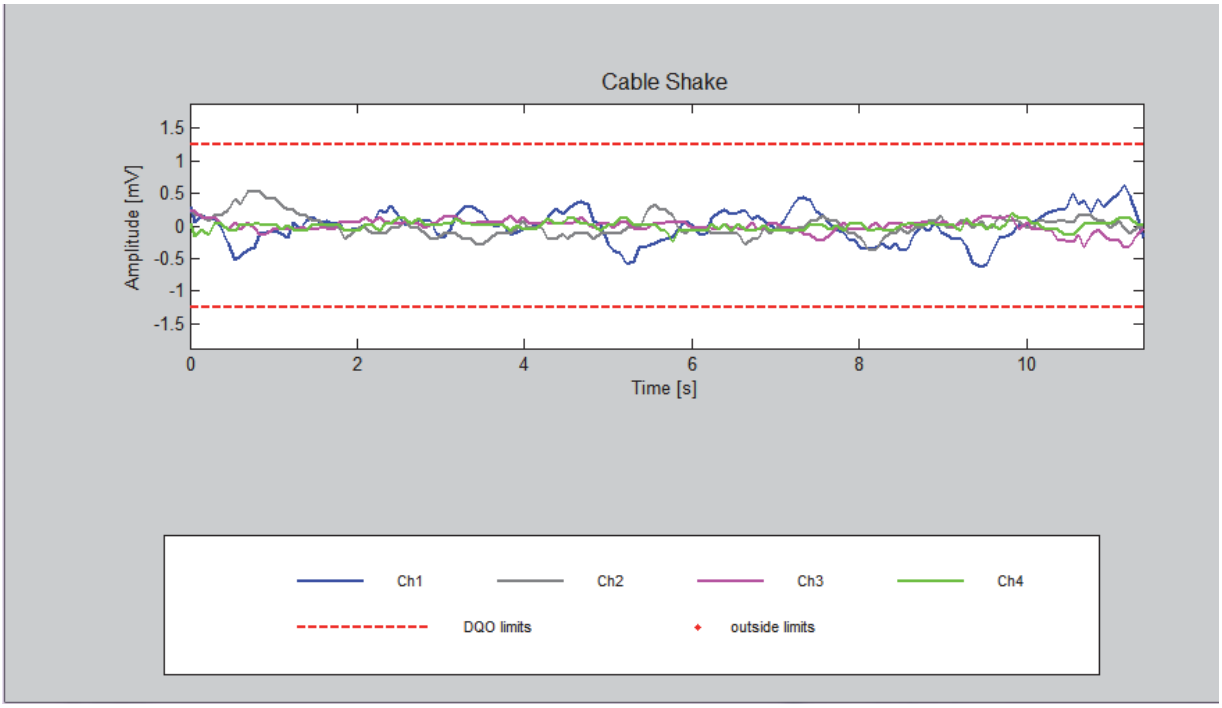
LITTER 1

Raw Data File: E2013294AC Survey Type: Cable Shake

Processed Filename: 2013294_Litter1_Stand.xyz

erging Parameters

Sensor Position	Position File	Sensor File	Forward ffset	ateral Offset
1	P251329402AC.pos	E021329401AC.sen	0	0



Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC ame: J n Jac bs n QC Status: Passed

Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 1

Raw Data File: E2013294AF Survey Type: Time Calibrati n

Processed Filename: 2013294_Litter1_Stand.xyz

erging Parameters

Sensor Position	Position File	Sensor File	Forward ffset	ateral Offset
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Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC ame: J n Jac bs n QC Status: Passed

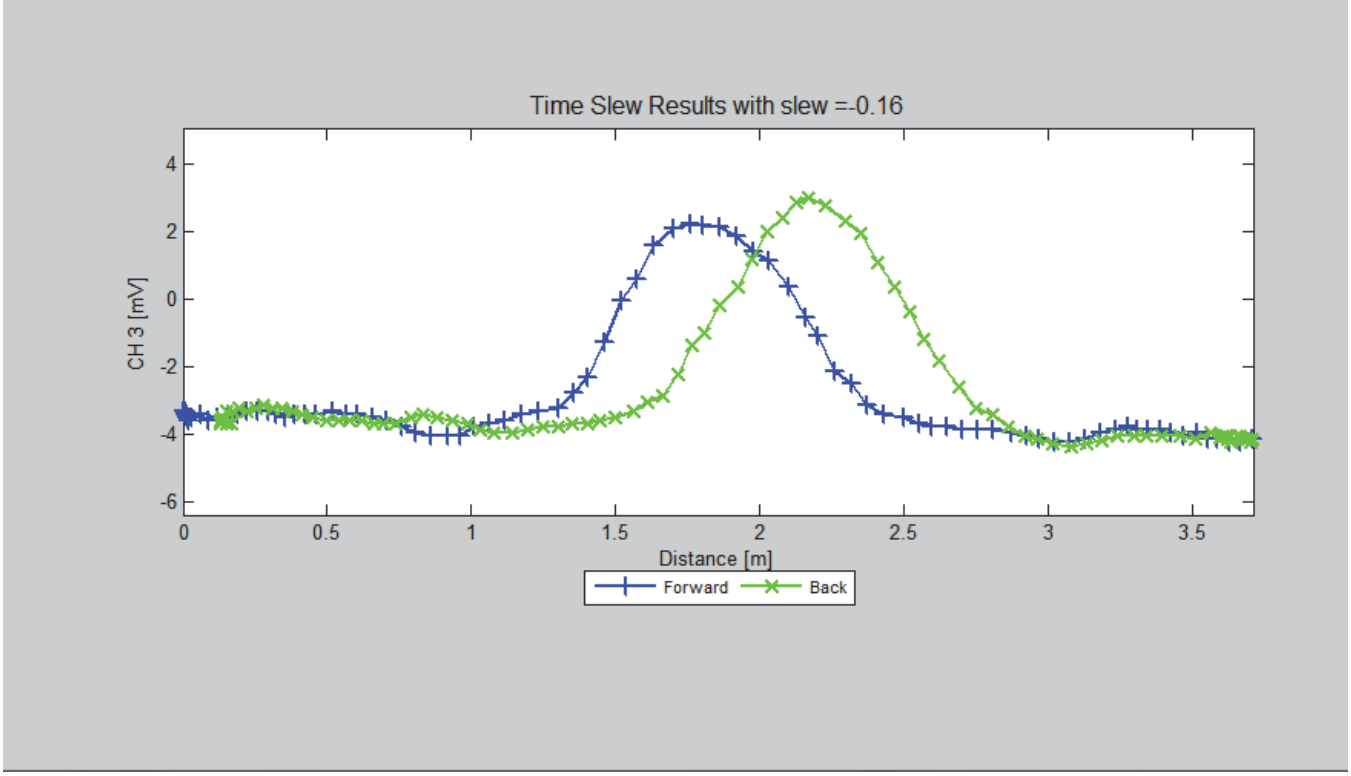
Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 1

Raw Data File: E2013294AF Survey Type: Time Calibrati n

Processed Filename: 2013294_Litter1_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 1

Raw Data File: E2013294AK Survey Type: Static/Spike

Processed Filename: 2013294_Litter2_Stand.xyz

erging Parameters

Sensor Position	Position File	Sensor File	Forward ffset	ateral Offset
1	P251329402AK.pos	E021329401AK.sen	0	0

Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC ame: J n Jac bs n QC Status: Passed

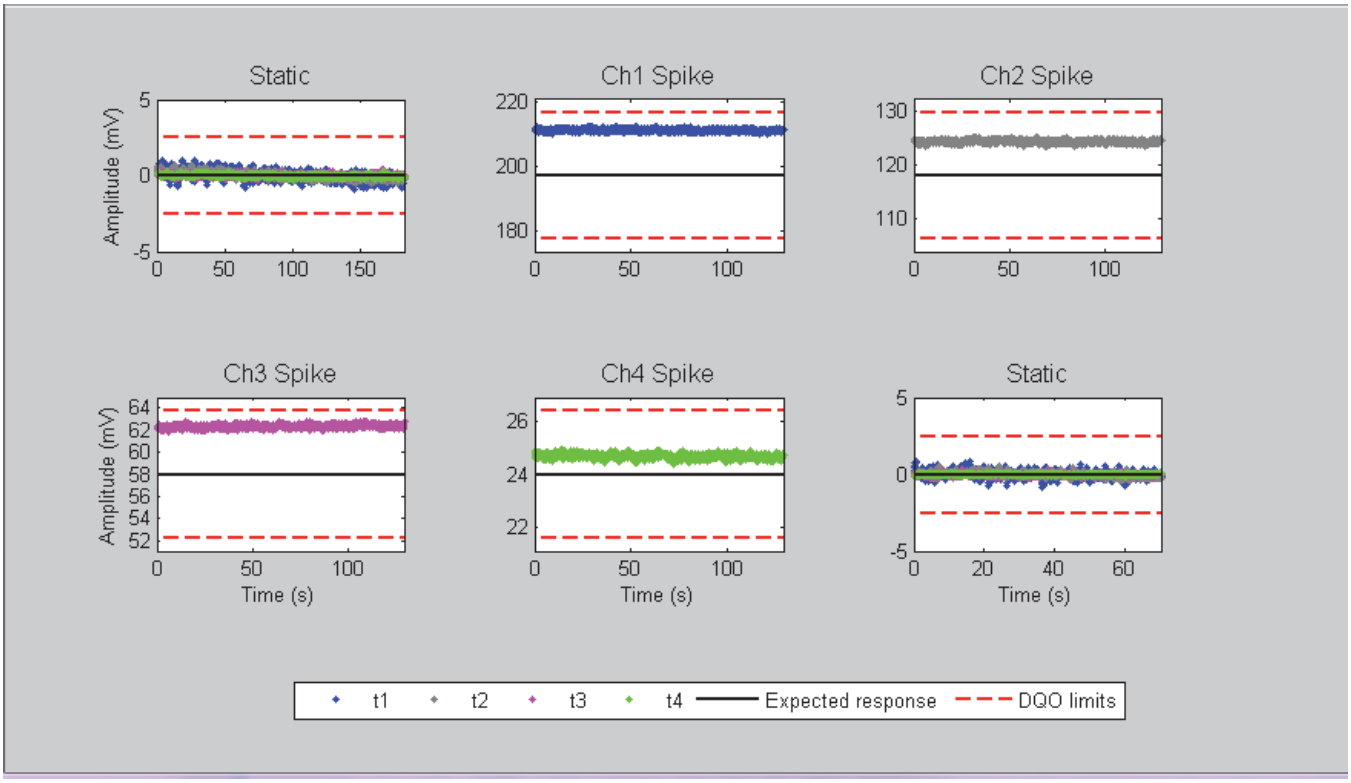
Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 1

Raw Data File: E2013294AK Survey Type: Static/Spike

Processed Filename: 2013294_Litter_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

Raw Data File: E2013294AL Survey Type: Static/Spike

Processed Filename: 2013294_Litter2_Stand.xyz

erging Parameters

Sensor Position	Position File	Sensor File	Forward ffset	ateral Offset
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Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC ame: J n Jac bs n QC Status: Passed

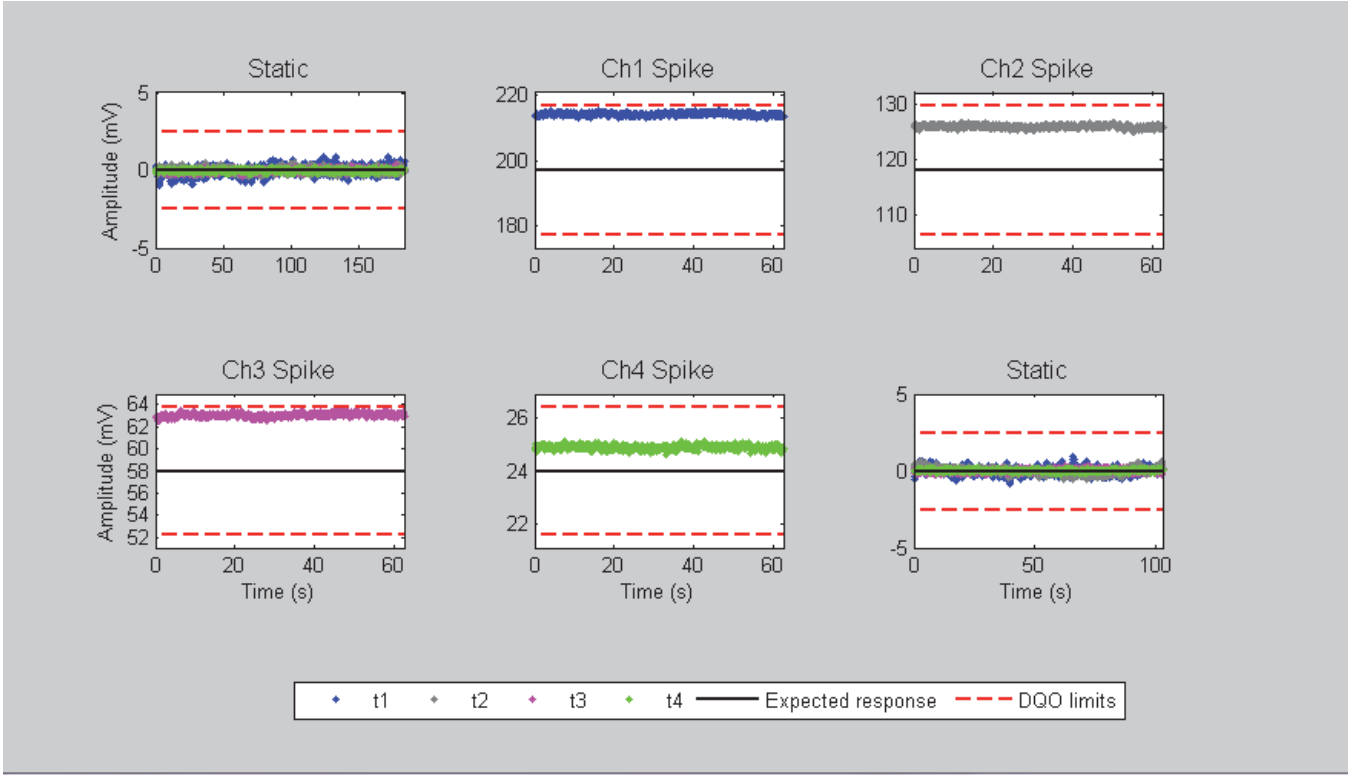
Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

Raw Data File: E2013294AL Survey Type: Static/Spike

Processed Filename: 2013294_Litter_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

Raw Data File: E2013294AN Survey Type: Cable Shake

Processed Filename: 2013294_Litter2_Stand.xyz

erging Parameters

Sensor Position	Position File	Sensor File	Forward ffset	ateral Offset
1	P251329402AN.pos	E021329401AN.sen	0	0

Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC ame: J n Jac bs n QC Status: Passed

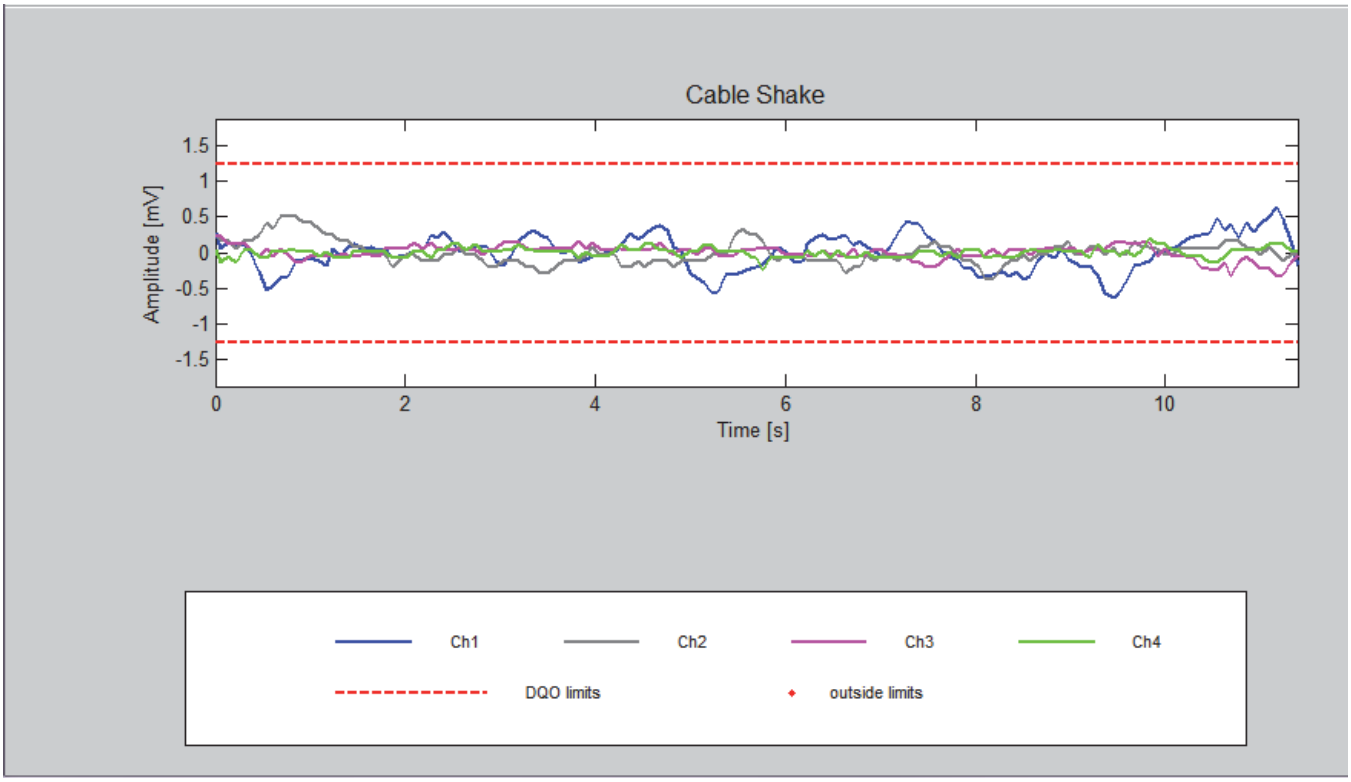
HDR Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

Raw Data File: E2013294AN Survey Type: Cable Shake

Processed Filename: 2013294_Litter2_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

Raw Data File: E2013294AO Survey Type: Time Calibration

Processed Filename: 2013294_Litter2_Stand.xyz

erging Parameters

Sensor Position	Position File	Sensor File	Forward ffset	ateral Offset
1	P251329402AO.pos	E021329401AO.sen	0	0

Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC ame: J n Jac bs n QC Status: Passed

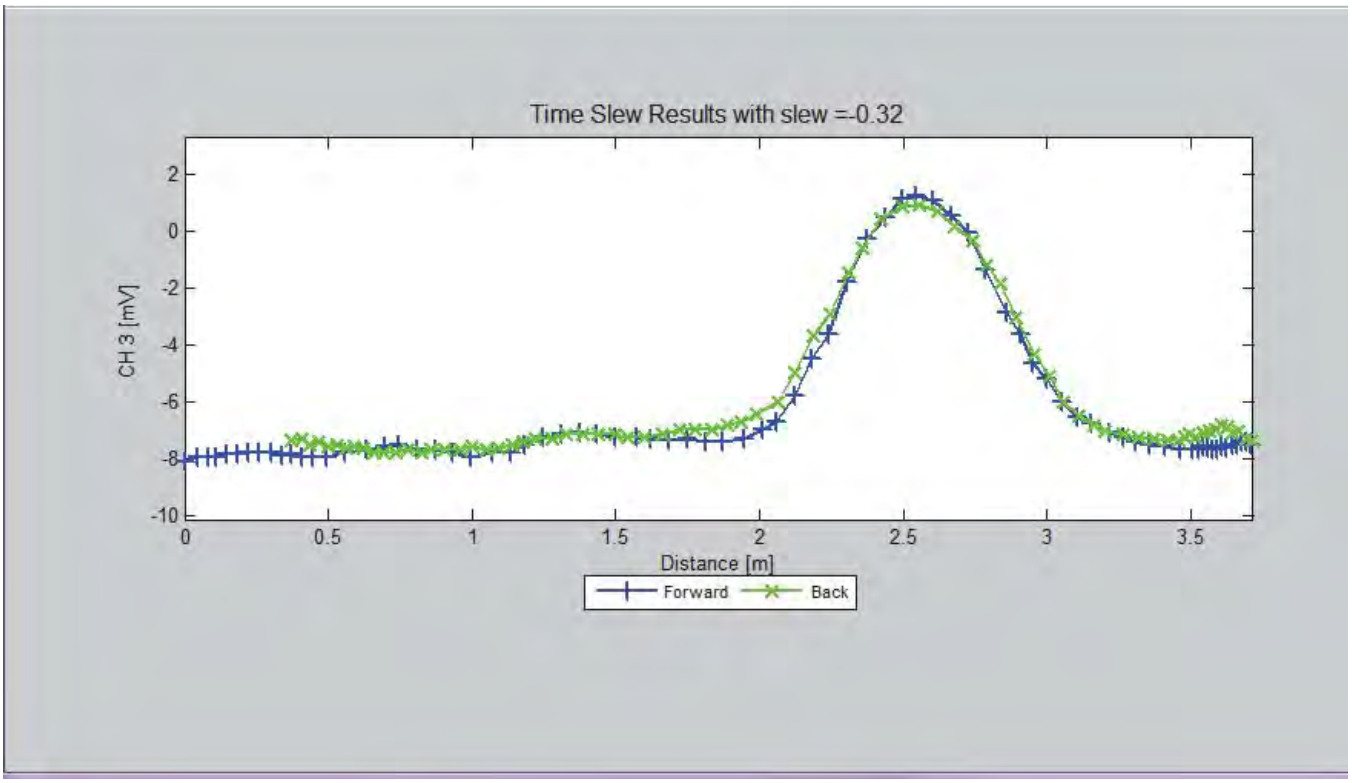
HDR Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

Raw Data File: E2013294AO Survey Type: Time Calibration

Processed Filename: 2013294_Litter2_Stand.xyz



Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

Raw Data File: E2013294AR Survey Type: Static/Spike

Processed Filename: 2013294_Litter2_Stand.xyz

erging Parameters

Sensor Position	Position File	Sensor File	Forward ffset	ateral Offset
1	P251329402AR.pos	E021329401AR.sen	0	0

Processor Name: Andrew Schrag Processing Status: Passed

Processing Comments:

QC ame: J n Jac bs n QC Status: Passed

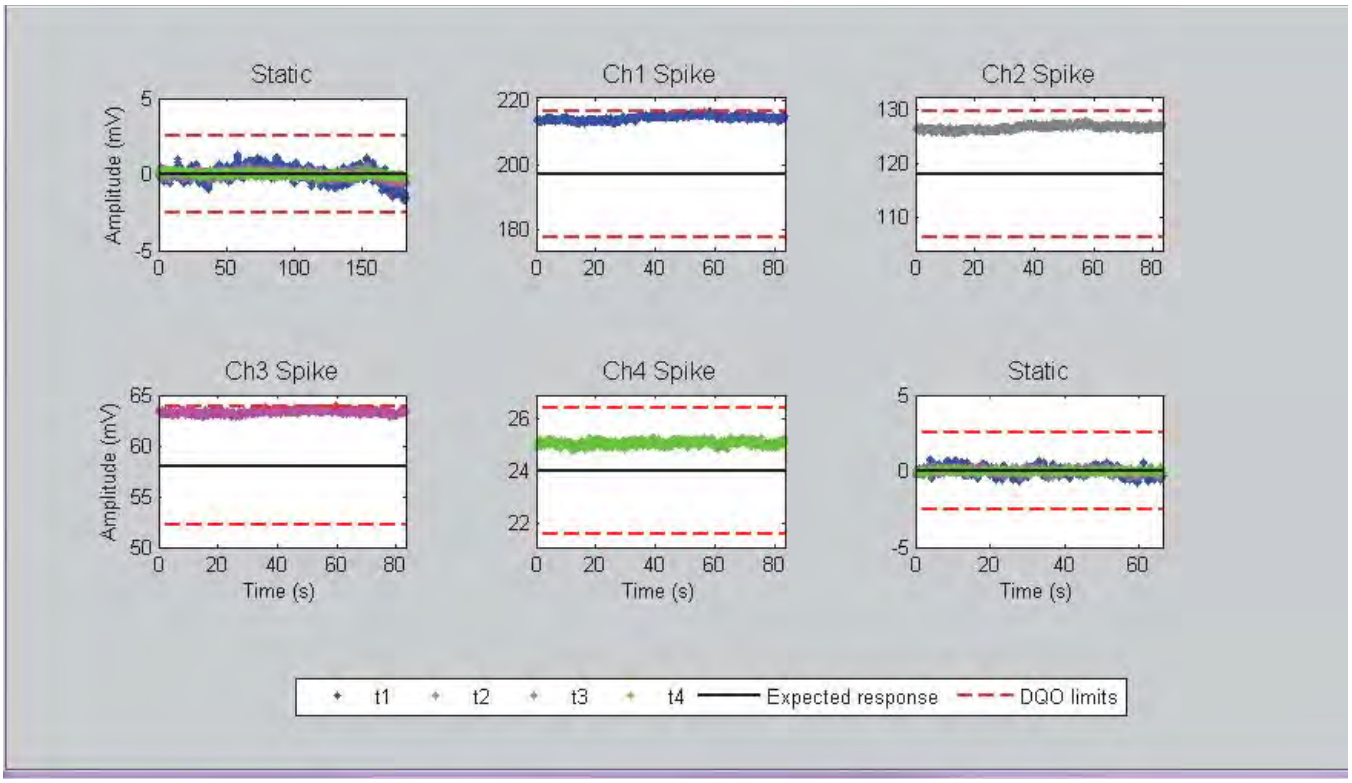
HDR Daily Survey and Processing Summary

Survey Date: 4/11/2013 Site:PACR Log Date: 2013294

LITTER 2

Raw Data File: E2013294AR Survey Type: Static/Spike

Processed Filename: 2013294_Litter2_Stand.xyz



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APPENDIX

Ordnance Technical Data Sheets

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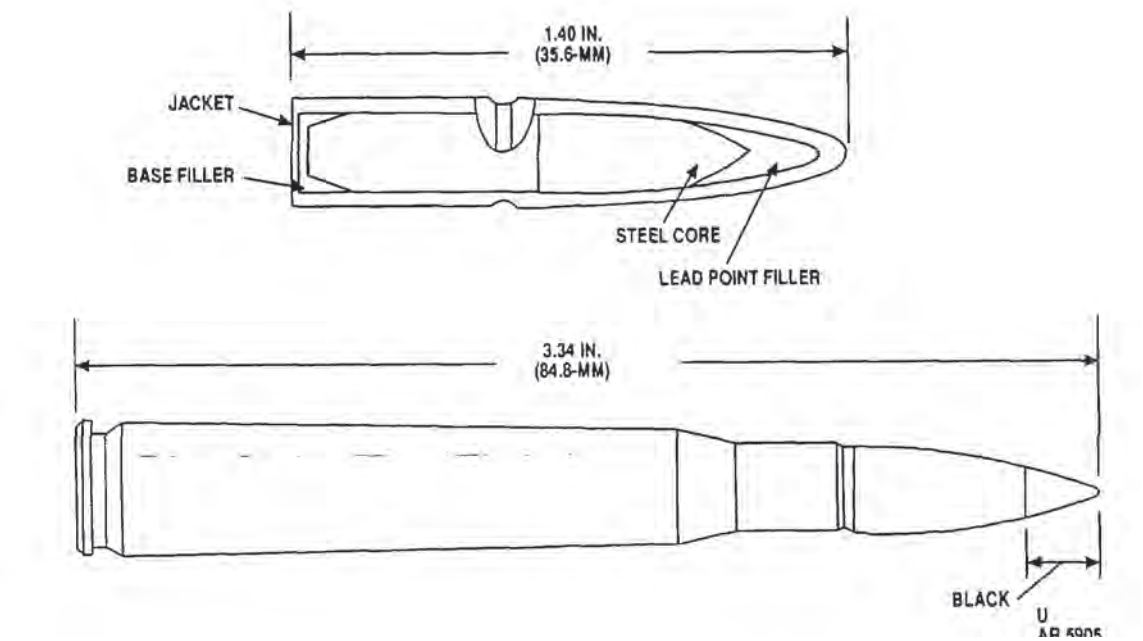
T GE, L BE .30, MO P E NG, M2



Type lassifica ion:

OBS - MSR 11756003.

Use:

Machine Guns, Caliber .30, M37, M1919A4 and M1919A6; and Rifle, Caliber .30, M1.

escrip ion:

ARMOR PIERCING Cartridge. The cartridge is identified by a black bullet tip.

Func ion:

Penetration, fired at 7/8-inch thick homogeneous armor plate at 100 yards, will be not less than 0.42 inch.

Tabula ed a a:

DODAC	1305-A202
UNO serial number	0012
UNO proper shipping name	Cartridges for weapons, inert projectile
Weight	424 gr
Length	3.34 in. (84.8 mm)
Tracer	NA
Primer	Percussion
Fuze	NA
Explosive:	
Type	NA
Weight	NA
Incendiary:	
Type	NA
Weight	NA
Propellant:	
Type	WC 852
Weight	55 gr
Projectile:	
Weight	165.7 gr

Performance:

Chamber pressure	54,000 psi
Velocity	2715 fps, 78 ft from muzzle

Shipping and S orage a a:

Quantity-distance class/ SCG	1.4S
Storage code	Class V
DOT shipping class	C
DOT designation	SMALL ARMS AMMUNITION
Drawing number	6138194

eferences:

SB 700-20
TM 1005-222-12P/1
TM 9-1300-206

SHELL, Practice, M44. This shell is used for practice firing in the 81-mm (figure 110c) trench mortar weapon.The body of the shell is made of cast iron and contains an inert filler. A small amount of black powder (0.20 pound) is placed below the fuze to give a spotting effect when the fuze functions. The body shape, size, and weight are identical to the M43 Shell. It has no adapter, however. The fuze screws directly into the nose of the shell. The shell body is painted blue with white stencil and is packed in the same manner as SHELL, H.E. M43.

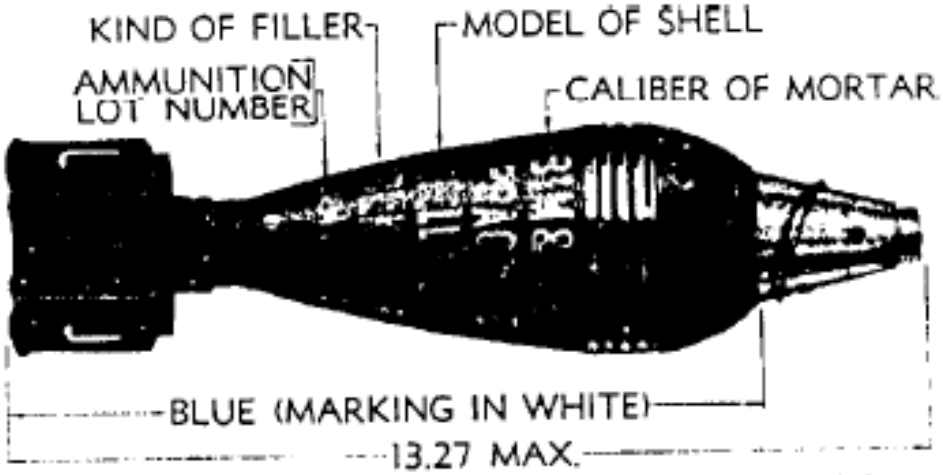
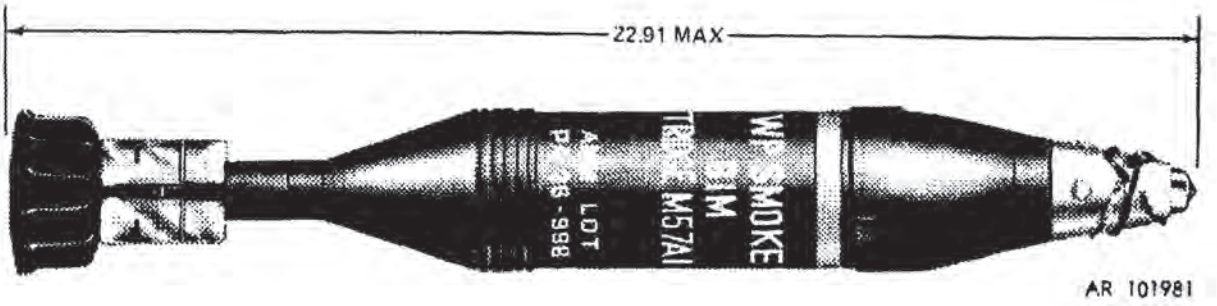
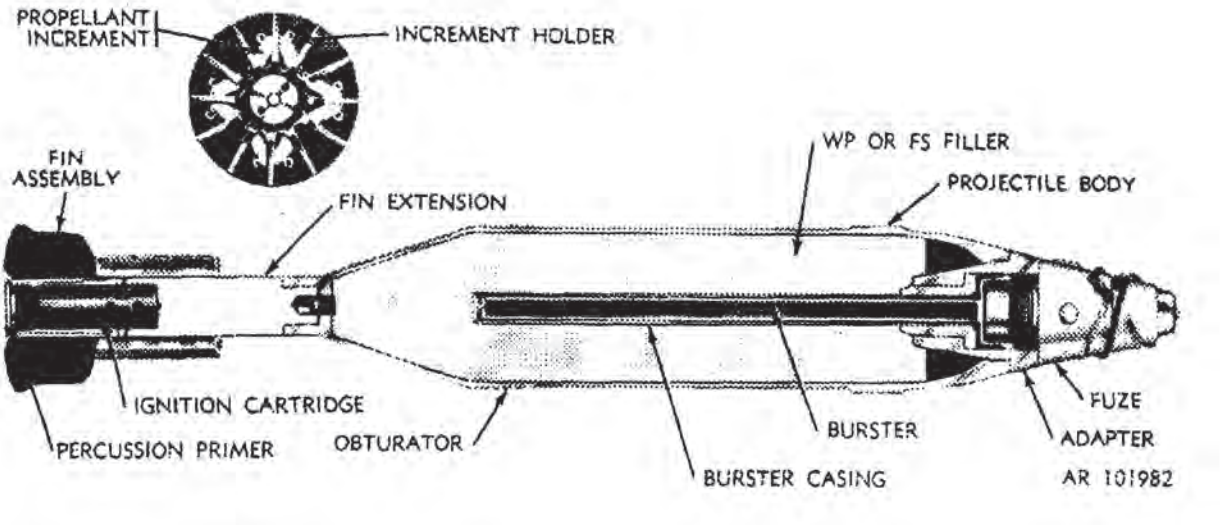


Figure 110B

CARTRIDGE, 81 MILLIMETER: SMOKE, WP, M57A1 AND M57





Type Classification:

With WP Filler: CON 11756003.
With FS Filler: OBS OTCM 37196 dtd 1961.

Use:

This cartridge is used against personnel and materiel as an incendiary device and also to produce screening smoke.

Description:

The complete round consists of a projectile body with a burster assembly, a point-detonating fuze, a fin assembly a propellant charge, and an ignition cartridge with a percussion primer. The projectile body is of relatively thin-walled steel, and is filled with white phosphorous (WP) or a liquid smoke filler (FS). The base of the projectile is internally threaded to accept the fin assembly, and the nose is fitted with a steel adapter. The adapter is internally threaded to accept the fuze, and is designed to hold the burster assembly. The burster assembly is a thin-walled steel tube filled with tetryl and extends into the smoke charge.

Functioning:

When the cartridge is loaded, it slides down the mortar tube until the percussion primer in the ignition cartridge strikes the firing pin in the base cap of the mortar. The primer ignites the ignition cartridge, and the cartridge ignites the propellant charge. Rapidly expanding gases from the burning propellant expel the projectile from the tube with the velocity required to reach the target. The fuze functions on impact, detonating the burster charge which ruptures the projectile and disperses the chemical filler. Both WP and FS react spontaneously on contact with the air; WP ignites producing a dense white smoke and some incendiary effect, while FS, combining with the moisture in the air, creates a cloud-like smoke screen without burning.

Difference Between Models:

The M57 is fitted with the M4 fin assembly and the M57A1 uses the M4A1 assembly. These differ in minor manufacturing details only. Cartridges with liquid smoke filler (FS) are classified as obsolete.

Tabulated Data:

Complete Round:	
Type	Smoke
Weight	11.38 lb
Length	22.91 in.
Cannon used with	M1, M29, M29A1
Projectile:	
Body material	Steel
Color	Grey w/yellow markings
Filler and weight	WP, 4.06 lb
Burster charge	Tetryl, 0.08 lb
Components:	
Burster assembly	M1
Ignition cartridge	M6
Propellant charge	M2A1
Percussion primer	M34
Fin assembly	M4, M4A1
Fuze	M525 series

Temperature Limits:

Firing:	
Lower limit	-40°F
Upper limit	+125°F
Storage:	
Lower limit	-80°F (for period not more than 3 days)
Upper limit	+160°F (for period not more than 4 hr/day)
*Packing	1 round in fiber container; 2 containers in wooden box
*Packing Box:	
Weight	43.0 lb
Dimensions	28 x 9-11/16 x 6-15/32 in.
Cube	1.0 cu ft

*NOTE: See DOD Consolidated Ammunition Catalog for complete packing data including NSN's.

Shipping and Storage Data:

UNO serial number	0245
Quantity-distance class	(12) 1.2
Storage compatibility group	H
DOT shipping class	A
DOT designation	AMMUNITION FOR CANNON WITH SMOKE PROJECTILES
DODAC	1315-C230
Drawing number	75-1-93

Ballistics:

Charge	Muzzle Velocity (fps)	Maximum Range (m)	(yd)
1**		630	700
2		1199	1300
3		1646	1800
4		2169	2872

**Charge 1 is the ignition cartridge and one increment charge; Charge 4 is the ignition cartridge and four increment charges.

Limitations:

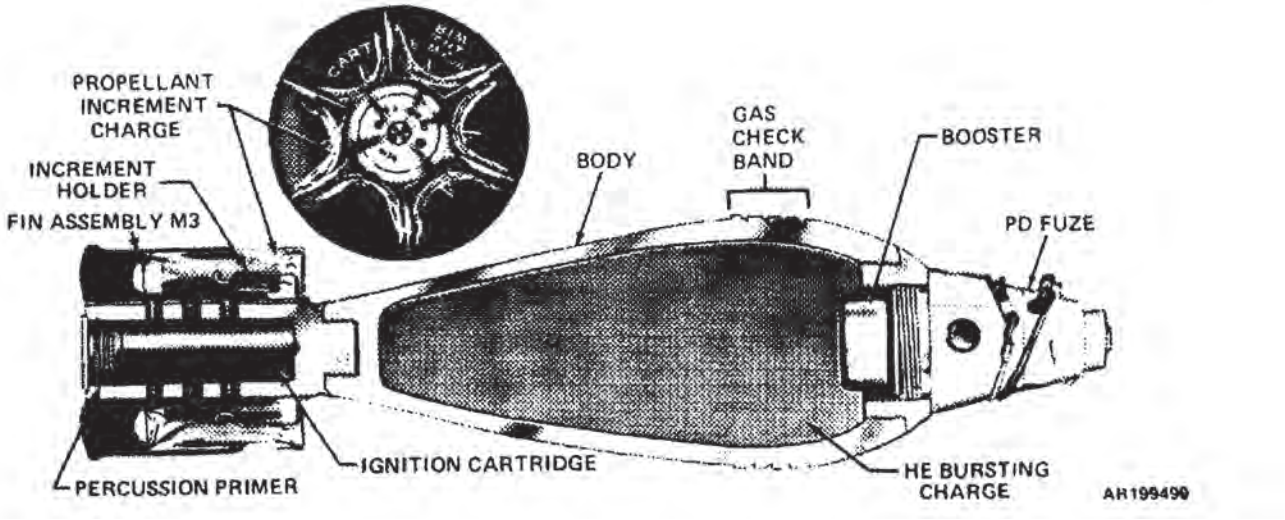
Store and transport WP rounds at temperatures below 111.4°F (melting point of WP). If impractical, store rounds on bases, so that if WP melts it will resolidify with void space in normal position in the nose of the projectile. Erratic performance may occur if voids exist inside of WP filler.

References:

AMC-P 700-3-3
SB 700-20
TM 9-1300-251-20
TM 9-3071-1

CARTRIDGE, 81 MILLIMETER: HE, M43A1 AND M43A1B1





Type Classification:

OBS 11756003.

Use:

This cartridge is used against personnel and light materiel, providing both fragmentation and blast effect.

Description:

The complete round consists of a projectile body, a point-detonating fuze, a tin assembly a propellant charge, and an ignition charge with a percussion primer. The projectile body is of forged steel, and is threaded internally at the nose to accept the fuze and at the base to accept the fin assembly. The projectile body is filled with Composition B high explosive.

Functioning:

When the cartridge is loaded, it slides down the mortar tube until the percussion primer in the ignition cartridge strikes the firing pin in the base cap of the mortar. The primer ignites the ignition cartridge, and the cartridge ignites the propellant charge. Rapidly expanding gases from the burning propellant expel the projectile from the tube and propel it to the target. The projectile is fin-stabilized in flight. The PD fuze functions on impact detonating the fuze booster charge and, in turn, the high explosive charge. The bursting charge shatters the projectile body, producing near optimum fragmentation and blast effect at the target.

Difference Between Models:

The two cartridges differ only in some minor metal parts.

Tabulated Data:

Complete Round:
- HE
- Weight: 07.5 lb
- Length: 13.32 in.
- Cannon used with: M1, M9, M29A1

Projectile:
- Body material: Forged steel
- Color: Olive drab w/yellow markings
- Filler and weight: Comp. B, 01.29 lb

Components:
- Ignition cartridge: M8 or M6
- Propellant charge: M1A1
- Percussion primer: M34
- Fin assembly: M3
- Fuze: PD, M525 series PD, M717

Temperature Limits:

Firing:
- Lower limit: -40°F
- Upper limit: +125°F

Storage:
- Lower limit: -80°F (for period not more than 3 days)
- Upper limit: +160°F (for period not more than 4 hr/day)

*Packing: 1 round in fiber containers; 4 containers in wooden box

*Packing box:
- Weight: 49.8 lb
- Dimensions: 17-3/4 x 9-11/16 x 10-15/32 in-
- Cube: 1.0 cu ft

*NOTE: See DOD Consolidated Ammunition catalog for complete packing data including NSN'S.

Shipping and Storage Data:

- UNO serial number: 0321
- Quantity-distance class: (08) 1,2
- Storage compatibility group: E
- Dot shipping class: A
- DOT designation: AMMUNITION FOR CANNON WITH EXPLOSIVE PROJECTILES
- DODAC: 1315-C225
- Drawing number: 9218433

Ballistics:

Charge	Muzzle Velocity (fps)	Maximum Range (m)	(yd)
** 0	238	517	565
1	351	1029	1111
2	443	1511	1649
3	519	1947	2120
4	590	2349	2560
5	656	2700	2950
6	719	3016	3290
7	779	3292	3590
8	834	3701	4050

**Charge 0 is the ignition cartridge only; Charge 1 is the ignition cartridge and one increment charge; Charge 8 is the ignition cartridge and eight increment charges.

References:

AMC-P 700-3-3
SB 700-20
TM 9-3071-1
TM 9-1300-251-20

35. Shell, Fixed, HE, M63, w/Fuze, BD, M58 for 37-mm Gun M6 (fig. 46)

a. GENERAL. This shell is for use with 37-mm tank gun when fragmentation and blast effect are desired. The shell body is a relatively heavy steel casing. The nose is solid and formed to a long ogive. The base is threaded to receive the M58 base fuze which functions with nondelay action. This construction provides a maximum distribution of metal forward of the TNT bursting charge and for some penetration before detonation, increasing the effectiveness against targets such as sheltered or entrenched personnel, trucks, and light armored vehicles. The round is assembled with both brass and steel cartridge cases. Present muzzle velocity is 2,600 fps, but rounds of earlier manufacture may be encountered which are loaded to give 2,700 fps muzzle velocity.

b. DATA.

Weight of complete round	3.08 lb
Length of complete round	14.09 in
Length of fuzed projectile	6.02 in
Length of cartridge case	8.75 in
Width of rotating band	0.74 in
Type of base	Square
Radius of ogive	8.97 cal.
Muzzle velocity	2,600 fps
Maximum range	9,500 yd



Figure 46. Shell, fixed, HE, M63, w/fuze, BD, M58, for 37-mm gun M6.

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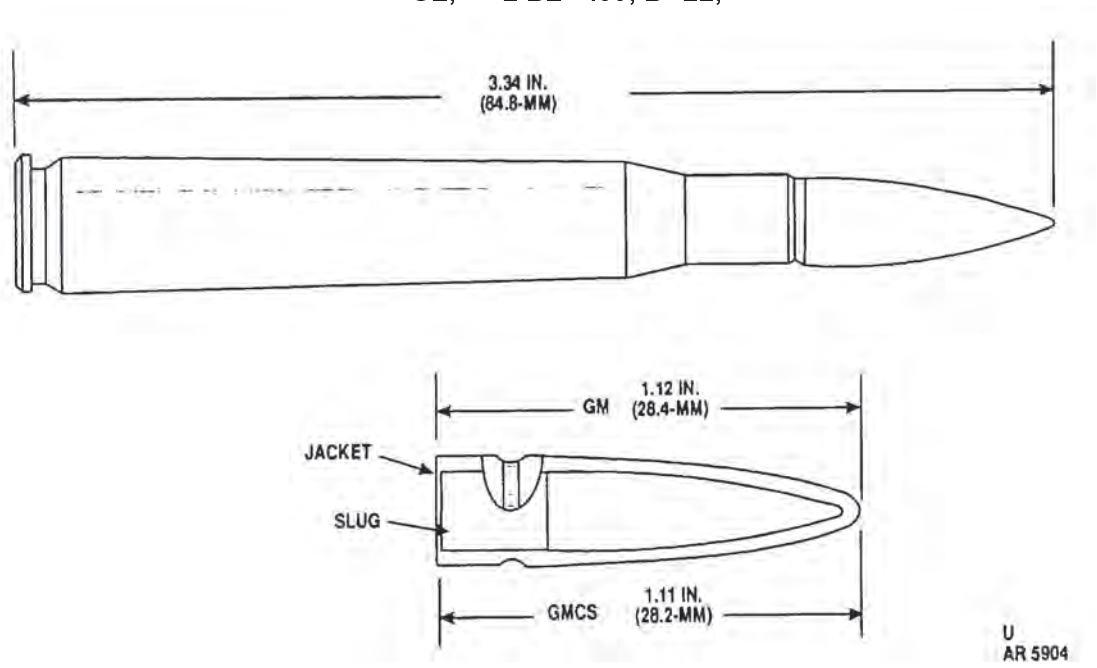
T GE, L BE .30, B LL, M2



Type lassification

OBS - MSR 11756003.

Use

Machine Guns, Caliber .30, M37, M1919A4 and M1919A6; and Rifle, Caliber .30, M1. The cartridge is intended for use against personnel or unarmored targets.

escription

BALL Cartridge. The cartridge is identified by a plain bullet tip.

Tabulated ata

DODAC	1305-A212
UNO serial number	0012
UNO proper shipping name	Cartridges for weapons, inert projectile
Weight	416 gr
Length	3.34 in. (84.8 mm)
Tracer	NA
Primer	Percussion
Fuze	NA
Explosive:	
Type	NA
Weight	NA
Incendiary:	
Type	NA
Weight	NA
Propellant:	
Type	IMR 4895
Weight	50 gr

Performance

Chamber pressure	50,000 psi
Velocity	2740 fps, 78 ft from muzzle

Shipping and Storage ata

Quantity-distance class/ SCG	1.4S
Storage code	Class V
DOT shipping class	C
DOT designation	SMALL ARMS AMMUNITION
Drawing number	6137544

eferences

SB 700-20
TM 9-1005-222-12P/1
TM 9-1300-206

SHELL, CHEMICAL, M64.

General. This round is a new type of chemical round, the projectile being equipped with a full length burster. It disperses the chemical agents more efficiently than does the older type chemical round (see SHELL, chemical, Mk. II, in section on 75-mm guns) since the entire projectile is split open. It may be expected that a chemical shell of this type will also be standardized for the 75-mm guns in the near future.

Projectile M64 figure 174. This projectile is similar to the H.E. Projectile M48 with the exception of an adapter for the burster casing in the nose, and the absence of a base plate. The burster casing is a press-fit in the adapter provided for it. The burster assembles within the burster casing. The standard fillers (chemical agents) for this shell are H, WP, and FS. The marking for these fillers will be similar to that for the same fillers in the SHELL, chemical, Mk. II. There are five weight zones in this projectile. The components associated with it in the complete round are:

Fuze M57. Discussed in chapter on 75-mm gun ammunition.
Burster M8.
Burster Casing M6.
Cartridge Casing M5A1 AND M5A1B1.
Propelling Charge. FNH, 4 zone, base and increment.
Primer M1B1A2. Discussed in chapter on 75-mm gun ammunition.

NOTE: This round is standard for manufacture and issue and is issued fuzed. It is a boresafe round.

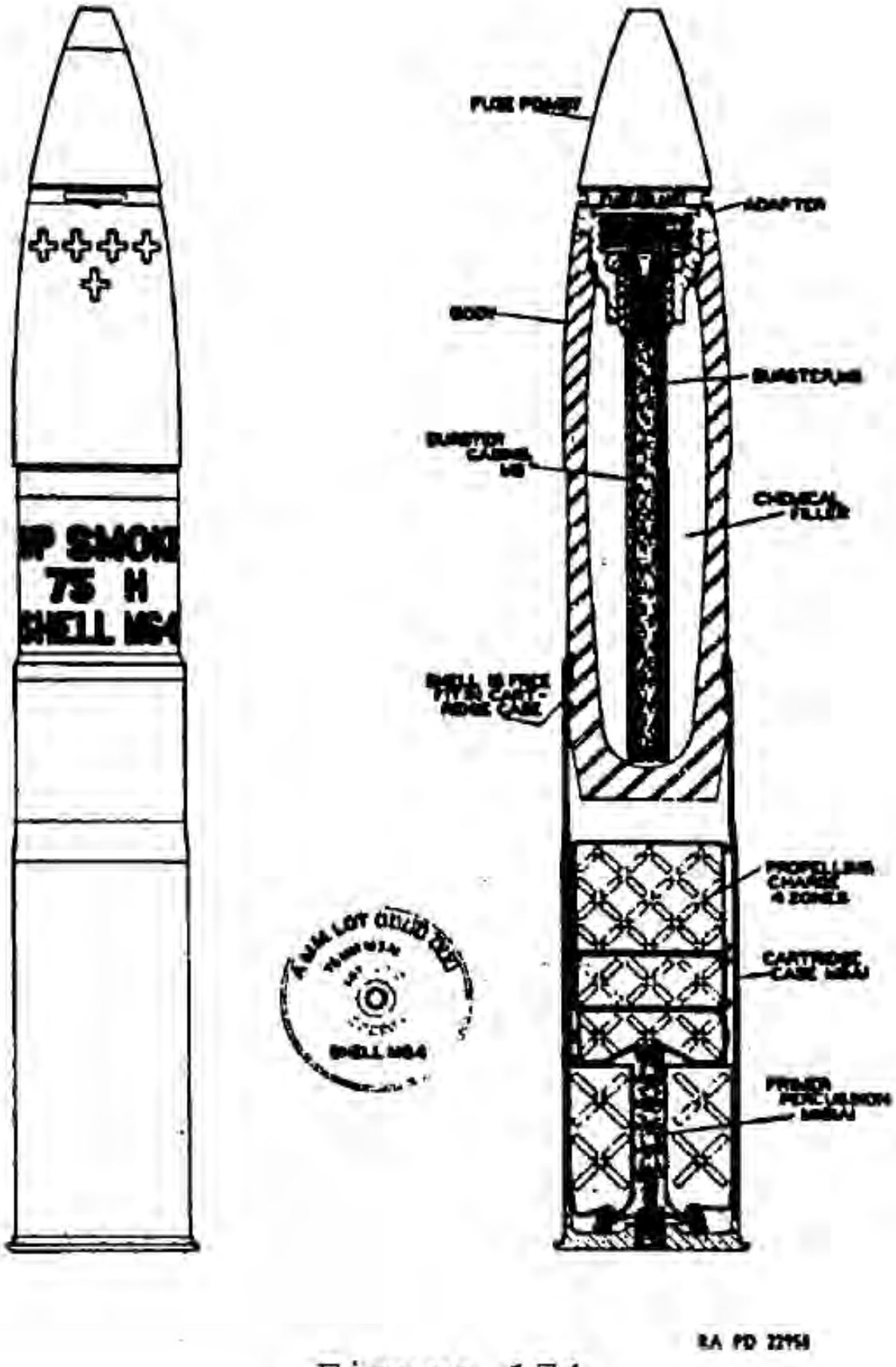
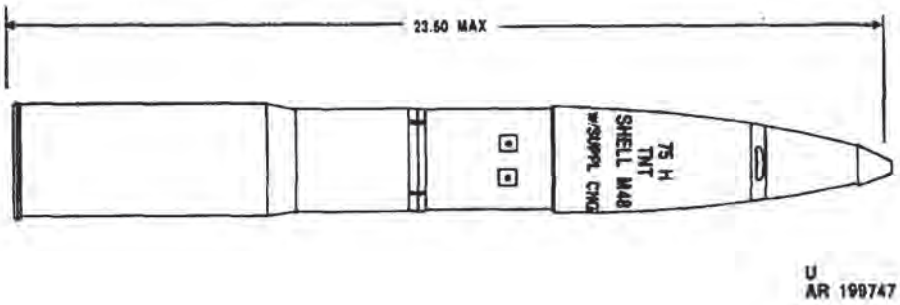
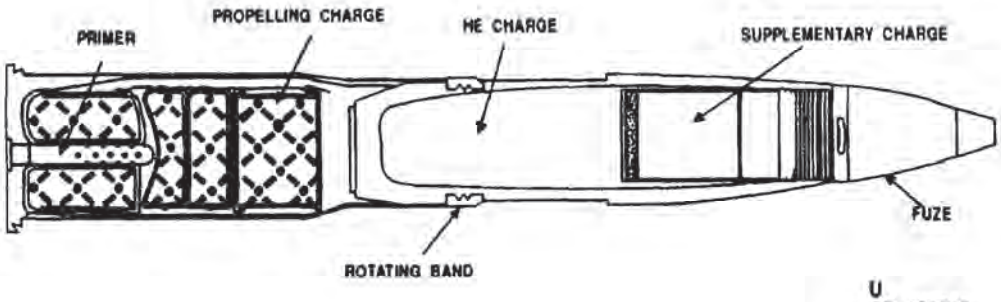

75 H
ADAPTER
BODY
CHEMICAL FILLER
PROPELLING CHARGE 4 ZONES
CARTRIDGE CASE M64A1
PRIMER PERCUSSION M64A1
SHELL M64
RA PD 22958

Figure 174

DGE, 75-M LL ME E HE, M48



U
AR 199747



U
AR 199746

Type Classification:

OBS MSR 11756003.

Use:

Cartridge M48 is a high explosive type round used for fragmentation, mining, and blast effects. The cartridge is used in 75-mm Howitzer M1A1.

Description:

The projectile of this cartridge is loosely assembled in the cartridge case because of the necessity for removal to adjust the propelling charge. The projectile is made with either a normal or deep fuze cavity. The deep fuze cavity type may be issued with or without a supplementary charge. As issued, the projectile may be fuzed or assembled with a closing plug. Impact, mechanical time-superquick, or proximity fuzes may be used. The propelling charge consists of a four-increment charge (base charge plus three increments) assembled in the cartridge case. A percussion primer is fitted in the base of the cartridge case.

Functioning:

When the percussion primer is struck by the firing pin of the weapon, a small amount of black powder in the primer tube is ignited. Sparks and flame from the black powder ignite the propelling charge. Gases from the burning propelling charge drive the projectile through the bore of the weapon. Spin is imparted to the projectile by the engagement of the rotating band with the rifling in the bore. This spin stabilizes the projectile in flight. When the fuze functions, either over or on the target, the bursting charge detonates with both blast and fragmentation effect.

Tabulated Data:

Complete round:	
Type	HE
Weight	18.24 lb
Length	23.50 in.
Cannon used with	M1A1
Projectile:	
Body material	Forged steel
Color	Olive drab w/yellow markings
Filler and weight	TNT or 50/50 amatol, 1.49 lb

Components:	
Cartridge case	M5A1, M5A1B1
Propelling charge	M1
Primer	M1, M1A1, M1A2, M1B1A2 or M64
Fuze:	
PD	M557
PROX.	M513 series
MTSQ	M520 series, M564
Performance:	
Maximum range	8796 meters
Muzzle velocity	1250 fps

Temperature Limits:

Firing:	
Lower limit	-40°F
Upper limit	+125°F
Storage:	
Lower limit	-80°F (for period not more than 3 days)
Upper limit	+160°F (for period not more than 4 hr/day)
*Packing	1 round per fiber container; 2 fiber containers per wooden box
*Packing Box:	
Weight	53.0 lb
Dimensions	27-15/16 x 9-5/8 x 6-11/32 in.
Cube	1.01 cu ft

*NOTE: See DOD Consolidated Ammunition Catalog for complete packing data including NSN's.

Shipping and Storage Data:

Quantity-distance class	4
Storage compatibility group	E
DOT shipping class	A
DOT designation	AMMUNITION FOR CANNON WITH EXPLOSIVE PROJECTILES
DODAC	1315-C027 - w/PD fuze, 1315-C028 - w/o fuze
UNO serial number	0321
UNO proper shipping name	Cartridges for weapons
Drawing number	75-1-59

Operational Characteristic

When assembling an impact or mechanical time fuze to a deep cavity projectile, assure that a supplementary charge is installed, as some deep cavity projectiles do not contain a supplementary charge when issued.

References:

SB 700-20
AMC-P 700-3-3
TM 9- 300-25 -20

APPENDIX

Demilitarization Documentation

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Invoice

Date	Invoice #
1/15/2014	11514

29925 Highway 108
Cold Springs, CA 95335

HDR Environmental
12850 E. Control Tower Rd.
Centennial, CO 80112

PO #	Terms
	Net 30

Quantity	Description	Rate	Amount
	50 lbs. of MDAS MIN. CHG. Rob Irons 303 323-9517	250.00	250.00
		Total	$250.00

Timberline Environmental Services, Inc.
Office: (209) 965-3118 Fax: (209) 965-4721

Certificate of Destruction

Sealed Container Generating Contractor **HDR**

Generating Location **Port Angeles**

Gross Weight **50 lbs**

[I certify that the items/assets/material received were demilitarized in accordance with guidelines contained in DoD 4160.21-M-1 and having been smelted are only identifiable by their basic content.]

COD# **011514-4** *Date* **01/15/14**

Certifying Official **Terry Northcutt** *Title* **President**

Signature _____

TES Inc. 29925 Hwy 108, Cold Springs, CA 95335 209-965-3118 caoffice@timberlineenvsv.com

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

1	2	3	4	5	6	7	23	24	25	26	27	28	29	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
DOC	DENT	RI FROM	M&S	UNIT	ISS	QUANTITY							SER	SUPPLE-MENTARY ADDRESS						SIG	FUND	DIS-TRI-BU-TION			PRO-JECT			PRI	REQD	DEL DATE		ADV			RI		O/P	COND	MGT	UNIT PRICE DOLLARS	CTS	TOTAL PRICE DOLLARS	CTS						

1. TOTAL PRICE	2. SHIP FROM	3. SHIP TO
	HDR	Timberline Environmental Services Inc.
	4. MARK FOR	

5. DOC DATE	6. NMFC	7. FRT RATE	8. TYPE CARGO	9. PS

10. QTY. REC'D	11 UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL

24. DOCUMENT NUMBER & SUFFIX (30-44)

CONTAINER NUMBER:
USACE/PACR/HDR/0001/4493345/4493323

SEAL NUMER:
4493345, 4493323

25. NATIONAL STOCK NO. & ADD (8-22)

50 lbs. Material Documented as Safe (MDAS)

16. FREIGHT CLASSIFICATION NOMENCLATURE
Ferrous metal scrap

17. ITEM NOMENCLATURE
MDAS

18. TY CONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE

22. RECEIVED BY

23. DATE RECEIVED
12/17/13

26. RIC (4-6)
UI (23-24)
QTY (25-29)
CON CODE (71)
DIST (55-56)
UP (74-80)

"This certifies and verifies that the material listed has been 100% inspected and to the best of our knowledge and belief, are inert and/ or free of explosives or related materials."

27. ADDITIONAL DATA

Rick St. Amand SUXOS
Cell Number: 303-717-4278
HDR
12850 East Control Tower Rd
Centennial CO
303-925-1062

Byron Cook UXOQCS
Cell Number: 719-648-9729
HDR
12850 East Control Tower Rd
Centennial CO
303-925-1062

Adobe Designer 7.0

HDR

Chain of Custody Form

Project Location: Port Angeles Combat Range, WA		Contract No: W9128F-10-D-0058		DO No: 006	Page 1 of 1
Line	Description	Source (e.g., Grid or Range Identifier)	Container/Serial Number	Container Type	Unit Wt.
1	MDAS	Port Angeles Combat Range	USACE/PACR/HDR/0001	Small tool box	50 lbs
2					
3	Nothing Follows				
4					
5					

Inspector's certification: This certifies that the MPPEH residue, MD, MDAS, and Range Residue and/or Explosive Contaminated Property listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of any explosive hazards.

Printed/typed name: Rick St.Amand HDR	Signature:	Date: 13 Dec 13

Verifier certification: This certifies that the MPPEH residue, MD, MDAS , and Range Residue and/or Explosive Contaminated Property listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of any explosive hazards.

Printed/typed name: Byron Cook	Signature: Byron D. Cook	Date: 13 Dec 13

Transporter(s)	Transporter 1 acknowledgment of receipt of materials properly sealed/secured.		
	Printed/typed name:	Signature:	Date:
	Transporter 2 acknowledgment of receipt of materials properly sealed/secured.		
	Printed/typed name:	Signature:	Date:
Final Disposition	Facility owner or operator: Certification of receipt of AEDA/Range Residue materials, except as noted above. Acknowledgment of receipt of materials properly sealed/secured.		
	Printed/typed name: Terry Nathcutt	Signature:	Date: 12/17/13

APPENDIX

Summary of Lead in Soils – X-ray Fluorescence Screening Data

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XRF Reading No.	Date & Time	Type	Duration (sec)	Depth (inches)	Pb (mg/kg)	Munitions Response Site/Observations
421	11/14/2013 8:44	SOIL	30.9	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
422	11/14/2013 8:48	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
423	11/14/2013 8:50	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
424	11/14/2013 8:53	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
425	11/14/2013 8:55	SOIL	30.9	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
426	11/14/2013 8:57	SOIL	31.0	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
427	11/14/2013 8:59	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
428	11/14/2013 9:01	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
429	11/14/2013 9:03	SOIL	30.4	0-6	11	Range Complex No. 1 (a)/Natural Feature
430	11/14/2013 9:06	SOIL	30.5	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
431	11/14/2013 9:08	SOIL	30.6	0-6	11	Range Complex No. 1 (a)/Natural Feature
432	11/14/2013 9:11	SOIL	30.3	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
433	11/14/2013 9:13	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
434	11/14/2013 9:15	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
435	11/14/2013 9:17	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
436	11/14/2013 9:19	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
437	11/14/2013 9:21	SOIL	30.8	0-6	11	Range Complex No. 1 (a)/Natural Feature
438	11/14/2013 9:23	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
439	11/14/2013 9:26	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
440	11/14/2013 9:30	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
441	11/14/2013 9:32	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
442	11/14/2013 9:34	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
443	11/14/2013 9:36	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
444	11/14/2013 9:38	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
445	11/14/2013 9:39	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
446	11/14/2013 9:41	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
447	11/14/2013 9:43	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
448	11/14/2013 9:45	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
449	11/14/2013 9:47	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
450	11/14/2013 9:49	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
451	11/14/2013 9:51	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
452	11/14/2013 9:53	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
453	11/14/2013 9:55	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
454	11/14/2013 9:57	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
455	11/14/2013 10:00	SOIL	31.0	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
456	11/14/2013 10:03	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
457	11/14/2013 10:05	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
458	11/14/2013 10:07	SOIL	31.0	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
459	11/14/2013 10:08	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
460	11/14/2013 10:10	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature

XRF Reading No.	Date & Time	Type	Duration (sec)	Depth (inches)	Pb (mg/kg)	Munitions Response Site/Observations
461	11/14/2013 10:12	SOIL	31.0	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
462	11/14/2013 10:14	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
463	11/14/2013 10:16	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
464	11/14/2013 10:18	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
465	11/14/2013 10:20	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
466	11/14/2013 10:22	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
467	11/14/2013 10:24	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
468	11/14/2013 10:26	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
487	11/21/2013 13:49	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
488	11/21/2013 13:52	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
489	11/21/2013 13:54	SOIL	30.5	0-6	13	Range Complex No. 1 (a)/Natural Feature
490	11/21/2013 13:55	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
491	11/21/2013 13:57	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
492	11/21/2013 13:59	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
493	11/21/2013 14:01	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
494	11/21/2013 14:03	SOIL	30.6	0-6	12	Range Complex No. 1 (a)/Natural Feature
495	11/21/2013 14:06	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
496	11/21/2013 14:08	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
497	11/21/2013 14:10	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
498	11/21/2013 14:11	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
499	11/21/2013 14:14	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
500	11/21/2013 14:16	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
501	11/21/2013 14:18	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
502	11/21/2013 14:20	SOIL	30.7	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
503	11/21/2013 14:23	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
504	11/21/2013 14:25	SOIL	30.5	0-6	13	Range Complex No. 1 (a)/Natural Feature
505	11/21/2013 14:28	SOIL	30.4	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
506	11/21/2013 14:31	SOIL	30.6	0-6	< LOD	Range Complex No. 1 (a)/Natural Feature
507	11/21/2013 14:54	SOIL	30.7	0-6	< LOD	Range Complex No. 1/Unfired Small Arms Debris
508	11/21/2013 14:57	SOIL	30.3	0-6	< LOD	Range Complex No. 1/Unfired Small Arms Debris
509	11/21/2013 14:59	SOIL	30.6	0-6	< LOD	Range Complex No. 1/Unfired Small Arms Debris
510	11/21/2013 15:01	SOIL	30.3	0-6	< LOD	Range Complex No. 1/Unfired Small Arms Debris
511	11/21/2013 15:03	SOIL	30.7	0-6	< LOD	Range Complex No. 1/Unfired Small Arms Debris
512	11/21/2013 15:06	SOIL	31.3	0-6	12	Range Complex No. 1
513	11/21/2013 15:07	SOIL	30.6	0-6	< LOD	Range Complex No. 1
514	11/21/2013 15:11	SOIL	31.0	0-6	< LOD	Range Complex No. 1
516	11/21/2013 15:15	SOIL	30.5	0-6	64	Range Complex No. 1
517	11/21/2013 15:17	SOIL	30.4	0-6	< LOD	Range Complex No. 1
518	11/21/2013 15:19	SOIL	30.4	0-6	< LOD	Range Complex No. 1
520	11/21/2013 15:22	SOIL	30.5	0-6	111	Range Complex No. 1

XRF Reading No.	Date & Time	Type	Duration (sec)	Depth (inches)	Pb (mg/kg)	Munitions Response Site/Observations
521	11/21/2013 15:25	SOIL	30.5	0-6	22	Range Complex No. 1
539	11/22/2013 13:46	SOIL	31.0	0-6	< LOD	Range Complex No. 1
540	11/22/2013 13:49	SOIL	30.6	0-6	< LOD	Range Complex No. 1
541	11/22/2013 13:51	SOIL	30.7	0-6	< LOD	Range Complex No. 1
542	11/22/2013 13:54	SOIL	30.4	0-6	13	Range Complex No. 1
543	11/22/2013 13:56	SOIL	30.6	0-6	< LOD	Range Complex No. 1
544	11/22/2013 13:58	SOIL	30.6	0-6	< LOD	Range Complex No. 1
545	11/22/2013 14:00	SOIL	30.6	0-6	< LOD	Range Complex No. 1
546	11/22/2013 14:02	SOIL	31.0	0-6	< LOD	Range Complex No. 1
547	11/22/2013 14:04	SOIL	30.6	0-6	< LOD	Range Complex No. 1
548	11/22/2013 14:07	SOIL	30.7	0-6	12	Range Complex No. 1
549	11/22/2013 14:09	SOIL	30.7	0-6	< LOD	Range Complex No. 1
550	11/22/2013 14:12	SOIL	30.6	0-6	< LOD	Range Complex No. 1
551	11/22/2013 14:15	SOIL	30.7	0-6	< LOD	Range Complex No. 1
552	11/22/2013 14:17	SOIL	30.7	0-6	< LOD	Range Complex No. 1
553	11/22/2013 14:19	SOIL	30.4	0-6	10	Range Complex No. 1
554	11/22/2013 14:20	SOIL	30.7	0-6	< LOD	Range Complex No. 1
555	11/22/2013 14:22	SOIL	30.6	0-6	9	Range Complex No. 1
556	11/22/2013 14:24	SOIL	30.5	0-6	11	Range Complex No. 1
557	11/22/2013 14:26	SOIL	30.6	0-6	34	Range Complex No. 1
558	11/22/2013 14:28	SOIL	30.3	0-6	< LOD	Range Complex No. 1
559	11/22/2013 14:31	SOIL	30.6	0-6	< LOD	Range Complex No. 1
560	11/22/2013 14:33	SOIL	30.3	0-6	< LOD	Range Complex No. 1
561	11/22/2013 14:35	SOIL	30.6	0-6	< LOD	Range Complex No. 1
562	11/22/2013 14:38	SOIL	30.6	0-6	13	Range Complex No. 1
563	11/22/2013 14:39	SOIL	30.7	0-6	< LOD	Range Complex No. 1
564	11/22/2013 14:41	SOIL	30.6	0-6	< LOD	Range Complex No. 1
565	11/22/2013 14:43	SOIL	30.6	0-6	< LOD	Range Complex No. 1
566	11/22/2013 14:45	SOIL	30.6	0-6	12	Range Complex No. 1
567	11/22/2013 14:47	SOIL	30.4	0-6	< LOD	Range Complex No. 1
568	11/22/2013 14:49	SOIL	30.4	0-6	14	Range Complex No. 1
569	11/22/2013 14:51	SOIL	30.6	0-6	< LOD	Range Complex No. 1
570	11/22/2013 14:53	SOIL	30.5	0-6	9	Range Complex No. 1

Notes:
LOD = Limit of detection - approximately 10 mg/kg

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APPENDIX

Visual Sampling Plan Reports

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Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

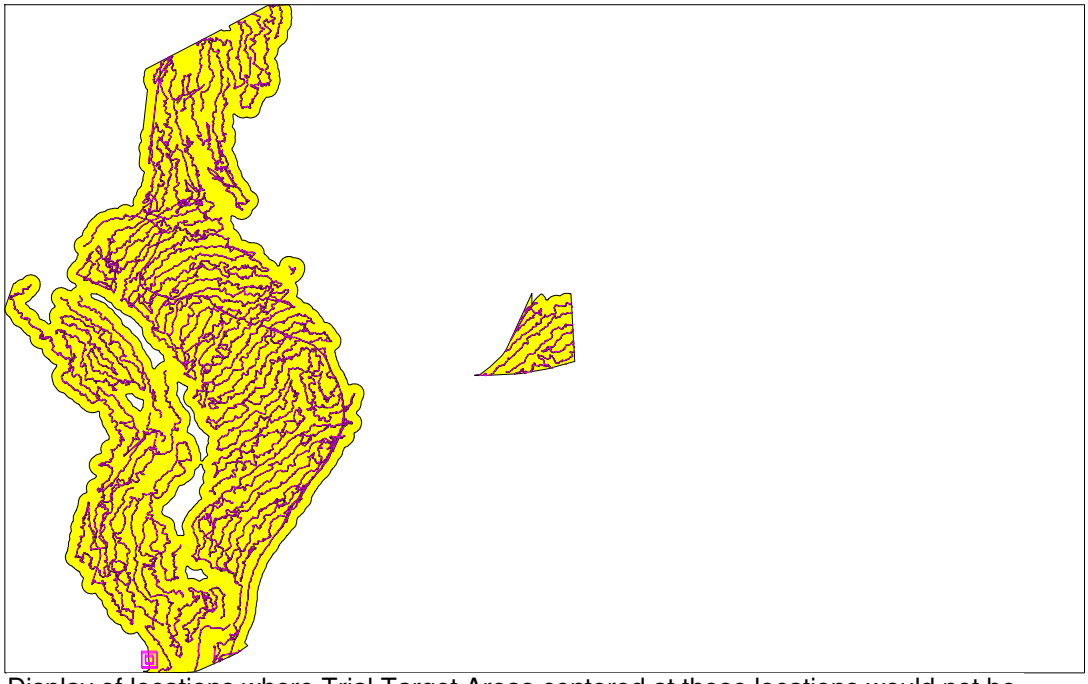
Summary

This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.968 Height/Width)
Semi-major axis length of target area of concern	32.2795 meters
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	1.00 (100% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 1 (100% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	32.2795 meters
s	0.968
θ	Random
Output	
P	1.00

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

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Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

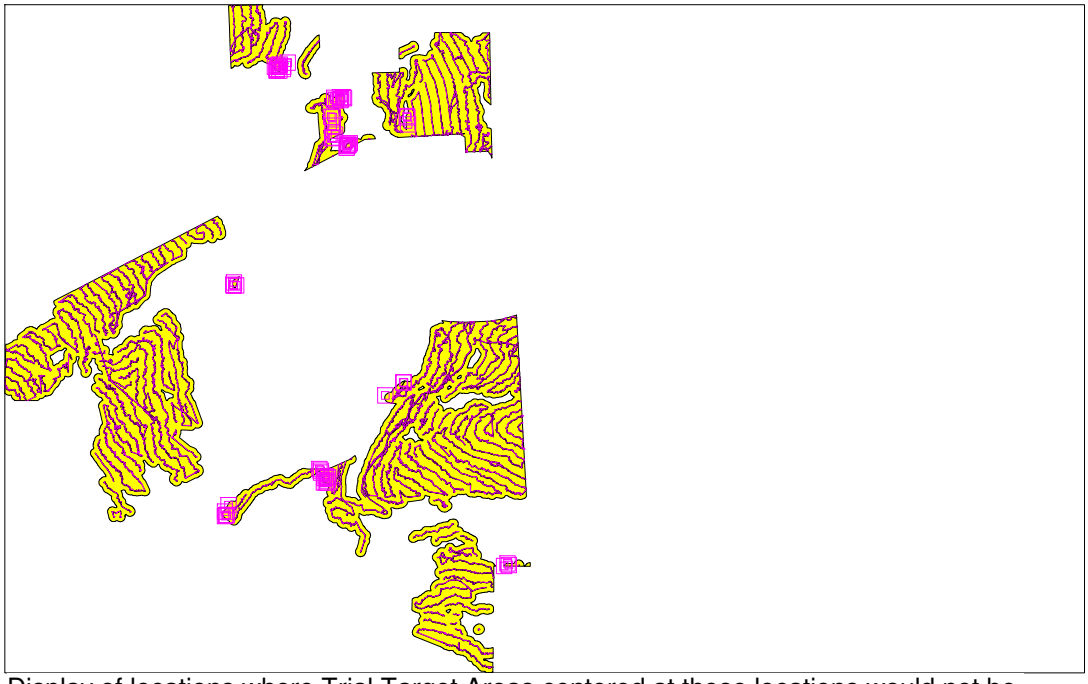
Summary

This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.968 Height/Width)
Semi-major axis length of target area of concern	105.904 feet
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.99 (99% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 0.99 (99% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	105.904 feet
s	0.968
θ	Random
Output	
P	0.99

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

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Trial Size	Transect Spacing feet	IA Size Acres	IA Shape	Shape Description	Score
10000	75	1	0.2	ellipse	100
10000	75	1	1	circle	100
10000	75	0.5	0.2	ellipse	99
10000	75	0.5	1	circle	100
10000	75	0.25	0.2	ellipse	97
10000	75	0.25	1	circle	95
10000	75	0.1	0.2	ellipse	91
10000	75	0.1	1	circle	86
10000	150	1	0.2	ellipse	99
10000	150	1	1	circle	100
10000	150	0.5	0.2	ellipse	97
10000	150	0.5	1	circle	99
10000	150	0.25	0.2	ellipse	92
10000	150	0.25	1	circle	89
10000	150	0.1	0.2	ellipse	79
10000	150	0.1	1	circle	67

Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

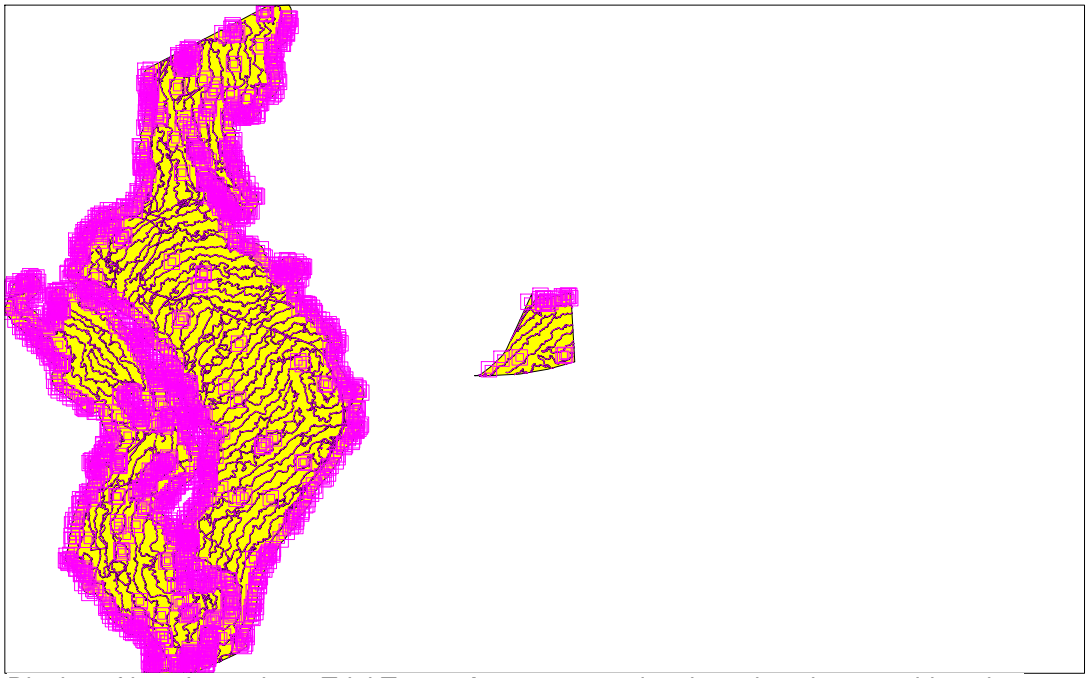
Summary

This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	11.3497 meters
Number of simulation trials	10000
Simulated probability of traversing the target area	0.86 (86% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective

The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required

high probability. The probability of traversing a target area was simulated to be 0.86 (86% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	11.3497 meters
Output	
P	0.86

Where:
n is the number of simulation trials
r is the radius of the target area
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

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Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

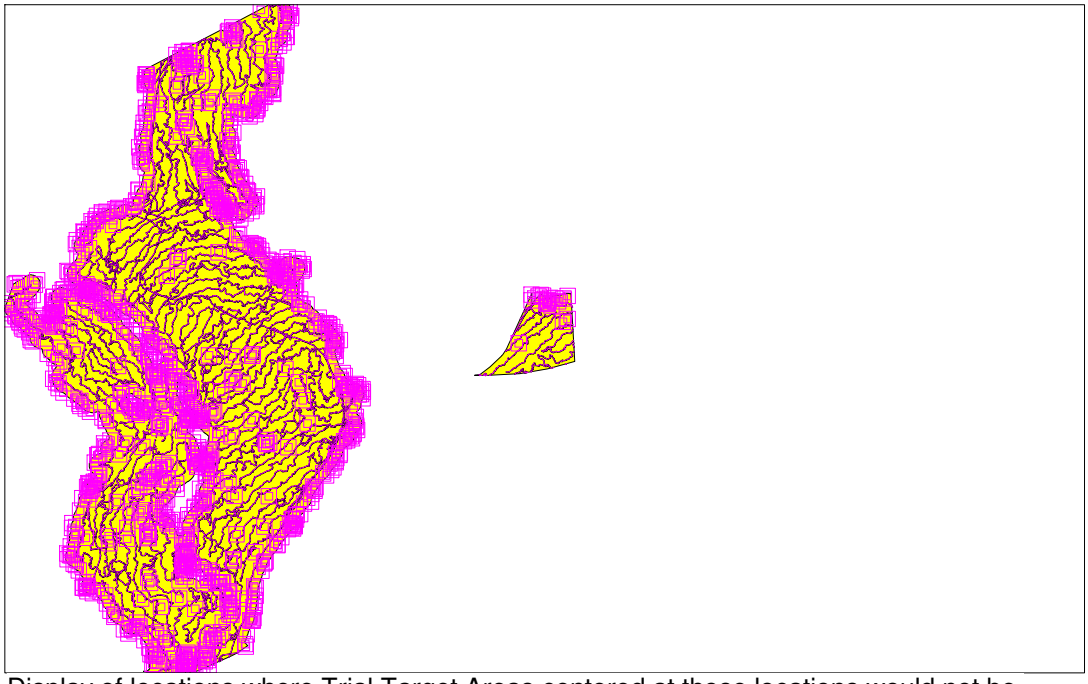
Summary

This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	25.3787 meters
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.91 (91% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 0.91 (91% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	25.3787 meters
s	0.2
θ	Random
Output	
P	0.91

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

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Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary

This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	35.8909 meters
Number of simulation trials	10000
Simulated probability of traversing the target area	1.00 (100% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective

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high probability. The probability of traversing a target area was simulated to be 1 (100% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

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When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	35.8909 meters
Output	
P	1.00

Where:
n is the number of simulation trials
r is the radius of the target area
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
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Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary

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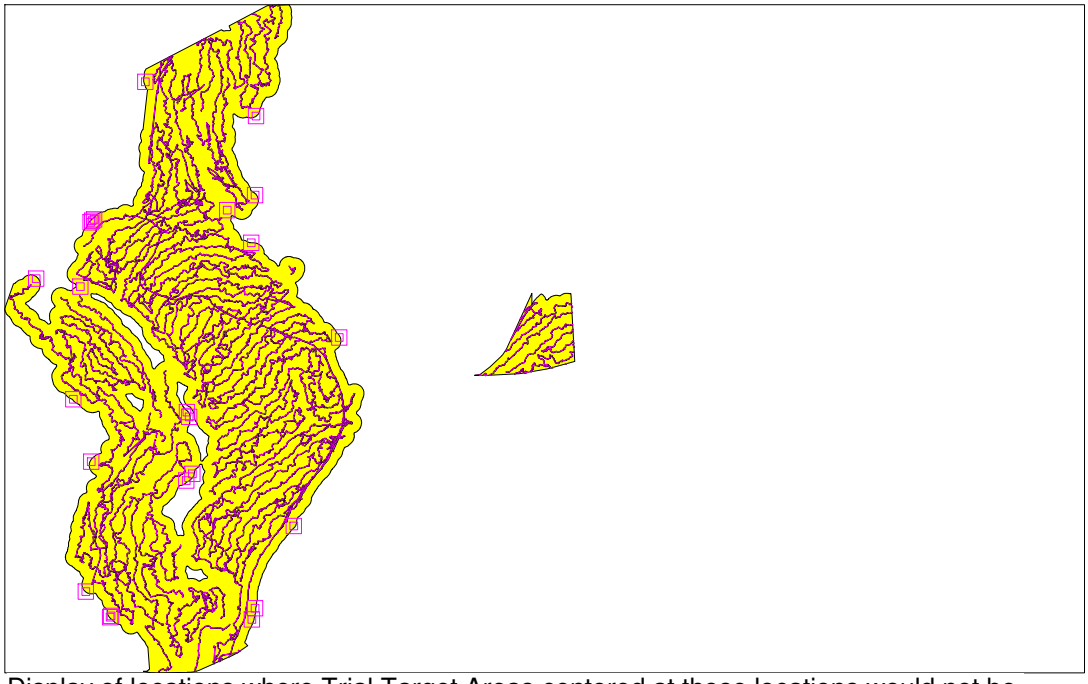
SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	80.2544 meters
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	1.00 (100% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 1 (100% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
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The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	80.2544 meters
s	0.2
θ	Random
Output	
P	1.00

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

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Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary

This report summarizes the post-survey evaluation of detecting target areas of UXO developed by VSP based on inputs provided by the VSP user.

The following table summarizes the sampling design used and the post-survey evaluation by VSP. A figure that shows the actual swath placement in the field and the simulated target area centers that could exist without being traversed is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	25.3787 meters
Number of simulation trials	10000
Simulated probability of traversing the target area	1.00 (100% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective

The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required

high probability. The probability of traversing a target area was simulated to be 1 (100% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

Probability of Traversing a Target Area
VSP can be used to approximate the probability that a target area of specified size and shape would have been traversed by any given set of transects. The probability of traversing an elliptical or circular target area with a meandering swath pattern is approximated by the probability of the target intersecting one or more of the swath rectangles. It is an approximation because there is no compensation for the gaps between and overlapping areas of the rectangles. Rather than try to deterministically calculate the probability of traversing, VSP uses a Monte-Carlo method for simulating the probability of traversing (hitting) the target.

When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	25.3787 meters
Output	
P	1.00

Where:
n is the number of simulation trials
r is the radius of the target area
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

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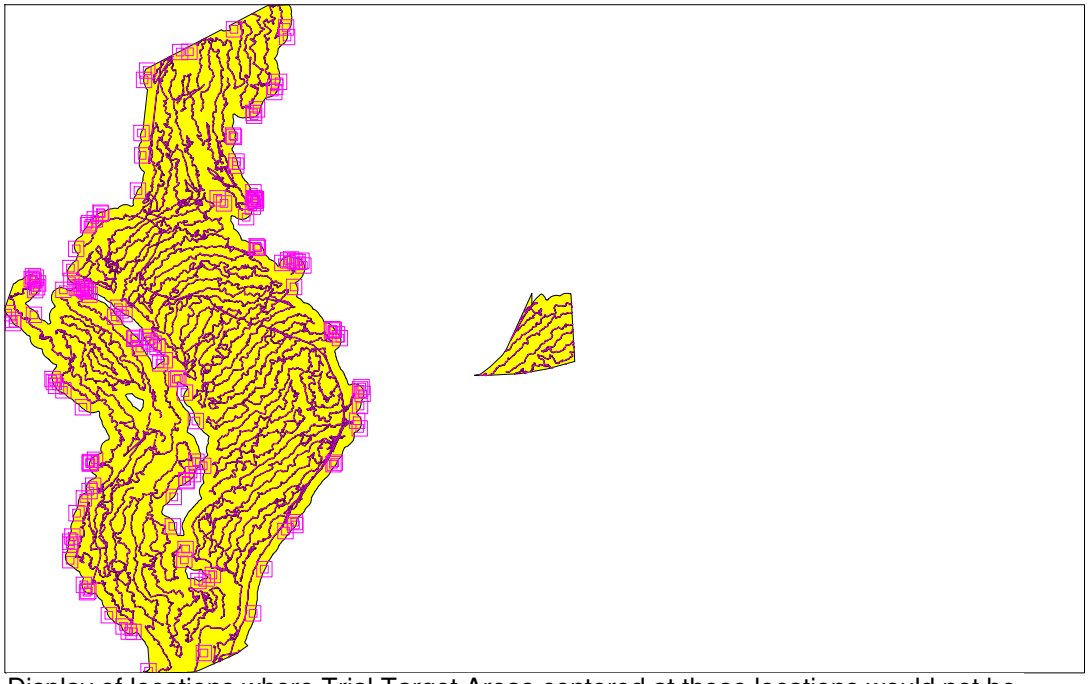
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	56.7484 meters
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.99 (99% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 0.99 (99% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
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When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	56.7484 meters
s	0.2
θ	Random
Output	
P	0.99

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
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Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary

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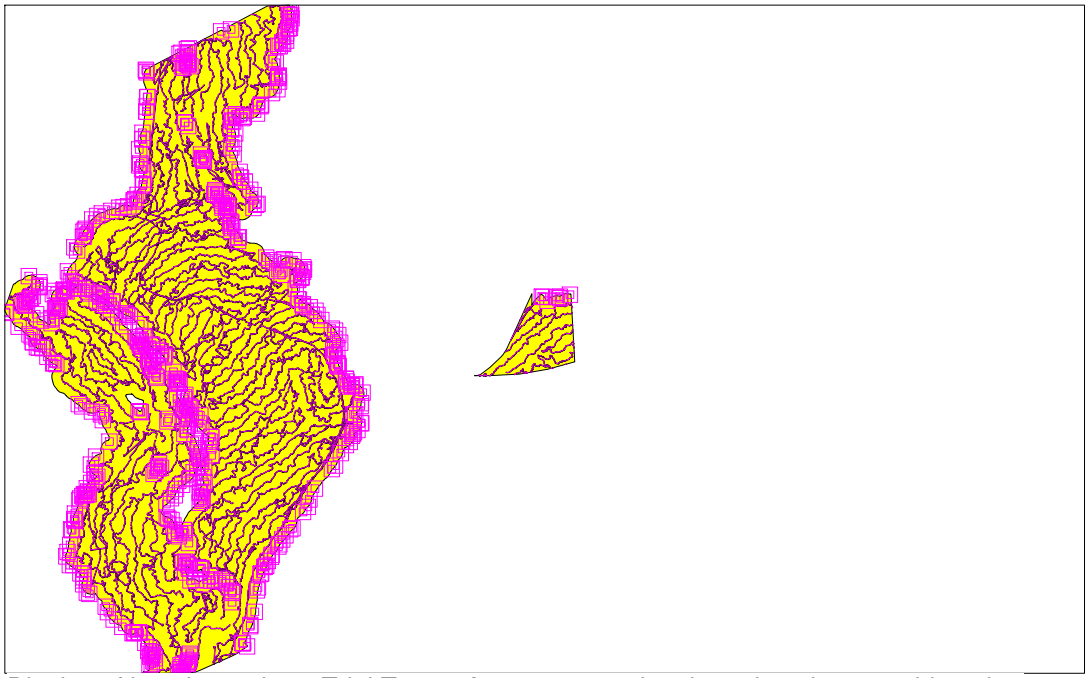
SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	17.9454 meters
Number of simulation trials	10000
Simulated probability of traversing the target area	0.95 (95% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective

The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required

high probability. The probability of traversing a target area was simulated to be 0.95 (95% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

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Parameter	Value
Inputs	
n	10000
r	17.9454 meters
Output	
P	0.95

Where:
n is the number of simulation trials
r is the radius of the target area
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
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Post-survey evaluation for detecting target areas of unexploded ordnance (UXO)

Summary

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SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	2
Specified sampling area [b]	720809.37 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	40.1272 meters
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.97 (97% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
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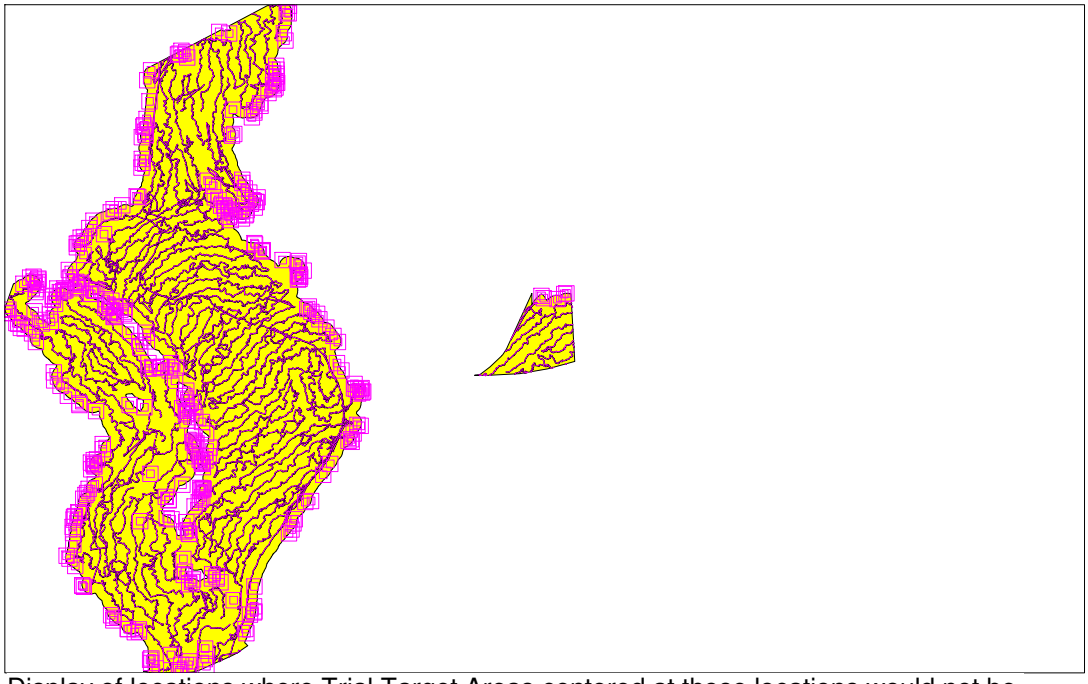

Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 0.97 (97% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
The transect (swath) sampling plans laid out by VSP are perfect straight lines that are spaced at regular intervals. However, when field crews implement a VSP sampling plan, they may find that obstacles, dense vegetation, geographic features and other factors make it undesirable, difficult or impossible to follow straight lines with the geophysical sensors. Also, the VSP user may have developed a sampling plan from a different source.

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The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	40.1272 meters
s	0.2
θ	Random
Output	
P	0.97

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
2. the meandering swaths can be represented as a series of connected rectangles

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Summary

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SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Detect the presence of a target area that has a specified size and shape
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	37.2365 feet
Number of simulation trials	10000
Simulated probability of traversing the target area	0.67 (67% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective

The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required

high probability. The probability of traversing a target area was simulated to be 0.67 (67% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
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Probability of Traversing a Target Area
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Parameter	Value
Inputs	
n	10000
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Output	
P	0.67

Where:
n is the number of simulation trials
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P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
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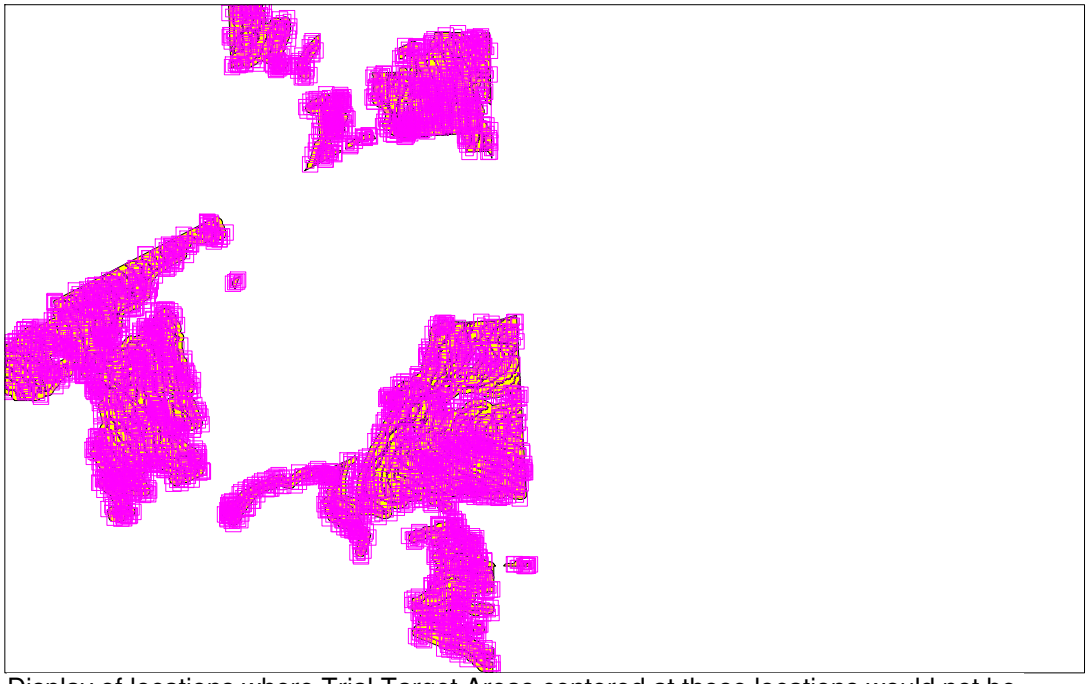
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	83.2634 feet
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.80 (80% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The probability of traversing a target area was simulated to be 0.8 (80% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
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The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	83.2634 feet
s	0.2
θ	Random
Output	
P	0.80

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
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Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	117.752 feet
Number of simulation trials	10000
Simulated probability of traversing the target area	1.00 (100% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



Display of locations where Trial Target Areas centered at those locations would not be traversed

Primary Sampling Objective

The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required

high probability. The probability of traversing a target area was simulated to be 1 (100% chance).

Selected Sampling Approach
The specified sampling approach was a meandering swath pattern specified by the VSP user. If a different pattern or swath width is used, the probability of traversing the target area will be different than that calculated by VSP through simulation.

Simulation Process and Inputs
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Transects used in the field are defined as a series of connected points. These connected points would probably be captured by a logging global positioning system (GPS). In reality, swaths have a width reflecting the width of the detection equipment as it traverses the ground. The swaths therefore can be represented as a series of connected rectangles rather than as a series of connected line segments. VSP refers to these types of transects as meandering swaths.

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When the Target Traversal "Simulate" button is pushed, VSP throws down the *n* trial target areas and counts the number that touch one of the swath segments. A "hit" occurs when a trial target area touches a swath segment. The user can choose to have a sample point placed at the center of each "missed" target area, highlighting areas that may need further characterization. The probability of traversing is computed as the number of hits divided by the number of trial targets. This probability is displayed as a percentage. For technical details of how the algorithm works, refer to the document: *Version 2.0 Visual Sample Plan (VSP): UXO Module Code Verification*, by Gilbert et al. (2003).

The following table displays the parameters used for the simulation:

Parameter	Value
Inputs	
n	10000
r	117.752 feet
Output	
P	1.00

Where:
n is the number of simulation trials
r is the radius of the target area
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
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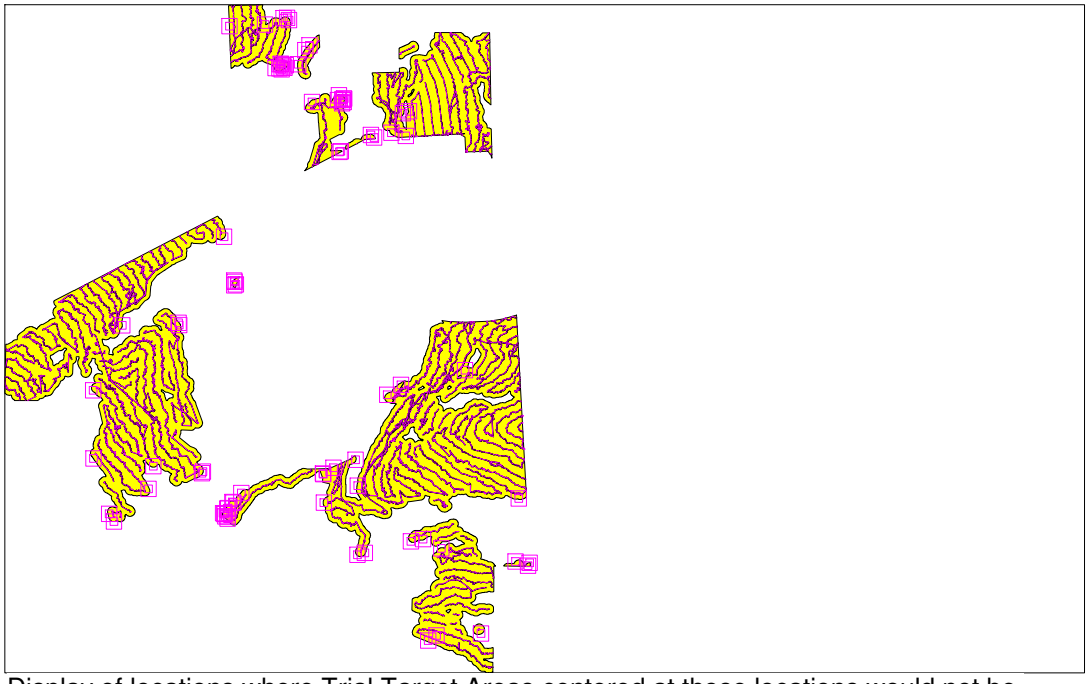
Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	263.302 feet
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.99 (99% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



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Parameter	Value
Inputs	
n	10000
r	263.302 feet
s	0.2
θ	Random
Output	
P	0.99

Where:
n is the number of simulation trials
r is the length of the semi-major axis of the elliptical target area
s is the shape of the target area (height to width ratio)
θ is the orientation of the target area with respect to the x-axis
P is the probability of traversing a target area

Statistical Assumptions
The assumptions associated with the swath spacing algorithm are that:
1. the target area (its projection onto the coordinate plane) is circular or elliptical,
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Type of Sampling Design	Swath (transect)
Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	83.2634 feet
Number of simulation trials	10000
Simulated probability of traversing the target area	0.99 (99% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.



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Inputs	
n	10000
r	83.2634 feet
Output	
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Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	186.183 feet
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.97 (97% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
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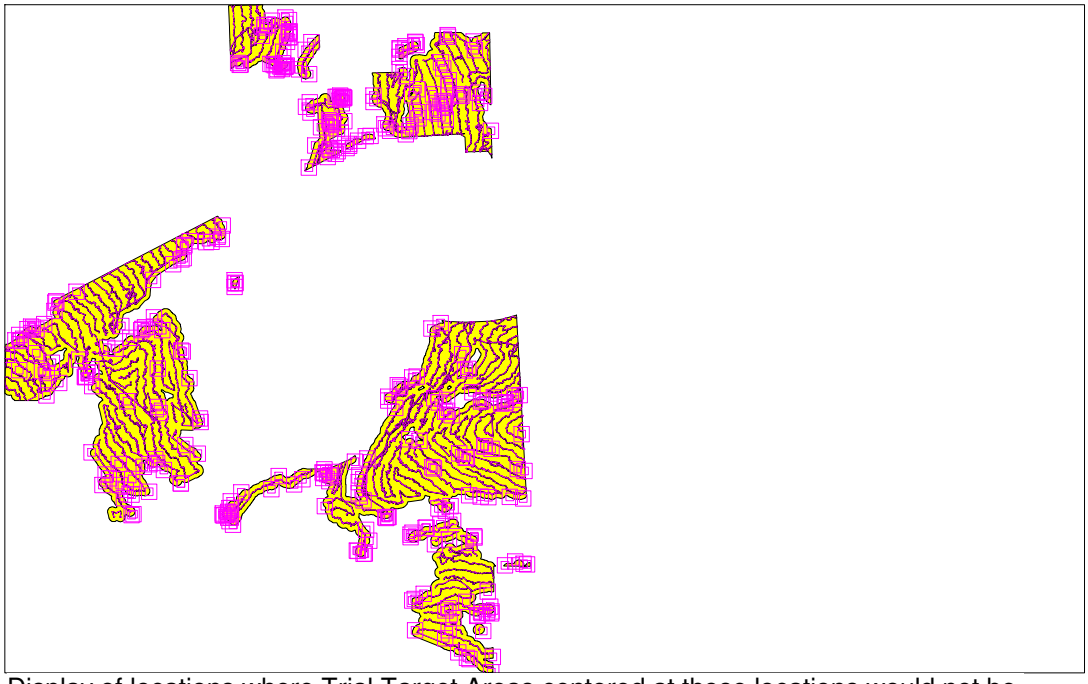

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Parameter	Value
Inputs	
n	10000
r	186.183 feet
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θ	Random
Output	
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Formula for calculating the probability of traversing	Monte Carlo Simulation (method described below)
Number of selected sample areas [a]	13
Specified sampling area [b]	1811315.10 m^2
Swath pattern	Meandering
Shape of target area of concern	Circular
Radius of target area of concern	58.8761 feet
Number of simulation trials	10000
Simulated probability of traversing the target area	0.89 (89% chance)

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
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Shape of target area of concern	Ellipse (0.2 Height/Width)
Semi-major axis length of target area of concern	131.651 feet
Assumed orientation of target to x-axis	Random
Number of simulation trials	10000
Simulated probability of traversing the target area	0.92 (92% chance)

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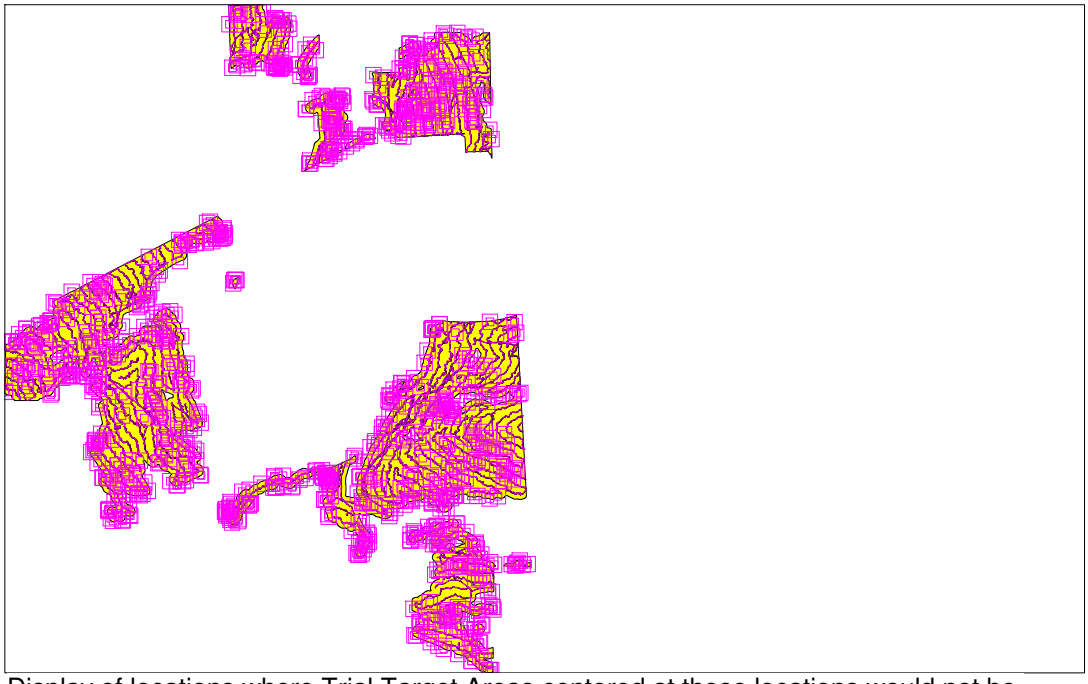

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Output	
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APPENDIX

Munitions and Explosives of Concern Hazard Assessment Tables

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MEC HA Summary Information

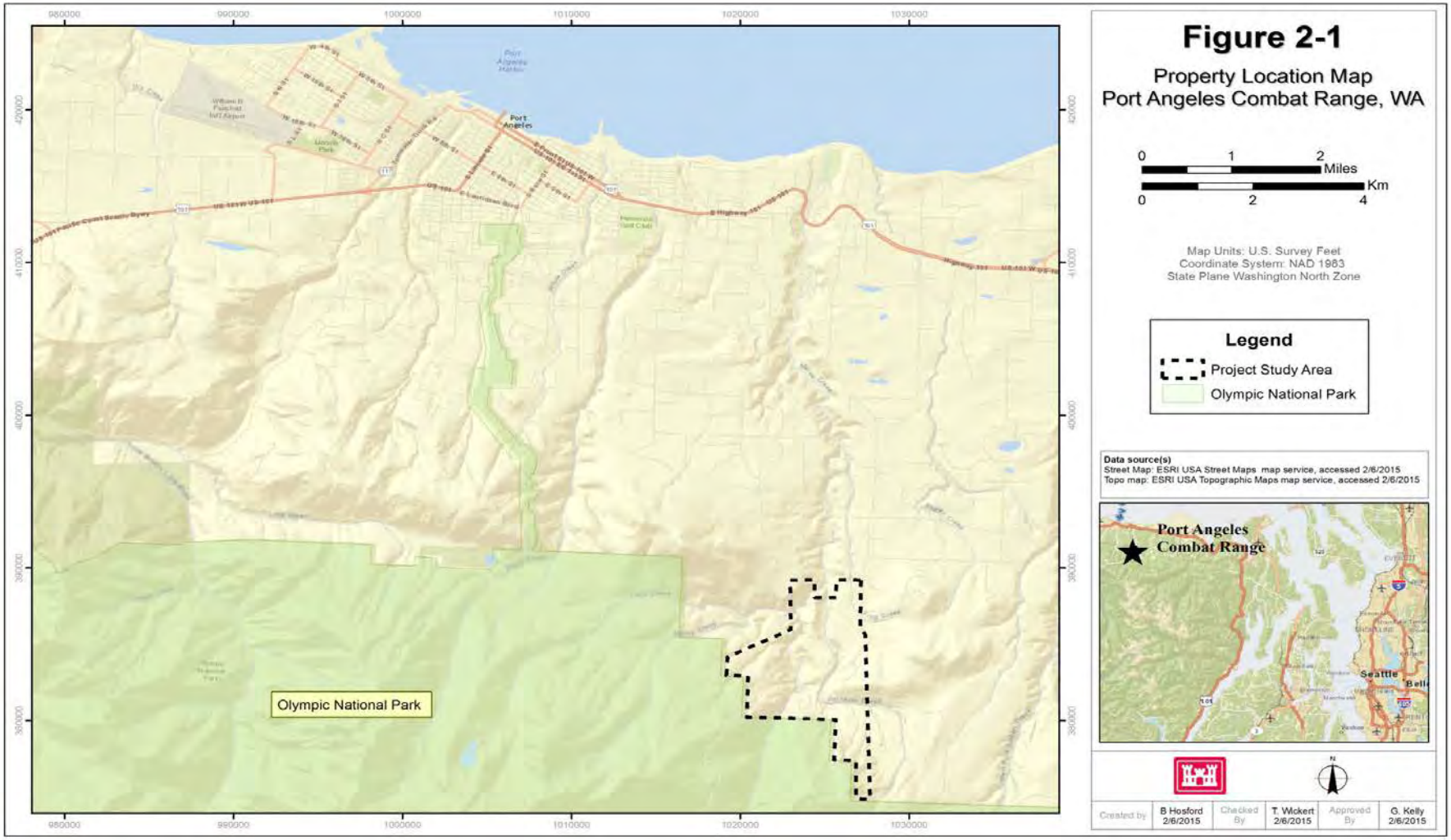
					Comments
Site ID:	**Port Angeles Combat Range FUDS Property No. F10WA00330**				Prepared by: Celeste Marsh, HDR, Inc.
Date:	2/6/2015				Reviewed by: N. Luke, J. Rogalla, HDR, Inc.
Port Angeles Combat Range - Range Complex No. 1 MRS					
Please identify the single specific area to be assessed in this hazard assessment. From this point forward, all references to "site" or "MRS" refer to the specific area that you have defined.					
A. Enter a unique identifier for the site:					
Port Angeles Combat Range - **Range Complex No. 1** MRS					
Provide a list of information sources used for this hazard assessment. As you are completing the worksheets, use the "Select Ref(s)" buttons at the ends of each subsection to select the applicable information sources from the list below.					
Ref. No.	Title (include version, publication date)				
1	Port Angeles Combat Range FUDS Remedial Investigation Work Plan, Draft Final, HDR, Inc., July, 2013				
2	Archive Search Report Conclusions and Recommendation for the former Port Angeles Combat Range, USACE, September, 1996				
3	Final Site Inspection Report, Port Angeles Combat Range, Clallam County, WA FUDS Property No. F10WA0033, Shaw, June, 2009				
4	Inventory Project Report - Port Angeles Combat Range, USACE, 1993				
5	Archives Search Report Supplement, Port Angeles Combat Range, Clallam County, Washington, USACE, 2004.				
6	Preliminary Assessment, Port Angeles Combat Range, USACE, Seattle District, 1993				Cannot locate actual PA; may have been an informal process or incorporated into the SI
7	Port Angeles Combat Range, Range Clearance Technology Assessment, U.S. Navy (NEODFC,1986)				
8	Data Collection Report, EM61-MK2 Data Collection and Analysis at the Port Angeles Combat Range, Port Angeles, WA, Environmental Security Technology Certification Program (ESTCP), September, 2011				
9	FDRF-75 mm HE Mk I DB Revision 4/6/13, DDESB				From ESP, HDR, 2013
10	FDRF-81mm M45, DB Revision 4/6/13, DDESB				From ESP, HDR, 2013
11	Explosives Site Plan, HDR, Inc., July 2013				
12	Port Angeles Combat Range RI/FS, HDR Inc., 2015				

B. Briefly describe the site:				Another smaller area (north end) was not investigated during the RI (no ROE)
1. Area (include units):	**105.7 acres**			The area within the Olympic National Park was not investigated during the RI (no Right-of-Entry, (ROE))
2. Past munitions-related use:				Ground-to-ground combat range; weapons practice including small arms
Firing Points				

3. Current land-use activities (list all that occur):				
Forest resource management, recreation, limited farming, hunting, perhaps limited fishing, year-round human occupancy, possible wildlife conservation habitat				T&E species critical habitat nearby but not within the PACR
4. Are changes to the future land-use planned?			No	None known
5. What is the basis for the site boundaries?				
The overall site boundaries are the MRS boundaries established at the conclusion of the SI.				There are a number of private inholdings including the City of Port Angeles which maintains the area as a municipal watershed
6. How certain are the site boundaries?				
The reported total area of Range Complex No.1 MRS (2,629 acres) exceeds the total area of the seven sub-ranges combined (2,519 acres). This discrepancy is due to the area of the Impact/Buffer Area extending beyond the FUDS property boundary in the northern portion of the PACR MRS.				For more detail pertaining to the seven subranges, refer to **Table 2-2**, Draft Final Port Angeles Combat Range RI Work Plan
Reference(s) for Part B:				
Port Angeles Combat Range FUDS Remedial Investigation Work Plan, Draft Final, HDR, Inc., July, 2013 **Archive Search Report Conclusions and Recommendation for the former Port Angeles Combat Range, USACE, September, 1996** **Final Site Inspection Report, Port Angeles Combat Range, Clallam County, WA FUDS Property No. F10WA0033, Shaw, June, 2009** **Inventory Project Report - Port Angeles Combat Range, USACE, 1993** **Archives Search Report Supplement, Port Angeles Combat Range, Clallam County, Washington, USACE, 2004.** **Preliminary Assessment, Port Angeles Combat Range, USACE, Seattle District, 1993** **Port Angeles Combat Range RI/FS, HDR Inc., 2015**		[redacted]		

C. Historical Clearances					
1. Have there been any historical clearances at the site?			Yes, surface clearance		
2. If a clearance occurred:					
	a. What year was the clearance performed?			1949, 1952, 1955, 1956, 1957, 2011, 2013	
	b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of removed items, and whether metal detectors were used):				
	October 1948 to January 1949 - a range clearance was conducted consisting of an inspection and dedudding program for approximately 775 acres thought to be contaminated. The work consisted of using mine detectors to sweep all open fields and known impact/target areas. Trees that were thought to contain projectiles were cut down (PACR SI Report, 2009). **May 7, 1949** - certificate of clearance (Docs. E-5 to E-9) issued noting approx. 775 ac cleared of dangerous/explosive material (USACE, 1996). **September 1952** -personnel from the bomb disposal team swept a 10-acre parcel (Peterson property) in the contaminated area that had been reportedly missed during the 1948-1949 work. No explosives were found. Despite no ordnance or scrap being found, "surface use only" was recommended to remain in place. **September 1956** - A subsurface sweep (max.12-inch depth); the 0.71-acre parcel was carried out by 411 Fort Lewis personnel Sept. 17-21. Considerable scrap metal from a target tank was collected as well as various items of expended ordnance. Items recovered included twenty-six 37mm, M51 rounds; one 37mm, M63 high explosive round; four 414 rusted bodies, M51 fuze type; and three rusted fin fragments, 81mm mortar. **March 1957** - A final clearance certificate indicated that further actions toward clearing the area would not achieve a completely "free and clear" determination. Items recovered were identified as "dangerous &/or explosive materials." **1986** - Range Clearance Technology Assessment was completed for the PACR (US Navy, 1986). The report concluded that access to virtually all the range is extremely limited due to terrain and vegetation and "Additional mechanical clearance of the range is environmentally, technically, and economically unfeasible at this time or in the foreseeable future". **2011** - Geophysical investigation, DGM recovered one (1) 37 mm projectile for a 31 ac. parcel survey (ESTCP Report). **2013** – Remedial Investigation/Feasibility Study – conducted DGM, assisted visual surveys on over 700 acres (remainder unsurveyable due to no ROE obtained or steep terrain) ; recovered 5 MEC items (37 mm M63 HE projectiles and considerable MD (HDR, 2014)				
Reference(s) for Part C:					
Port Angeles Combat Range FUDS Remedial Investigation Work Plan, Draft Final, HDR, Inc., July, 2013 **Archive Search Report Conclusions and Recommendation for the former Port Angeles Combat Range, USACE, September, 1996** **Final Site Inspection Report, Port Angeles Combat Range, Clallam County, WA FUDS Property No. F10WA0033, Shaw, June, 2009** **Inventory Project Report - Port Angeles Combat Range, USACE, 1993** **Archives Search Report Supplement, Port Angeles Combat Range, Clallam County, Washington, USACE, 2004.** **Preliminary Assessment, Port Angeles Combat Range, USACE, Seattle District, 1993** **Port Angeles Combat Range, Range Clearance Technology Assessment, U.S. Navy (NEODFC,1986)** **Data Collection Report, EM61-MK2 Data Collection and Analysis at the Port Angeles Combat Range, Port Angeles, WA, Environmental Security Technology Certification Program (ESTCP), September, 2011** **FDRF-75 mm HE Mk I DB Revision 4/6/13, DDESB** **FDRF-81mm M45, DB Revision 4/6/13, DDESB** **Explosives Site Plan, HDR, Inc., July 2013**	[redacted]			

D. Attach maps of the site below (select 'Insert/Picture' on the menu bar.)



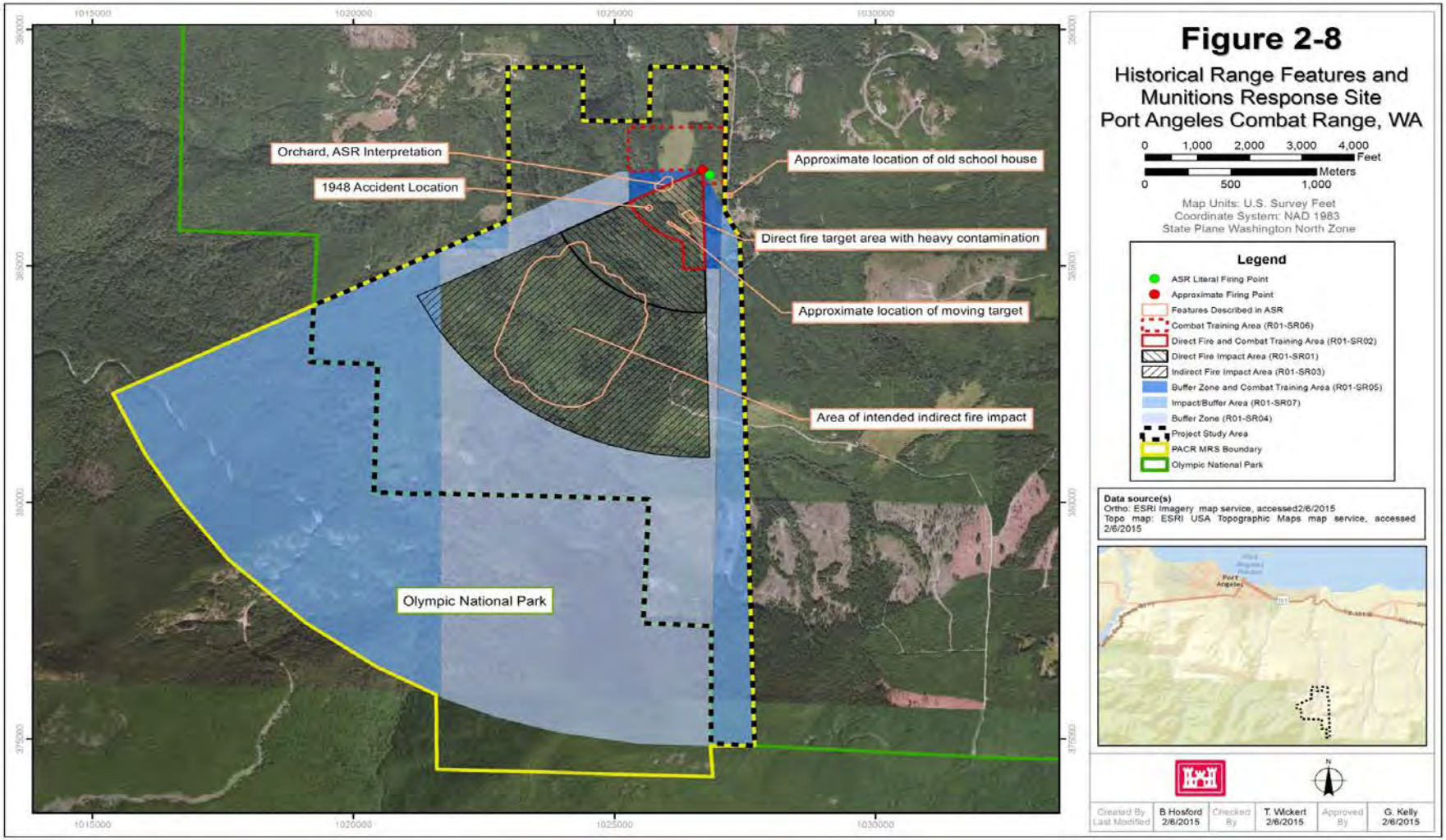


Figure 2-8

Historical Range Features and Munitions Response Site Port Angeles Combat Range, WA

0 1,000 2,000 3,000 4,000 Feet
0 500 1,000 Meters

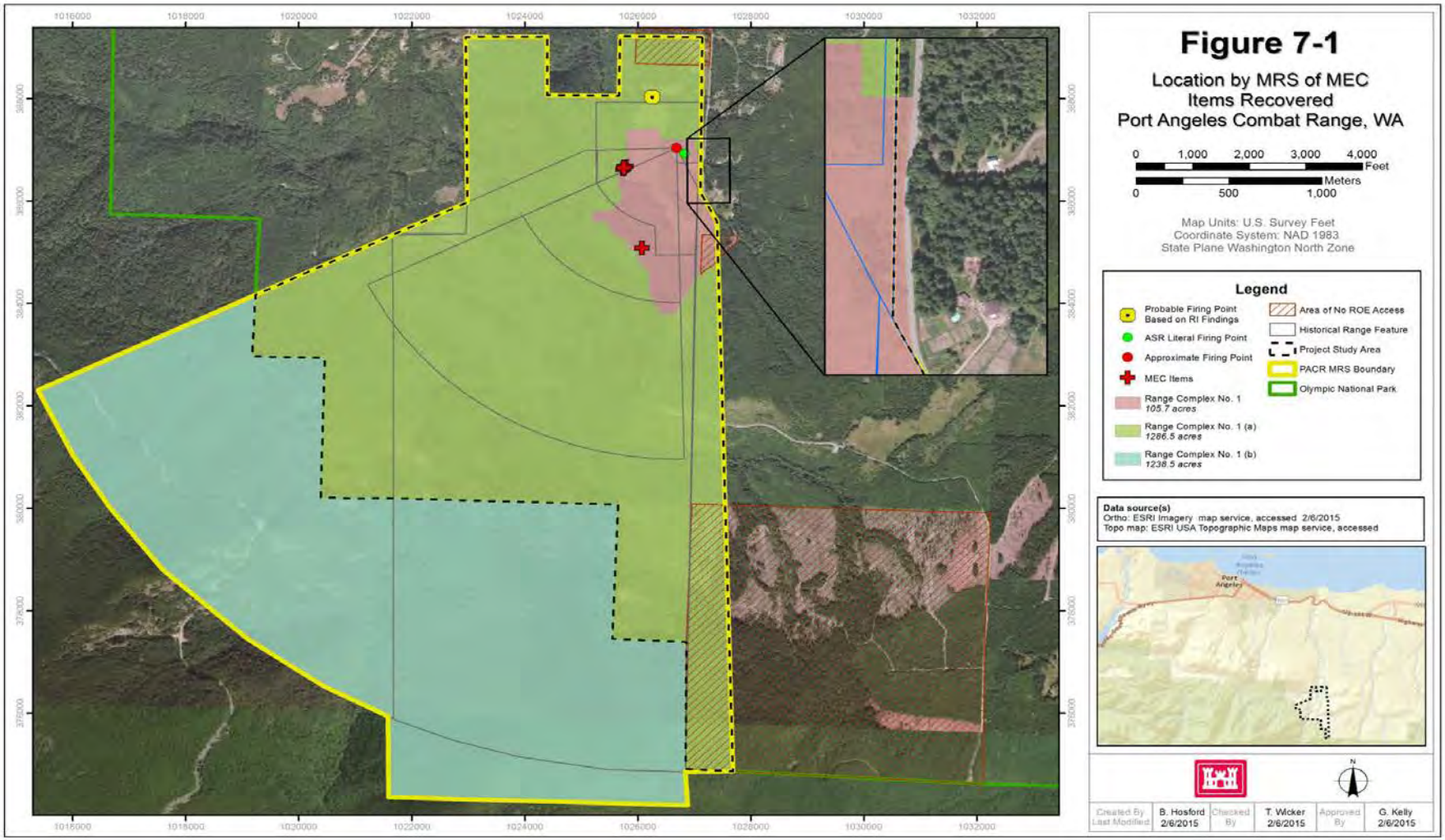
Map Units: U.S. Survey Feet
Coordinate System: NAD 1983
State Plane Washington North Zone

Legend

- ASR Literal Firing Point
- Approximate Firing Point
- Features Described in ASR
- Combat Training Area (R01-SR06)
- Direct Fire and Combat Training Area (R01-SR02)
- Direct Fire Impact Area (R01-SR01)
- Indirect Fire Impact Area (R01-SR03)
- Buffer Zone and Combat Training Area (R01-SR05)
- Impact/Buffer Area (R01-SR07)
- Buffer Zone (R01-SR04)
- Project Study Area
- PACR MRS Boundary
- Olympic National Park

Data source(s)
Ortho: ESRI Imagery map service, accessed2/6/2015
Topo map: ESRI USA Topographic Maps map service, accessed 2/6/2015

Created By	Last Modified	Checked By	Approved By
B Hosford 2/6/2015		T. Wickert 2/6/2015	G. Kelly 2/6/2015



Summary Info Worksheet

Site ID: **Port Angeles Combat Range FUDS Property No. F10WA00330**
Date: **2/6/2015**
Port Angeles Combat Range - Range Complex No. 1 MRS

Cased Munitions Information

Item No.	Munition Type (e.g., mortar, projectile, etc.)	Munition Size	Munition Size Units	Mark/ Model	Energetic Material Type	Is Munition Fuzed?	Fuzing Type	Fuze Condition	Minimum Depth for Munition (ft)	Location of Munitions	Comments (include rationale for munitions that are "subsurface only")
1	Mortars	81	mm	M45	High Explosive	Yes	Impact	Armed	0.5	Surface and Subsurface	item suspected - used this listed item from the ESP per R. Irons (2/27/14); not actually found during the 2013 RI
2	Mortars	37	mm	M63	High Explosive	Yes	Impact	Armed	0.5	Surface and Subsurface	MEC -Five (5) projectiles; shallow subsurface; 4 found in K-03 grid, 1 found in M-11 grid
3	Artillery	75	mm	Mk I	High Explosive	Yes	Impact	Armed	0.5	Surface and Subsurface	based on MD only; assumed armed
4	Mortars	81	mm	M57	White Phosphorus	Yes	Impact	Armed	0.5	Surface and Subsurface	based on MD only; assumed armed
5	Mortars	81	mm	M43	High Explosive	Yes	Impact	Armed	0.5	Surface and Subsurface	based on MD only; assumed armed

Reference(s) for table above:

[redacted]

Port Angeles Combat Range FUDS Remedial Investigation Work Plan, Draft Final, HDR, Inc., July, 2013
Archive Search Report Conclusions and Recommendation for the former Port Angeles Combat Range, USACE, September, 1996
Final Site Inspection Report, Port Angeles Combat Range, Clallam County, WA FUDS Property No. F10WA0033, Shaw, June, 2009
Inventory Project Report - Port Angeles Combat Range, USACE, 1993
Archives Search Report Supplement, Port Angeles Combat Range, Clallam County, Washington, USACE, 2004.
Port Angeles Combat Range, Range Clearance Technology Assessment, U.S. Navy (NEODFC,1986)
Data Collection Report, EM61-MK2 Data Collection and Analysis at the Port Angeles Combat Range, Port Angeles, WA, Environmental Security Technology Certification Program (ESTCP), September, 2011
FDRF-75 mm HE Mk I DB Revision 4/6/13, DDESB
FDRF-81mm M45, DB Revision 4/6/13, DDESB
Explosives Site Plan, HDR, Inc., July 2013
Port Angeles Combat Range RI/FS, HDR Inc., 2014

Site ID: **Port Angeles Combat Range FUDS Property No. F10WA00330**
Date: **2/6/2015**
Port Angeles Combat Range - Range Complex No. 1 MRS
Activities Currently Occurring at the Site

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Outdoor Recreation	10	36	**360**	0.5	Does not include area within Olympic National Park; no recreationalists observed during 2013 Field Season; assumes pairs of persons hiking, day use only; 6 hr/day @1 weekend/month (i.e., 2 days) * 3 months/yr (height of summer season, Jun-Aug)
2	Forest Resource Management	5	240	**1,200**	5	Not all of the PACR MRS is available for timber removal; logged areas observed; no equipment or personnel observed during 2013 field season; 8 hr/day * 30 days/yr
3	Limited Farming	4	360	**1,440**	1.5	Based on field observations and contact with few residents, farming is limited to small private gardens; no hay collection observed during 2013 field season; 4 hr/day * 90 days/yr (height of summer season, Jun-Aug)
4	Limited Fishing	2	40	**80**	0	Streams run through the area; considerable water and habitat; no fishing observed during 2013 field season; 4 hr/day * 10 day/yr
5	Hunting	4	192	**768**	0.5	Private landholders may or may not grant access; hunters present as many deer carcasses observed; in many cases, there are trespassers; 6 hr/day * 8 day/month (4 weekends/month) * 4 months/yr (two seasons / year both in the fall)

Total Potential Contact Time (receptor hrs/yr): **3,848**
Maximum intrusive depth at site (ft): **5**

[redacted]

Site ID:	**Port Angeles Combat Range FUDS Property No. F10WA00330**
Date:	**2/6/2015**

Port Angeles Combat Range - Range Complex No. 1 MRS

Planned Remedial or Removal Actions

Response Action No.	Response Action Description	Expected Resulting Minimum MEC Depth (ft)	Expected Resulting Site Accessibility	Will land use activities change if this response action is implemented?	What is the expected scope of cleanup?	Comments
1	Institutional Controls	0	Moderate Accessibility	No	No MEC cleanup	assume no land use change
2	Surface Removal	0	Moderate Accessibility	No	cleanup of MEC located on the surface only	assume no land use change
3	Subsurface Removal	1	Moderate Accessibility	No	cleanup of MEC located both on the surface and subsurface	assume no land use change
4	Tree Survey/Removal	1	Moderate Accessibility	No	cleanup of MECs located both on the surface and subsurface	assume no land use change

According to the 'Summary Info' worksheet, no future land uses are planned. For those alternatives where you answered 'No' in Column E, the land use activities will be assessed against current land uses.

Site ID: **Port Angeles Combat Range FUDS Property No. F10WA00330**
Date: **2/6/2015**
Port Angeles Combat Range - Range Complex No. 1 MRS
This worksheet needs to be completed for each remedial/removal action alternative listed in the 'Remedial-Removal Action' worksheet that will cause a change in land use.

Land Use Activities Planned After Response Alternative #1: Institutional Controls

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):
Maximum intrusive depth at site (ft):

Reference(s) for table above:

[redacted]

Land Use Activities Planned After Response Alternative #2: Surface Removal

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Maximum intrusive depth at site (ft):

Reference(s) for table above:

[redacted]

Land Use Activities Planned After Response Alternative #3: Subsurface Removal

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

[redacted]

Land Use Activities Planned After Response Alternative #4: Tree Survey/Removal

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

[redacted]

Land Use Activities Planned After Response Alternative #5:

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

[redacted]

Land Use Activities Planned After Response Alternative #6:

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

[redacted]

Site ID:	**Port Angeles Combat Range FUDS Property No. F10WA00330**
Date:	**2/6/2015**

Port Angeles Combat Range - Range Complex No. 1 MRS

Energetic Material Type Input Factor Categories						**Comments**	
The following table is used to determine scores associated with the energetic materials. Materials are listed in order from most hazardous to least hazardous.							
	Baseline Conditions	**Surface Cleanup**	**Subsurface Cleanup**				
High Explosive and Low Explosive Filler in Fragmenting Rounds	100	100	100				
White Phosphorus	70	70	70				
Pyrotechnic	60	60	60				
Propellant	50	50	50				
Spotting Charge	40	40	40				
Incendiary	30	30	30				
The most hazardous type of energetic material listed in the 'Munitions, Bulk Explosive Info' Worksheet falls under the category 'High Explosive and Low Explosive Filler in Fragmenting Rounds'.				***Score***			High Explosive and Low Explosive Filler in Fragmenting Rounds
Baseline Conditions:				**100**			
Surface Cleanup:				**100**			
Subsurface Cleanup:				**100**			

Location of Additional Human Receptors Input Factor Categories				
1. What is the Explosive Safety Quantity Distance (ESQD) from the Explosive Siting Plan or the Explosive Safety Submission for the MRS?	242	feet	based on HFD for 81 mm M45 per R.Irons (2/27/14)	
2. Are there currently any features or facilities where people may congregate within the MRS, or within the ESQD arc?	Yes			
3. Please describe the facility or feature.			**see Figure 2-1**	
One home at south end of MRS next to Deer Park Road			also, to the East across Deer Park Road, 2 residences, some outbuildings (Grid S-11)	
MEC Item(s) used to calculate the ESQD for current use activities	81 mm M45		based on HFD for 81 mm M45 per R.Irons (2/27/14)	
Item #5. Mortars (81mm, High Explosive)	[redacted]		based on HFD for 81 mm M45 per R.Irons (2/27/14)	

The following table is used to determine scores associated with the location of additional human receptors (current use activities):

	Baseline Conditions	**Surface Cleanup**	**Subsurface Cleanup**
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

4. Current use activities are 'Inside the MRS or inside the ESQD arc', based on Question 2.'					***Score***			Inside the MRS or inside the ESQD arc
Baseline Conditions:					**30**			
Surface Cleanup:					**30**			
Subsurface Cleanup:					**30**			
Site Accessibility Input Factor Categories					[redacted]			
The following table is used to determine scores associated with site accessibility:								
	Description	**Baseline Conditions**	**Surface Cleanup**	**Subsurface Cleanup**				
Full Accessibility	No barriers to entry, including signage but no fencing	80	80	80				
Moderate Accessibility	Some barriers to entry, such as barbed wire fencing or rough terrain	55	55	55				
Limited Accessibility	Significant barriers to entry, such as unguarded chain link fence or requirements for special transportation to reach the site	15	15	15				
Very Limited Accessibility	A site with guarded chain link fence or terrain that requires special equipment and skills (e.g., rock climbing) to access	5	5	5				
Current Use Activities					***Score***			
Select the category that best describes the site accessibility under the current use scenario:								
Moderate Accessibility								
Baseline Conditions:					**55**			
Surface Cleanup:					**55**			
Subsurface Cleanup:					**55**			
Response Alternative No. 1: Institutional Controls					[redacted]			
Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Moderate Accessibility'.								Moderate Accessibility
Baseline Conditions:					**55**			
Surface Cleanup:					**55**			
Subsurface Cleanup:					**55**			
Response Alternative No. 2: Surface Removal								
Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Moderate Accessibility'.								Moderate Accessibility
Baseline Conditions:					**55**			
Surface Cleanup:					**55**			
Subsurface Cleanup:					**55**			
Response Alternative No. 3: Subsurface Removal								
Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Moderate Accessibility'.								Moderate Accessibility
Baseline Conditions:					**55**			
Surface Cleanup:					**55**			
Subsurface Cleanup:					**55**			
Response Alternative No. 4: Tree Survey/Removal								
Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Moderate Accessibility'.								Moderate Accessibility
Baseline Conditions:					**55**			
Surface Cleanup:					**55**			
Subsurface Cleanup:					**55**			

Potential Contact Hours Input Factor Categories								
The following table is used to determine scores associated with the total potential contact time:								
	Description	**Baseline Conditions**	**Surface Cleanup**	**Subsurface Cleanup**				
Many Hours	≥1,000,000 receptor-hrs/yr	120	90	30				
Some Hours	100,000 to 999,999 receptor hrs/yr	70	50	20				
Few Hours	10,000 to 99,999 receptor-hrs/yr	40	20	10				
Very Few Hours	<10,000 receptor-hrs/yr	15	10	5				
Current Use Activities :								
Input factors are only determined for baseline conditions for current use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is:					**3,848**	receptor hrs/yr		**<10,000 receptor-hrs/yr**
Based on the table above, this corresponds to a input factor score for baseline conditions of:					**15**	***Score***		
Response Alternative No. 1: Institutional Controls								
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.								
Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)					**3,848**			**<10,000 receptor-hrs/yr**
Based on the table above, this corresponds to input factor scores of:					***Score***			
Baseline Conditions:					**15**			
Surface Cleanup:					**10**			
Subsurface Cleanup:					**5**			
Response Alternative No. 2: Surface Removal								
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.								
Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)					**3,848**			**<10,000 receptor-hrs/yr**
Based on the table above, this corresponds to input factor scores of:					***Score***			
Baseline Conditions:					**15**			
Surface Cleanup:					**10**			
Subsurface Cleanup:					**5**			
Response Alternative No. 3: Subsurface Removal								
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.								
Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)					**3,848**			**<10,000 receptor-hrs/yr**
Based on the table above, this corresponds to input factor scores of:					***Score***			
Baseline Conditions:					**15**			
Surface Cleanup:					**10**			
Subsurface Cleanup:					**5**			
Response Alternative No. 4: Tree Survey/Removal								
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.								
Total Potential Contact Time, based on the contact time listed for current use activities (see 'Current and Future Activities' Worksheet)					**3,848**			**<10,000 receptor-hrs/yr**
Based on the table above, this corresponds to input factor scores of:					***Score***			
Baseline Conditions:					**15**			
Surface Cleanup:					**10**			
Subsurface Cleanup:					**5**			

Amount of MEC Input Factor Categories

The following table is used to determine scores associated with the Amount of MEC:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Target Area	Areas at which munitions fire was directed	180	120	30
OB/OD Area	Sites where munitions were disposed of by open burn or open detonation methods. This category refers to the core activity area of an OB/OD area. See the "Safety Buffer Areas" category for safety fans and kick-outs.	180	110	30
Function Test Range	Areas where the serviceability of stored munitions or weapons systems are tested. Testing may include components, partial functioning or complete functioning of stockpile or developmental items.	165	90	25
Burial Pit	The location of a burial of large quantities of MEC items.	140	140	10
Maneuver Areas	Areas used for conducting military exercises in a simulated conflict area or war zone	115	15	5
Firing Points	The location from which a projectile, grenade, ground signal, rocket, guided missile, or other device is to be ignited, propelled, or released.	75	10	5
Safety Buffer Areas	Areas outside of target areas, test ranges, or OB/OD areas that were designed to act as a safety zone to contain munitions that do not hit targets or to contain kick-outs from OB/OD areas.	30	10	5
Storage	Any facility used for the storage of military munitions, such as earth-covered magazines, above-ground magazines, and open-air storage areas.	25	10	5
Explosive-Related Industrial Facility	Former munitions manufacturing or demilitarization sites and TNT production plants	20	10	5

Select the category that best describes the ***most hazardous*** amount of MEC:	***Score***
Target Area	
Baseline Conditions:	**180**
Surface Cleanup:	**120**
Subsurface Cleanup:	**30**

Minimum MEC Depth Relative to the Maximum Intrusive Depth Input Factor Categories

Current Use Activities							
The shallowest minimum MEC depth, based on the 'Cased Munitions Information' Worksheet:				0.5	ft		
The deepest intrusive depth:				5	ft		
The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:							
	Baseline Conditions	**Surface Cleanup**	**Subsurface Cleanup**				
Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240	150	95				
Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	240	50	25				
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150	N/A	95				
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.	50	N/A	25				

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth will overlap after cleanup. MEC are located only subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.' For 'Current Use Activities', only Baseline Conditions are considered.						**150**	***Score***		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.
Future Use Activities									
Deepest intrusive depth:							ft		
Not enough information has been entered to determine the input factor category.							***Score***		
Response Alternative No. 1: Institutional Controls									
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet):						**0**	ft		
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.									
Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet)						**5**	ft		
Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MEC are located only subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.'									Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.
						Score			
Baseline Conditions:						**150**			
Surface Cleanup:									
Subsurface Cleanup:									
Response Alternative No. 2: Surface Removal									
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet):						**0**	ft		
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this									
Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see						**5**	ft		
Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MEC are located only subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.'									Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.
						Score			
Baseline Conditions:									
Surface Cleanup:						**N/A**			
Subsurface Cleanup:									
Response Alternative No. 3: Subsurface Removal									
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet):						**1**	ft		
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will not change if this alternative is implemented.									
Maximum Intrusive Depth, based on the maximum intrusive depth listed for current use activities (see 'Current and Future Activities' Worksheet)						**5**	ft		
Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MEC are located only subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.'									Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.
						Score			
Baseline Conditions:									
Surface Cleanup:									
Subsurface Cleanup:						**95**			

Migration Potential Input Factor Categories								
Is there any physical or historical evidence that indicates it is possible for natural physical forces in the area (e.g., frost heave, erosion) to expose subsurface MEC items, or move surface or subsurface MEC items?							observed steep terrain, significant precipitation	
If "yes", describe the nature of natural forces. Indicate key areas of potential migration (e.g., overland water flow) on a map as appropriate (attach a map to the bottom of this sheet, or as a separate worksheet).								
MEC items located on edge of the mesa (See Figure) could potentially be translocated down the ravine based on heavy rainfall								
The following table is used to determine scores associated with the migration potential:								
			Baseline Conditions	**Surface Cleanup**	**Subsurface Cleanup**			
Possible			30	30	10			
Unlikely			10	10	10			
Based on the question above, migration potential is 'Possible.'						***Score***		
Baseline Conditions:						**30**		
Surface Cleanup:						**30**		
Subsurface Cleanup:						**10**		
Reference(s) for above information:								
MEC Classification Input Factor Categories								
Cased munitions information has been inputed into the 'Munitions, Bulk Explosive Info' Worksheet; therefore, bulk explosives do not comprise all MEC for this MRS.								No
The 'Amount of MEC' category is 'Target Area'. It cannot be automatically assumed that the MEC items from this category are DMM. Therefore, the conservative assumption is that the MEC items in this MRS are UXO.								No
Has a technical assessment shown that MEC in the OB/OD Area is DMM?								
Are any of the munitions listed in the 'Munitions, Bulk Explosive Info' Worksheet:						Yes		mortars, projectiles
	· Submunitions							
	· Rifle-propelled 40mm projectiles (often called 40mm grenades)							
	· Munitions with white phosphorus filler							
	· High explosive anti-tank (HEAT) rounds							
	· Hand grenades							
	· Fuzes							
	· Mortars							
At least one item listed in the 'Munitions, Bulk Explosive Info' Worksheet was identified as 'fuzed'.								Yes
The following table is used to determine scores associated with MEC classification categories:								
	UXO Special Case		**Baseline Conditions**	**Surface Cleanup**	**Subsurface Cleanup**			
UXO Special Case			180	180	180			
UXO			110	110	110			
Fuzed DMM Special Case			105	105	105			
Fuzed DMM			55	55	55			
Unfuzed DMM			45	45	45			
Bulk Explosives			45	45	45			
Based on your answers above, the MEC classification is 'UXO Special Case'.						***Score***		
Baseline Conditions:						**180**		
Surface Cleanup:						**180**		
Subsurface Cleanup:						**180**		

MEC Size Input Factor Categories

The following table is used to determine scores associated with MEC Size:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup				
Small	Any munitions (from the 'Munitions, Bulk Explosive Info' Worksheet) weigh less than 90 lbs; small enough for a receptor to be able to move and initiate a detonation	40	40	40				
Large	All munitions weigh more than 90 lbs; too large to move without equipment	0	0	0				
Based on the definitions above and the types of munitions at the site (see 'Munitions, Bulk Explosive Info' Worksheet), the MEC Size Input Factor is:					Small			Small
					Score			
Baseline Conditions:					**40**			
Surface Cleanup:					**40**			
Subsurface Cleanup:					**40**			

Scoring Summary

Port Angeles Combat Range - Range Complex No. 1 MRS

Site ID:	Port Angeles Combat Range FUDS Property No. F10WA00330	a. Scoring Summary for Current Use Activities	
Date:	2/6/2015	Response Action Cleanup:	No Response Action
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	15
V. Amount of MEC		Target Area	180
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with	150
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	**780**
		Hazard Level Category	**2**

Site ID:	Port Angeles Combat Range FUDS Property No. F10WA00330	b. Scoring Summary for Response Alternative 1: Institutional Controls	
Date:	2/6/2015	Response Action Cleanup:	No MEC cleanup
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	15
V. Amount of MEC		Target Area	180
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with	150
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	**780**
		Hazard Level Category	**2**

Site ID:	Port Angeles Combat Range FUDS Property No. F10WA00330		
Date:	2/6/2015	Response Action Cleanup:	cleanup of MEC located on the surface only
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	10
V. Amount of MEC		Target Area	120
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with	N/A
VII. Migration Potential		Possible	30
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	**565**
		Hazard Level Category	**3**

Site ID:	Port Angeles Combat Range FUDS Property No. F10WA00330		
Date:	2/6/2015	Response Action Cleanup:	cleanup of MEC located both on the surface and subsurface
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	5
V. Amount of MEC		Target Area	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with	95
VII. Migration Potential		Possible	10
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	**545**
		Hazard Level Category	**3**

Site ID:	Port Angeles Combat Range FUDS Pro	e. Scoring Summary for Response Alternative 4: Tree Survey/Removal	
Date:	2/6/2015	Response Action Cleanup:	cleanup of MECs located both on the surface and subsurface
Input Factor		**Input Factor Category**	**Score**
I. Energetic Material Type		High Explosive and Low Explosive Filler in	100
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	30
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		<10,000 receptor-hrs/yr	5
V. Amount of MEC		Target Area	30
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located only subsurface. Baseline Condition or After	95
VII. Migration Potential		Possible	10
VIII. MEC Classification		UXO Special Case	180
IX. MEC Size		Small	40
		Total Score	**545**
		Hazard Level Category	**3**

Site ID:	Port Angeles Combat Range FUDS Proj	Scoring Summary for Response Alternative 5:	
Date:	2/6/2015	Response Action Cleanup:	
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	
III. Site Accessibility			
IV. Potential Contact Hours			
V. Amount of MEC		Target Area	
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			
VII. Migration Potential		Possible	
VIII. MEC Classification		UXO Special Case	
IX. MEC Size		Small	
		Total Score	
		Hazard Level Category	

Site ID:	Port Angeles Combat Range FUDS Proj	Scoring Summary for Response Alternative 6:	
Date:	2/6/2015	Response Action Cleanup:	
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	
II. Location of Additional Human Receptors		Inside the MRS or inside the ESQD arc	
III. Site Accessibility			
IV. Potential Contact Hours			
V. Amount of MEC		Target Area	
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			
VII. Migration Potential		Possible	
VIII. MEC Classification		UXO Special Case	
IX. MEC Size		Small	
		Total Score	
		Hazard Level Category	

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APPENDIX

Munitions Response Site Prioritization Protocol Tables

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Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the MRS summary, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Munitions Response Site Name: Range Complex No 1

Component: USACE FUDS/Omaha District (NWO)

Installation/Property Name: Port Angeles Combat Range

Location (City, County, State): Port Angeles, Clallam County, WA

Site Name/Project Name (Project No.): Port Angeles Combat Range

Date Information Entered/Updated: 2/18/2014 4:54:12 AM

Point of Contact (Name/Phone): Adam Plack/(402) 995-2755

Project Phase (check only one):

☐ PA	☐ SI	■ RI	☐ FS	☐ RD
☐ RA-C	☐ RIP	☐ RA-O	☐ RC	☐ LTM

Media Evaluated (check all that apply):

☐ Groundwater	☐ Sediment (human receptor)
☐ Surface soil	☐ Surface Water (ecological receptor)
☐ Sediment (ecological receptor)	☐ Surface Water (human receptor)

MRS Summary:

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM or MC known or suspected to be present. When possible, identify munitions, CWM, and MC by type:

In early 1943, the U.S. Army requested that land be leased in the area of Port Angeles, WA for use as a ground-to-ground combat range. In April and May 1944, the range was declared excess and all leases and permits were canceled. Two young boys were killed in August 1948, when a 37mm shell exploded while they were cutting downed timber.

This MRS includes 105.7 acres. 3.9 acres of parcel 47501 are included within this MRS. These 3.9 acres were not investigated as an ROE was not obtained for this phase of work. Assisted visual surveys, DGM, and magnetometer (mag) and dig investigations were conducted.

Evidence of MEC and MD items were observed including:
Five M63 37mm HE projectiles
Thirteen M51 37mm AP projectiles
One M48 point detonating fuze for 75mm projectile (expended)
One M44 81mm practice mortar
Three M43A1 81mm HE mortar pieces
Three M57 81mm White Phosphorus mortar bodies
Four 81mm mortar tail fin pieces
One 81mm motor tail fin
One 75mm practice projectile, and one half of a 75mm projectile

The EHE module was assigned a score of 3/B. There was evidence of MEC and MD identified within the MRS.

The CHE Module was assigned the alternative rating of No Known or Suspected CWM Hazard. There were no Port Angeles Combat Range MRSs suspected of containing CWM.

The HHE Module was assigned a score of "evaluation pending". No environmental media sampling was conducted during the RI.

This RI was intended only to determine the nature and extent of areas impacted by munitions related activities. Additional MEC items may be present in the subsurface soils of the MRS. The condition of the MEC cannot be know. If compromised MEC is found at a later date, MC sampling may be required.

Throughout the MRSPP, the following references are made:
Reference to "RI/FS Report", refers to the " Remedial Investigation/Feasibility Study
Final Report", dated February 2015.
Reference to "SI Report" refers to the Final Site Inspection Report, dated June 2009.

Description of Pathways for Human and Ecological Receptors:

MEC was discovered during the RI; consequently the exposure pathway for contact with MEC in surface soil (0 – 6 inches deep) is considered complete for all human receptors. The exposure pathway for contact with MEC in subsurface (> 6 inches deep) soil is potentially complete.

Because there is no way to ensure 100% removal of MEC at the PACR, there is always the potential for human receptors to encounter both MEC and possibly MC in compromised munitions. If MEC are present in damaged condition, MC could potentially be released to the environment; however, based on historical investigations and the results of the RI, the potential for human and ecological exposure to MC is likely very low. There is some degree of uncertainty associated with potential MEC items which could remain buried; however, all current information suggests that the soil exposure pathway for MC is likely incomplete or likely insignificant (RI/FS, Section 5.1/5.2).

Description of Receptors (Human and Ecological):

Potential human receptors include current and future recreational users, current and future outdoor workers, current and future trespassers, and current and future residents.

The MRS includes transient habitat used by at least at least three federally/state-listed threatened species - Bull Trout, Northern Spotted Owl, and Marbled Murrelet (RI/FS, Section 2.2.11.1).

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the scores that correspond with **all** the munitions types known or suspected to be present at the MRS.

Note: The terms practice munitions, small arms ammunition, physical evidence, and historical evidence are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ UXO that are considered likely to function upon any interaction with exposed persons (e.g., submunitions, 40mm high-explosive [HE] grenades, white phosphorus [WP] munitions, high-explosive antitank [HEAT] munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions). ◆ Hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazardard.	30
High explosive (used or damaged)	◆ UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	*25*
Pyrotechnic (used or damaged)	◆ UXO containing a pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades). ◆ DMM containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	20
High explosive (unused)	◆ DMM containing a high explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	15
Propellant	◆ UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	15
Bulk secondary high explosives, pyrothechnics, or propellant	◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM that are bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ DMM containing a pyrotechnic fillers (i.e., red phosphorous), other than white phosphorous filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ UXO that are practice munitions that are not associated with a sensitive fuze. ◆ DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ Used munitions or DMM that are categorized as small arms ammunition [Physical evidence or historical evidence that no other types of munitions (e.g., grenades, subcaliber training rockets, demolition charges) were used or are present on the MRS is required for selection of this category.].	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	*25*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

Five M63 37mm HE projectiles were found within the MRS. All of these MEC items were found in the Direct Fire Impact Area and the Buffer Zone and Combat Training Area (sub-ranges SR-01 and SR-05). Mag and dig investigations were conducted in 10% of each 200-foot x 200-foot grid. The location of MD within this MRS is the driver defining possible subsurface MEC locations. MD observed within the MRS included:
• Thirteen M51 37mm AP projectiles
• One M48 point detonating fuze for 75mm projectile (expended)
• One M44 81mm practice mortar
• Three M43A1 81mm HE mortar pieces
• Three M57 81mm WP mortar bodies
• Four 81mm mortar tail fin pieces
• One 81mm motor tail fin
• One 75mm practice projectile, and one half of 75mm projectile (empty) (RI/FS Report, Section 5.1.1.3)

Table 2

EHE Module: Source of Hazard Data Element Table

DIRECTIONS: Below are 11 classifications describing sources of explosive hazards. Circle the scores that correspond with **all** the sources of explosive hazards known or suspected to be present at the MRS.

Note: The terms former range, practice munitions, small arms range, physical evidence, and historical evidence are defined in Appendix C of the Primer.

Classification	Description	Score
Former range	◆ The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include impact or target areas and associated buffer and safety zones.	*10*
Former munitions treatment (i.e., OB/OD) unit	◆ The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal.	8
Former practice munitions range	◆ The MRS is a former military range on which only practice munitions without sensitive fuzes were used.	6
Former maneuver area	◆ The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category.	5
Former burial pit or other disposal area	◆ The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment.	5
Former industrial operating facilities	◆ The MRS is a location that is a former munitions maintenance, manufacturing, or demilitarization facility.	4
Former firing points	◆ The MRS is a firing point, where the firing point is delineated as an MRS separate from the rest of a former military range.	4
Former missile or air defense artillery emplacements	◆ The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a military range.	2
Former storage or transfer points	◆ The MRS is a location where munitions were stored or handled for transfer between different modes of transportation (e.g., rail to truck, truck to weapon system).	2
Former small arms range	◆ The MRS is a former military range where only small arms ammunition was used. (There must be evidence that no other types of munitions [e.g., grenades] were used or are present to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present.	0
SOURCE OF HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	*10*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Source of Hazard*** classifications in the space provided.

In early 1943, the U.S. Army requested that land be leased in the area of Port Angeles, WA for use as a ground-to-ground combat range. The range was intended to be used for tactical firing problems and short-range known distance firing (200-300 yards). The range was used for weapons practice with 37mm and 75mm projectiles, and 60mm and 81mm mortars (RI/FS, Section 2.3.1).

Table 3

EHE Module: Location of Munitions Data Element Table

DIRECTIONS: Below are eight classifications of munitions locations and their descriptions. Circle the scores that correspond with **all** the locations where munitions are known or suspected to be present at the MRS.

Note: The terms confirmed, surface, subsurface, small arms ammunition, physical evidence, and historical evidence are defined in Appendix C of the Primer.

Classification	Description	Score
Confirmed surface	◆ Physical evidence indicates that there are UXO or DMM on the surface of the MRS. ◆ Historical evidence (i.e., a confirmed report such as an explosive ordnance disposal [EOD], police, or fire department report that an incident or accident that involved UXO	25
Confirmed subsurface, active	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS,and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM.	*20*
Confirmed subsurface, stable	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed.	15
Suspected (physical evidence)	◆ There is physical evidence (e.g., munitions debris, such fragments, penetrators, projectiles, shell casings, links, fins), other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS.	10
Suspected (historical evidence)	◆ There is historical evidence indicating that UXO or DMM may be present at the MRS.	5
Subsurface, physical constraint	◆ There is physical or historical evidence indicating that UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM.	2
Small arms (regardless of location)	◆ The presence of small arms ammunition is confirmed or suspected, regardless of other factors such as geological stability (There must be evidence that no other types of munitions [e.g., grenades] were used or are present at the MRS to place an MRS into this category.)	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
LOCATION OF MUNITIONS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 25).	*20*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of Munitions*** classifications in the space provided.

Five M63 37mm HE projectiles were found within the MRS. The MEC items were found at depths of 6-12 inches bgs. All of these MEC items were found in the Direct Fire Impact Area and the Buffer Zone and Combat Training Area (sub-ranges SR-01 and SR-05). Mag and dig investigations were conducted in 10% of of each 200-foot x 200-foot grid. The location of MD within this MRS is the driver defining possible subsurface MEC locations. MD observed within the MRS included:

- Thirteen M51 37mm AP projectiles
- One M48 point detonating fuze for 75mm projectile (expended)
- One M44 81mm practice mortar
- Three M43A1 81mm HE mortar pieces
- Three M57 81mm WP mortar bodies
- Four 81mm mortar tail fin pieces
- One 81mm motor tail fin
- One 75mm practice projectile, and one half of 75mm projectile (empty) (RI/FS Report, Section 5.1.1.3)

Table 4

EHE Module: Ease of Access Data Element Table

DIRECTIONS: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to the MRS. Circle the score that corresponds with the ease of access to the MRS.

Note: The term barrier is defined in Appendix C of the Primer.

Classification	Description	Score
No barrier	◆ There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible).	10
Barrier to MRS access is incomplete	◆ There is a barrier preventing access to parts of the MRS, but not the entire MRS.	*8*
Barrier to MRS access is complete but not monitored	◆ There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5
Barrier to MRS access is complete and monitored	◆ There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.	0
EASE OF ACCESS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	*8*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classifications in the space provided.

The MRS is accessible to the general public from Deer Park Road on the east side of the MRS. During the RI field investigation in 2013, barbed wire fencing was observed along the Deer Park Road. The fencing was in poor condition and was propped up in places. A few remaining signs warning of munitions hazards are still present. In addition, approximately 3.4 acres of the MRS were unsurveyable due to steep treacherous slopes and dense vegetation (RI/FS Report, Section 2.2.3/2.2.4).

Table 5

EHE Module: Status of Property Data Element Table

DIRECTIONS: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Circle the score that corresponds with the status of property at the MRS.

Classification	Description	Score
Non-DoD control	◆ The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies.	*5*
Scheduled for transfer from DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the Protocol is applied.	3
DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24 hours per day, every day of the calendar year.	0
STATUS OF PROPERTY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	*5*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classifications in the space provided.

Property within Range Complex No. 1 MRS is owned by the City of Port Angeles and maintained as a protected watershed. According to the ASR, no land in the PACR is owned by any DoD or other federal agency. 3.9 acres of parcel 47501 are included within this MRS. These 3.9 acres were not investigated as a ROE was not obtained for this phase of work (RI/FS Report, Section 2.2.3/2.2.4).

Table 6

EHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications for population density and their descriptions. Determine the population density per square mile that most closely corresponds with the population of the MRS, including the area within a two-mile radius of the MRS's perimeter. Circle the most appropriate score.

Note: Note: Use the U.S. Census Bureau tract data available to capture the highest population density within a two-mile radius of the perimeter of the MRS.

Classification	Description	Score
> 500 persons per square mile	◆ There are more than 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	5
100–500 persons per square mile	◆ There are 100 to 500 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	*3*
< 100 persons per square mile	◆ There are fewer than 100 persons per square mile in the U.S. Census Bureau tract in which the MRS is located.	1
POPULATION DENSITY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	*3*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classifications in the space provided.

The Census Block Group closest to the northern boundary of the PACR has a population density of 126 persons per square mile. Estimated population within a two-mile radius of the PACR property boundary is 1,064. The estimated number of households within a two-mile radius of the PACR property boundary is 496. The 2010 population density for Clallum County is approximately 40.4 persons per square mile (RI/FS Report, Section 2.2.3).

Table 7

EHE Module: Population Near Hazard Data Element Table

DIRECTIONS: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the potential population near the MRS. Determine the number of inhabited structures within two miles of the MRS boundary and select the score that corresponds with the number of inhabited structures.

Note: The term inhabited structures is defined in Appendix C of the Primer.

Classification	Description	Score
26 or more inhabited structures	◆ There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	*5*
16 to 25 inhabited structures	◆ There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4
11 to 15 inhabited structures	◆ There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3
6 to 10 inhabited structures	◆ There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2
1 to 5 inhabited structures	◆ There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1
0 inhabited structures	◆ There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	0
POPULATION NEAR HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	*5*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classifications in the space provided.

The estimated numbers of households within a two-mile radius of the PACR property boundary is 496 (RI/FS Report, Section 2.2.3).

Table 8

EHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures and their descriptions. Review the types of activities that occur and/or structures that are present withinn two miles of the MRS and circle the scores that correspond with **all** the activities/structures classifications at the MRS.

Note: The term inhabited structure is defined in Appendix C of the Primer.

Classification	Description	Score
Residential, educational, commercial, or subsistence	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	*5*
Parks and recreational areas	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	*4*
Agricultural, forestry	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	*3*
Industrial or warehousing	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2
No known or recurring activities	◆ There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	1
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	***5***

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space provided.

The parcels within Range Complex No. 1 MRS are owned by the City of Port Angeles and are primarily maintained as a protected watershed. There is one private residence located within parcel 47501. No ROE was granted for parcel 47501 during the RI.

There are no schools or other critical assets located within a two-mile radius of the MRS.

During the hunting season, the field team saw evidence of deer hunting while conducting the field investigation. The field team also saw and heard occasional evidence of recreational target shooting (e.g. improvised targets).

Manke Timber Corporation and Green Crow Corporation manage adjacent parcels for commercial timber (RI/FS Report, Section 2.2.3).

Table 9

EHE Module: Ecological and/or Cultural Resources Data Element Table

DIRECTIONS: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and circle the score that corresponds with the ecological and/or cultural resources present on the MRS.

Note: The terms ecological resources and cultural resources are defined in Appendix C of the Primer.

Classification	Description	Score
Ecological and cultural resources present	◆ There are both ecological and cultural resources present on the MRS.	5
Ecological resources present	◆ There are ecological resources present on the MRS.	*3*
Cultural resources present	◆ There are cultural resources present on the MRS.	3
No ecological or cultural resources present	◆ There are no ecological resources or cultural resources present on the MRS.	*0*
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	*3*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classifications in the space provided.

The parcels within Range Complex No. 1 MRS are owned by the City of Port Angeles and primarily maintained as a protected watershed for the city . An identified sensitive ecosystem (wetland) is present within Range Complex No. 1; however, the wetland was not investigated, as it is within parcel 47501 where an ROE was not obtained during the RI.

No federally designated critical habitat is located on the PACR; however, there is federally designated critical habitat within one mile of the PACR for the following T & E species:

1. Bull Trout
2. Marbled Murrelet
3. Northern Spotted Owl (RI/FS Report, Section 2.2.11.1)

No cultural resources were identified within the MRS (RI/FS Report, Section 2.2.11.2).

Table 10

Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.
4. Circle the appropriate range for the **EHE Module Total** below.
5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Explosive Hazard Factor Data Elements			
Munitions Type	Table 1	25	35
Source of Hazard	Table 2	10	
Accessibility Factor Data Elements			
Location of Munitions	Table 3	20	33
Ease of Access	Table 4	8	
Status of Property	Table 5	5	
Receptor Factor Data Elements			
Population Density	Table 6	3	16
Population Near Hazard	Table 7	5	
Types of Activities/ Structures	Table 8	5	
Ecological and /or Cultural Resources	Table 9	3	
EHE MODULE TOTAL			*84*

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	*B*
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	*B*

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the scores that correspond to **all** the CWM configurations known or suspected to be present at the MRS.

Note: The terms CWM/UXO, CWM/DMM, physical evidence, and historical evidence are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, that are either UXO, or explosively configured damaged DMM	The CWM known or suspected of being present at the MRS is: ◆ CWM that are UXO (i.e., CWM/UXO). ◆ Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged.	30
CWM mixed with UXO	◆ The CWM known or suspected of being present at the MRS are undamaged CWM/DMM or CWM not configured as a munition that are commingled with conventional munitions that are UXO.	25
CWM, explosive configuration that are undamaged DMM	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20
CWM/DMM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS is: ◆ Nonexplosively configured CWM/DMM either damaged or undamaged ◆ Bulk CWM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS is CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10
Evidence of no CWM	◆ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	*0*
CWM CONFIGURATION	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	*0*

DIRECTIONS: Document any MRS-specific data used in selecting the ***CWM Configuration*** classifications in the space provided.

There were no Port Angeles Combat Range MRSs suspected of containing CWM (RI/FS Report, Section 2.3.1).

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
4. Circle the appropriate range for the **CHE Module Total** below.
5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	0	0
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		0
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		0
Population Near Hazard	Table 17		
Types of Activities/ Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			*0*

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	***No Known or Suspected CWM Hazard***

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's groundwater and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional groundwater contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and display the CHF Value. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Groundwater MC Hazard ☐

Table 21 Comments: No groundwater samples were collected from the MRS during the RI.

"Evaluation Pending" based upon probable MEC.

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard for human endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$
100 > CHF > 2	M (Medium)	
2 > CHF	L (Low)	

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ☐

Table 22 Comments: No surface water samples were collected from the MRS during the RI.

'Evalulation Pending' is selected based on probable MEC.

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with human endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Sediment (Human Endpoint) MC Hazard ☐

Table 23 Comments: No sediment samples were collected from the MRS during the RI.

"Evaluation Pending" based upon probable MEC.

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ☐

Table 24 Comments: No surface water samples were collected from the MRS during the RI.

'Evalulation Pending' is selected based on probable MEC.

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ☐

Table 25 Comments: No sediment samples were collected from the MRS during the RI.

'Evalulation Pending' is selected based on probable MEC.

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface soil and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface soil contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Soil MC Hazard ☐

Table 26 Comments: No surface soil samples were collected from the MRS during the RI.

All recovered MEC items were intact and in good condition. MC sampling for energetics and explosives residue was not conducted because a release would not have occurred. All recovered MEC items functioned as designed (complete detonation). MC sampling for energetics and explosives residue was not conducted because all explosives associated with the munitions were consumed during detonation (RI/FS Report, Section 5.2.2).

This RI was intended only to determine the nature and extent of areas impacted by muntions related activites within the MRS. Additional MEC items may be present in the subsurface soils of the MRS. The condition of the subsruface MEC cannot be known. If compromised MEC is found at a later date, MC sampling may be required.

"Evaluation Pending" was selected based upon probable MEC.

In-situ XRF screening was conducted to analyze for lead in soils where natural features (e.g., natural berm feature) or small arms debris was identified. XRF screening was utilized for information only and to assist the field investigation team determine sampling locations for laboratory analysis. A conservative in-situ XRF screening level of 125 mg/kg (compared to the State of Washington soil cleanup level of 250 mg/kg) was utilized. In-situ XRF screening for lead in soil was conducted in two locations where natural features (e.g., natural berm feature) where found, and in one location where small arms debris was found. A total of 113 in-situ XRF screening samples were analyzed from the three locations. All in-situ XRF sample results for lead were below 125 mg/kg (RI/FS - Appendix L). Thus, no soil samples were collected for laboratory analysis (RI/FS Report, Section 5.2.1).

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Only use this table if there are more than five contaminants in any given medium present at the MRS. This is a supplemental table designed to hold information about contaminants that do not fit in the previous tables. Indicate the media in which these contaminants are present. Then record all contaminants, their maximum concentrations and their comparison values (from Appendix B of the Primer) in the table below. Calculate and record the ratio for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF for each medium on the appropri

Note: Dissolved, rather than total, metals analyses are used when both are available.

Media	Contaminant	Maximum Concentration	Comparison Value	Ratio

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the Contaminant Hazard, Migration Pathway, and Receptor Factors for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the Three-Letter Combination boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the HHE Ratings provided below, determine each media's rating (A-G) and record the letter in the corresponding Media Rating box below.

Media (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value		Three-Letter Combination (Hs-Ms-Ls)		Media Rating (A-G)
Groundwater (Table 21)							
Surface Water/Human Endpoint (Table 22)							
Sediment/Human Endpoint (Table 23)							
Surface Water/Ecological Endpoint (Table 24)							
Sediment/Ecological Endpoint (Table 25)							
Surface Soil (Table 26)							

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the HHE Module Rating box.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE MODULE RATING	***Evaluation Pending***

HHE Ratings (for reference only)	
Combination	**Rating**
HHH	A
HHM	B
HHL	C
HMM	
HML	D
MMM	
HLL	E
MML	
MLL	F
LLL	G
Alternative Module Ratings	***Evaluation Pending***
	No Longer Required
	No Known or Suspected MC Hazard

Table 29
MRS Priority

DIRECTIONS: In the chart below, circle the letter rating for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical priority for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS Priority is the single highest priority; record this relative priority in the MRS Prioriy or Alternative MRS Rating at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	B	2	A	2
B	*3*	C	3	B	3
C	4	D	4	C	4
D	5	E	5	D	5
E	6	F	6	E	6
F	7	G	7	F	7
G	8			G	8
Evaluation Pending		Evaluation Pending		***Evaluation Pending***	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		*No Known or Suspected CWM Hazard*		No Known or Suspected MC Hazard	
MRS PRIORITY or ALTERNATIVE MRS RATING				*3*	

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the MRS summary, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Munitions Response Site Name: Range Complex No 1 a

Component: USACE FUDS/Omaha District (NWO)

Installation/Property Name: Port Angeles Combat Range

Location (City, County, State): Port Angeles, Clallam County, WA

Site Name/Project Name (Project No.): Port Angeles Combat Range

Date Information Entered/Updated: 2/18/2014 4:29:20 AM

Point of Contact (Name/Phone): Adam Plack/(402) 995-2755

Project Phase (check only one):

☐ PA	☐ SI	■ RI	☐ FS	☐ RD
☐ RA-C	☐ RIP	☐ RA-O	☐ RC	☐ LTM

Media Evaluated (check all that apply):

☐ Groundwater	☐ Sediment (human receptor)
☐ Surface soil	☐ Surface Water (ecological receptor)
☐ Sediment (ecological receptor)	☐ Surface Water (human receptor)

MRS Summary:

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM or MC known or suspected to be present. When possible, identify munitions, CWM, and MC by type:

In early 1943, the U.S. Army requested that land be leased in the area of Port Angeles, WA for use as a ground-to-ground combat range. In April and May 1944, the range was declared excess and all leases and permits were canceled.

This MRS includes 1286.5 acres. 0.24 acres of parcel 47501, 14.5 acres of parcel 47404, and 87.2 acres of parcel 47730 are included within this MRS. These 102 acres were not investigated because a ROE was not obtained for this phase of work.

No evidence of MEC or MD was observed so MC samples were not collected. No impact areas were indentified.

The EHE module was assigned the alternative rating of No Know or Suspected Explosive Hazard. There was no evidence of MEC or MD identified within the MRS.

The CHE Module was assigned the alternative rating of No Known or Suspected CWM Hazard. There were no Port Angeles Combat Range MRSs suspected of containing CWM.

The HHE Module was assigned the alternative rating of No Known or Suspected MC Hazard. There was no evidence of MEC or MD, so MC samples were not collected (RI/FS Report, Section 5.1).

Throughout the MRSPP, the following reference is made: Reference to "RI/FS Report", refers to the Remedial Investigation/Feasibility Study Final Report, dated February 2015.

Description of Pathways for Human and Ecological Receptors:

No MEC or MD was found within this MRS. Because there is no way to ensure 100% removal of MEC at the PACR, there is always the potential for human receptors to encounter both MEC and possibly MC in compromised munitions. If MEC are present in damaged condition, MC could potentially be released to the environment; however, based on historical investigations and the 2014 RI, the potential for human and ecological exposure to MC is likely very low. There is some degree of uncertainty associated with potential MEC items which could remain buried; however, all current information suggests that the soil exposure pathway for MC is likely incomplete or likely insignificant (RI/FS Report, Section 5.2).

Description of Receptors (Human and Ecological):

Potential human receptors include current and future recreational users, current and future outdoor workers, current and future trespassers, and current and future residents.

The MRS includes transient habitat used by at least at least three federally/state-listed threatened species - Bull Trout, Northern Spotted Owl, and Marbled Murrelet (RI/FS Report, Section 2.2.11.1).

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the scores that correspond with **all** the munitions types known or suspected to be present at the MRS.

Note: The terms practice munitions, small arms ammunition, physical evidence, and historical evidence are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ UXO that are considered likely to function upon any interaction with exposed persons (e.g., submunitions, 40mm high-explosive [HE] grenades, white phosphorus [WP] munitions, high-explosive antitank [HEAT] munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions). ◆ Hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazardard.	30
High explosive (used or damaged)	◆ UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	25
Pyrotechnic (used or damaged)	◆ UXO containing a pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades). ◆ DMM containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	20
High explosive (unused)	◆ DMM containing a high explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	15
Propellant	◆ UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	15
Bulk secondary high explosives, pyrothechnics, or propellant	◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM that are bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ DMM containing a pyrotechnic fillers (i.e., red phosphorous), other than white phosphorous filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ UXO that are practice munitions that are not associated with a sensitive fuze. ◆ DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ Used munitions or DMM that are categorized as small arms ammunition [Physical evidence or historical evidence that no other types of munitions (e.g., grenades, subcaliber training rockets, demolition charges) were used or are present on the MRS is required for selection of this category.].	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	*0*
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	*0*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

No evidence of MEC or MD were observed. No impact areas were identified (RI/FS Report, Section 5.1/8.5.1).

Table 10

Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.
4. Circle the appropriate range for the **EHE Module Total** below.
5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Explosive Hazard Factor Data Elements			
Munitions Type	Table 1	0	0
Source of Hazard	Table 2		
Accessibility Factor Data Elements			
Location of Munitions	Table 3		0
Ease of Access	Table 4		
Status of Property	Table 5		
Receptor Factor Data Elements			
Population Density	Table 6		0
Population Near Hazard	Table 7		
Types of Activities/ Structures	Table 8		
Ecological and /or Cultural Resources	Table 9		
EHE MODULE TOTAL			0

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	***No Known or Suspected Explosive Hazard***

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
4. Circle the appropriate range for the **CHE Module Total** below.
5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	0	0
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		0
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		0
Population Near Hazard	Table 17		
Types of Activities/ Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			0

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	***No Known or Suspected CWM Hazard***

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
4. Circle the appropriate range for the **CHE Module Total** below.
5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	0	0
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		0
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		0
Population Near Hazard	Table 17		
Types of Activities/ Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			0

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	***No Known or Suspected CWM Hazard***

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's groundwater and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional groundwater contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and display the CHF Value. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Groundwater MC Hazard ■

Table 21 Comments: There was no evidence of MEC or MD observed, so MC samples were not collected. No impact areas were identified within this MRS (RI/FS Report, Section 5.2.2).

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard for human endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$
100 > CHF > 2	M (Medium)	
2 > CHF	L (Low)	

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ■

Table 22 Comments: There was no evidence of MEC or MD observed, so MC samples were not collected. No impact areas were identified within this MRS (RI/FS Report, Section 5.2.2).

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with human endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Sediment (Human Endpoint) MC Hazard ■

Table 23 Comments: There was no evidence of MEC or MD observed, so MC samples were not collected. No impact areas were identified within this MRS (RI/FS Report, Section 5.2.2).

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ■

Table 24 Comments: There was no evidence of MEC or MD observed, so MC samples were not collected. No impact areas were identified within this MRS (RI/FS Report, Section 5.2.2).

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ■

Table 25 Comments: There was no evidence of MEC or MD observed, so MC samples were not collected. No impact areas were identified within this MRS (RI/FS Report, Section 5.2.2).

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface soil and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface soil contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Soil MC Hazard ■

Table 26 Comments: There was no evidence of MEC or MD observed, so MC samples were not collected. No impact areas were identified within this MRS (RI/FS Report, Section 5.2.2).

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the Contaminant Hazard, Migration Pathway, and Receptor Factors for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the Three-Letter Combination boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the HHE Ratings provided below, determine each media's rating (A-G) and record the letter in the corresponding Media Rating box below.

Media (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value		Three-Letter Combination (Hs-Ms-Ls)		Media Rating (A-G)
Groundwater (Table 21)							
Surface Water/Human Endpoint (Table 22)							
Sediment/Human Endpoint (Table 23)							
Surface Water/Ecological Endpoint (Table 24)							
Sediment/Ecological Endpoint (Table 25)							
Surface Soil (Table 26)							

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the HHE Module Rating box.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE MODULE RATING	***No Known or Suspected MC Hazard***

HHE Ratings (for reference only)

Combination	Rating
HHH	A
HHM	B
HHL	C
HMM	C
HML	D
MMM	D
HLL	E
MML	E
MLL	F
LLL	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected MC Hazard

Table 29
MRS Priority

DIRECTIONS: In the chart below, circle the letter rating for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical priority for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS Priority is the single highest priority; record this relative priority in the MRS Prioriy or Alternative MRS Rating at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	B	2	A	2
B	3	C	3	B	3
C	4	D	4	C	4
D	5	E	5	D	5
E	6	F	6	E	6
F	7	G	7	F	7
G	8			G	8
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		*No Known or Suspected CWM Hazard*		*No Known or Suspected MC Hazard*	
MRS PRIORITY or ALTERNATIVE MRS RATING				***No Known Or Suspected Hazard***	

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from Service and DoD databases. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the MRS summary, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental nonmunitions-related contaminants (e.g., benzene, trichloroethylene) found at the MRS, and any potentially exposed human and ecological receptors. If possible, include a map of the MRS.

Munitions Response Site Name: Range Complex No 1 b

Component: USACE FUDS/Omaha District (NWO)

Installation/Property Name: Port Angeles Combat Range

Location (City, County, State): Port Angeles, Clallam County, WA

Site Name/Project Name (Project No.): Port Angeles Combat Range

Date Information Entered/Updated: 2/18/2014 3:15:01 AM

Point of Contact (Name/Phone): Adam Plack/(402) 995-2755

Project Phase (check only one):

☐ PA	☐ SI	■ RI	☐ FS	☐ RD
☐ RA-C	☐ RIP	☐ RA-O	☐ RC	☐ LTM

Media Evaluated (check all that apply):

☐ Groundwater	☐ Sediment (human receptor)
☐ Surface soil	☐ Surface Water (ecological receptor)
☐ Sediment (ecological receptor)	☐ Surface Water (human receptor)

MRS Summary:

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM or MC known or suspected to be present. When possible, identify munitions, CWM, and MC by type:

In early 1943, the U.S. Army requested that land be leased in the area of Port Angeles, WA for use as a ground-to-ground combat range. In April and May 1944, the range was declared excess and all leases and permits were canceled.

This MRS includes 1238.5 acres. This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the National Park Service (NPS) and the DoD does not exist.

The area within the Olympic National Park (ONP) is at the furthest extents of the range saftety buffer. Based on topography and the typical configuration of the munitions identified during the RI there is a low probability that munitions are present with the ONP.

The EHE module was assigned the alternative rating of No Known or Suspected Explosive Hazard. There was no evidence of MEC or MD identified within the MRS that borders the ONP to the north (Range Complex No 1 [a]). There is little likelihood that any impact areas or other significant features are located within the ONP.

The CHE Module was assigned the alternative rating of No Known or Suspected CWM Hazards. There were no Port Angeles Combat Range MRSs suspected of containing CWM.

The HHE Module was assigned the alternative rating of No Known or Suspected Explosive Hazard. There was no evidence of MEC or MD identified within the MRS that borders the ONP to the north (Range Complex No 1 [a]). There is little likelihood that any impact areas or other significant features are located within the ONP.

Throughout the MRSPP, the following reference is made: Reference to RI/FS Report, refers to the Remedial Investigation/Feasibility Study Final Report, dated February 2015.

Description of Pathways for Human and Ecological Receptors:

Due to the lack of ROE, Range Complex No. 1 (b) was not investigated during the RI. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Description of Receptors (Human and Ecological):

Due to the lack of ROE, Range Complex No. 1 (b) was not investigated during the RI. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the scores that correspond with **all** the munitions types known or suspected to be present at the MRS.

Note: The terms practice munitions, small arms ammunition, physical evidence, and historical evidence are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ UXO that are considered likely to function upon any interaction with exposed persons (e.g., submunitions, 40mm high-explosive [HE] grenades, white phosphorus [WP] munitions, high-explosive antitank [HEAT] munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions). ◆ Hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazardard.	30
High explosive (used or damaged)	◆ UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	25
Pyrotechnic (used or damaged)	◆ UXO containing a pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades). ◆ DMM containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	20
High explosive (unused)	◆ DMM containing a high explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	15
Propellant	◆ UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	15
Bulk secondary high explosives, pyrothechnics, or propellant	◆ DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ DMM that are bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ DMM containing a pyrotechnic fillers (i.e., red phosphorous), other than white phosphorous filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ UXO that are practice munitions that are not associated with a sensitive fuze. ◆ DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ Used munitions or DMM that are categorized as small arms ammunition [Physical evidence or historical evidence that no other types of munitions (e.g., grenades, subcaliber training rockets, demolition charges) were used or are present on the MRS is required for selection of this category.].	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	*0*
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	*0*

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist. The area within the ONP is at the furthest extents of the range saftety buffer. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 10

Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.
4. Circle the appropriate range for the **EHE Module Total** below.
5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Explosive Hazard Factor Data Elements			
Munitions Type	Table 1	0	0
Source of Hazard	Table 2		
Accessibility Factor Data Elements			
Location of Munitions	Table 3		0
Ease of Access	Table 4		
Status of Property	Table 5		
Receptor Factor Data Elements			
Population Density	Table 6		0
Population Near Hazard	Table 7		
Types of Activities/ Structures	Table 8		
Ecological and /or Cultural Resources	Table 9		
EHE MODULE TOTAL			0

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	***No Known or Suspected Explosive Hazard***

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the scores that correspond to **all** the CWM configurations known or suspected to be present at the MRS.

Note: The terms CWM/UXO, CWM/DMM, physical evidence, and historical evidence are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, that are either UXO, or explosively configured damaged DMM	The CWM known or suspected of being present at the MRS is: ◆ CWM that are UXO (i.e., CWM/UXO). ◆ Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged.	30
CWM mixed with UXO	◆ The CWM known or suspected of being present at the MRS are undamaged CWM/DMM or CWM not configured as a munition that are commingled with conventional munitions that are UXO.	25
CWM, explosive configuration that are undamaged DMM	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20
CWM/DMM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS is: ◆ Nonexplosively configured CWM/DMM either damaged or undamaged ◆ Bulk CWM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS is CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10
Evidence of no CWM	◆ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	*0*
CWM CONFIGURATION	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	*0*

DIRECTIONS: Document any MRS-specific data used in selecting the ***CWM Configuration*** classifications in the space provided.

There were no Port Angeles Combat Range MRSs suspected of containing CWM (RI/FS Report, Section 2.3.1).

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
4. Circle the appropriate range for the **CHE Module Total** below.
5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	0	0
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		0
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		0
Population Near Hazard	Table 17		
Types of Activities/ Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			0

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	***No Known or Suspected CWM Hazard***

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's groundwater and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional groundwater contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and display the CHF Value. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Groundwater MC Hazard ■

Table 21 Comments: This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist.The area within the ONP is at the furthest extents of the range saftety buffer. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard for human endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$
100 > CHF > 2	M (Medium)	
2 > CHF	L (Low)	

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ■

Table 22 Comments: This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist. The area within the ONP is at the furthest extents of the range saftety buffer. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with human endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Sediment (Human Endpoint) MC Hazard ■

Table 23 Comments: This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist. The area within the ONP is at the furthest extents of the range saftety buffer. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface water and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface water contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the surface water, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ■

Table 24 Comments: This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist. The area within the ONP is at the furthest extents of the range saftety buffer. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's sediment and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the ratios together, including any additional sediment contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard with ecological endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ■

Table 25 Comments: This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist. The area within the ONP is at the furthest extents of the range saftety buffer. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the maximum concentrations of all contaminants in the MRS's surface soil and their comparison values (from Appendix B of the Primer) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the ratios for each contaminant by dividing the maximum concentration by the comparison value. Determine the CHF by adding the contaminant ratios together, including any additional surface soil contaminants recorded on Table 27. Based on the CHF, use the CHF Scale to determine and record the CHF Value. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Contaminant	Maximum Concentration	Comparison Value	Unit	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Soil MC Hazard ■

Table 26 Comments: This portion of the PACR was not investigated during the course of the RI because a programmatic agreement to conduct investigation and remedial actions between the NPS and the DoD does not exist. The area within the ONP is at the furthest extents of the range saftety buffer. Based on topography and the typical configuration of the munitions indentified during the RI there is a low probability that munitions are present with the ONP (RI/FS Report, Section 8.5.1).

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the Contaminant Hazard, Migration Pathway, and Receptor Factors for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the Three-Letter Combination boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the HHE Ratings provided below, determine each media's rating (A-G) and record the letter in the corresponding Media Rating box below.

Media (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value		Three-Letter Combination (Hs-Ms-Ls)		Media Rating (A-G)
Groundwater (Table 21)							
Surface Water/Human Endpoint (Table 22)							
Sediment/Human Endpoint (Table 23)							
Surface Water/Ecological Endpoint (Table 24)							
Sediment/Ecological Endpoint (Table 25)							
Surface Soil (Table 26)							

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the HHE Module Rating box.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE MODULE RATING	***No Known or Suspected MC Hazard***

HHE Ratings (for reference only)	
Combination	**Rating**
HHH	A
HHM	B
HHL	C
HMM	C
HML	D
MMM	D
HLL	E
MML	E
MLL	F
LLL	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected MC Hazard

Table 29
MRS Priority

DIRECTIONS: In the chart below, circle the letter rating for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical priority for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS Priority is the single highest priority; record this relative priority in the MRS Prioriy or Alternative MRS Rating at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	B	2	A	2
B	3	C	3	B	3
C	4	D	4	C	4
D	5	E	5	D	5
E	6	F	6	E	6
F	7	G	7	F	7
G	8			G	8
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		*No Known or Suspected CWM Hazard*		*No Known or Suspected MC Hazard*	
MRS PRIORITY or ALTERNATIVE MRS RATING				***No Known Or Suspected Hazard***	