US Army Corps of Engineers®
Omaha District

Final Site-Specific Work Plan
Ephrata Pattern Bombing Range
FUDS Property No. F10WA0579

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

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

November 2008

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FINAL

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Submitted to:

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

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List of Acronyms and Abbreviations

AAF	Army Air Field
AOC	area of concern
ASR	Archives Search Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSM	Conceptual Site Model
DERP	Defense Environmental Restoration Program
DMM	discarded military munitions
DNR	Washington State Department of Natural Resources
DoD	Department of Defense
DQO	data quality objective
EOD	Explosives Ordnance Disposal
EPA	U.S. Environmental Protection Agency
ER	Engineer Regulation
FSP	Field Sampling Plan
FUDS	Formerly Used Defense Site
GPS	global positioning system
HRS	Hazard Ranking System
IDW	investigation-derived waste
IEP	Important Ecological Place
INPR	Inventory Project Report
lb	pound
MC	munitions constituents
MEC	munitions and explosives of concern
MD	munitions debris
MMRP	Military Munitions Response Program
MRA	munitions response area
MRS	munitions response site
MRSPP	Munitions Response Site Prioritization Protocol
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDAI	No Department of Defense Action Indicated
NRCS	Natural Resources Conservation Service
NWO	Northwestern Division Omaha District, USACE
PBR	Pattern Bombing Range
QAPP	Quality Assurance Project Plan
RAC	Risk Assessment Code
RI/FS	Remedial Investigation/Feasibility Study
ROE	Right of Entry
SAP	Sampling and Analysis Plan
Shaw	Shaw Environmental, Inc.
SI	Site Inspection
SSHP	Site Safety and Health Plan
SSWP	Site-Specific Work Plan

List of Acronyms and Abbreviations (Cont.)

TPP	Technical Project Planning
USACE	U.S. Army Corps of Engineers
USC	United States Code
UXO	unexploded ordnance
WDFW	Washington Department of Fish and Wildlife
WDOE	Washington State Department of Ecology
Work Plan	*Final Type I Work Plan*

1.0 Introduction

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

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

1.1 Project Authorization

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

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

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

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

1.2 Site Name and Location

The former Ephrata PBR, FUDS identification number F10WA0579, is located approximately 20 miles north of the town of Ephrata, in Douglas County, Washington (Figure 1). The Ephrata PBR was also known as the Ephrata Pattern Bombing Range No. 4, Ephrata Pattern Bombing Range No. 1, and the Bright High Altitude Bombing Range (USACE, 2003), as well as the Ephrata Precision Bombing Range No 1 (USACE, 2004b).

The Ephrata PBR is located in Sections 31 and 32, Township 24 North (T24N), Range 26 East (R26E), and Sections 5 and 6, T23N, R26E (USACE, 2003). The Inventory Project Report (INPR; USACE, 1996) contains erroneous data, as the site map and description of the property are wrong (USACE, 1996). The INPR map shows the site as in Sections 31 and 32, T23N, R26E, and in Sections 5 and 6, T22N, R26E, one-half in Douglas and one-half in Grant Counties, Washington. Based on a historical aerial photograph included in the *Archives Search Report* (ASR), the actual Bombing Range is approximately 6 miles north of these tracts (USACE, 2003).

Currently the majority of the site remains in agricultural use primarily for growing crops. Some of the land is preserved as natural habitat. The FUDS parcels are currently owned by private individuals, the State of Washington, and Douglas County. The FUDS property boundary is shown on Figure 2. The ASR (USACE, 2003) indicated that the area of the FUDS consists of 2,460.12 acres, and the *ASR Supplement* (USACE, 2004b) indicated that the area of the range (Bombing Range (practice)) is 649.04 acres. Figure 2 is a 1949 aerial photograph from the ASR (Plate 3) that presents a layout of the Bombing Range (USACE, 2003). The ASR description states that the range includes a large 950-foot (ft) diameter ring target with five concentric circles of diameters of approximately 750 ft, 500 ft, 350 ft, 250 ft, and 125 ft. Figure 3 presents a current aerial photograph.

1.3 Scope and Objectives

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

The scope of the SI reported herein is restricted to evaluation of the presence of MEC or MC related to historical use of the FUDS prior to transfer. Potential releases of hazardous, toxic, or radioactive wastes are not addressed within the current scope. The intent of the SI is to confirm

the presence or absence of contamination from MEC and/or MC. The general approach for each SI is to conduct a records review and site reconnaissance in order to evaluate the presence or absence of MEC and to collect samples at locations where MC might be expected based on the conceptual site model (CSM) (Appendix A). The following decision rules are used to evaluate the results of the SI:

- Is No DoD Action Indicated (NDAI)? An NDAI recommendation may be made if:
  - There is no indication of MEC; and
  - MC contamination does not exceed screening levels determined from Technical Project Planning (TPP).
- Is an RI/FS warranted? An RI/FS may be recommended if:
  - There is evidence of MEC hazard. MEC hazard may be indicated by direct observation of MEC during the SI, by indirect evidence (e.g., a crater potentially caused by impact of UXO), or by a report of MEC being found in the past without record that the area was subsequently cleared; or
  - MC contamination exceeds screening levels determined from TPP.
- Is a removal action warranted? A removal action may be needed if:
  - High MEC hazard is identified. Shaw will immediately report any MEC findings so that USACE can determine the hazard in accordance with the MRSPP. An example of a high hazard would be finding sensitive MEC at the surface in a populated area with no barriers to restrict access; or
  - Elevated MC risk is identified. Identification of a complete exposure pathway (e.g., confirming MC concentrations above health-based risk standards in a water supply well) would trigger notification of affected stakeholders. Data would be presented at a second TPP meeting regarding the possible need for a removal action.

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

1.4 Site Inspection Process

The steps involved in conducting an SI include:

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

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

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

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

1.5 Munitions Response Site Prioritization Protocol

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

Definitions:

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

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

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

1.6 TPP Summary

The TPP meeting for the former Ephrata PBR was conducted on July 7, 2008, at the Best Western Inn located in Ephrata, Washington. Representatives from the USACE - Omaha Design Center, USACE – Seattle District, the Washington State Department of Ecology (WDOE) (via teleconference), and Shaw were in attendance. A site tour was not conducted as part of this meeting. By agreement with the USACE, a separate public meeting for stakeholders was held the evening of July 7, 2008, at the same location. The only public attendee was a representative from the Washington State Department of Natural Resources (DNR). Following the TPP presentation, there was a discussion of their parcel ownership. The DNR representative indicated that the DNR leases the State of Washington-owned parcel on the FUDS and uses it for dry wheat farming. The DNR representative was not aware of any portions of the parcel being preserved for natural habitat or being managed as a recovery area.

Shaw reviewed site information and presented a summary of the proposed SI approach for the Ephrata PBR, addressing MEC reconnaissance and MC sampling. The CSM presented characterized the site as consisting of one area of concern (AOC), a former practice pattern bombing range (Bombing Range). WDOE was in general agreement with the approach and the decision rules that were developed. Key agreements reached at the meeting included:

Areas of Concern: The presentation identified one AOC, the Bombing Range, as presented in the DoD Annual Report to Congress.

Reconnaissance Objectives: The TPP team agreed that the SI would include reconnaissance activities to:

- Confirm site conditions and land usage,
- Confirm the CSM,
- Select optimal sample locations (biased toward evidence of practice bombs, if observed), and
- Observe evidence of MEC and munitions history.

MC Sampling: The TPP team agreed that sampling for MC is appropriate for the site. The WDOE agreed that analysis of six surface soil samples and one sediment sample for select metals (aluminum, antimony, chromium, copper, iron, lead, manganese, nickel, and zinc) was appropriate since the FUDS was reportedly only used for practice bombing. However, the WDOE stipulated that a contingency should be in the SSWP indicating that if MEC or MD is observed consistent with explosive components, then the samples should also be analyzed for explosives (using EPA SW-846 Series 8000 methodology). The TPP team also agreed that surface water and groundwater sampling was not necessary for this FUDS.

Background Sampling: The TPP team agreed that background sampling for the site is appropriate since existing background data for this area is not known to be available. Ten background surface soil samples and one background sediment sample would be analyzed for select metals (aluminum, antimony, chromium, copper, iron, lead, manganese, nickel, and zinc).

Screening Criteria: The WDOE agreed that the EPA Region 9 Residential Preliminary Remediation Goals should be used for human health screening criteria for soils and sediments.

With respect to ecological screening criteria, team members agreed that ecological screening was necessary based on a preliminary assessment that an Important Ecological Place (IEP) or ecologically-managed lands were present at the site. Screening criteria used at other FUDS in Washington were proposed for use.

Stakeholders: Stakeholders consist of the State of Washington (which leases property to the Department of Natural Resources), Douglas County, and private individuals. Questions, comments, and concerns of landowners will be addressed through the right-of-entry request

process. Landowners will be provided an opportunity to review the TPP Memorandum and other documents pertaining to the site. Landowner-provided information with respect to site history, site conditions, land use, or other information relevant to the SI will be shared with the TPP team. The USACE - Seattle District is responsible to contact the landowners regarding the planned investigation.

1.7 Decision Rules

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

Objective 1: Determine if the site requires additional investigation or can be recommended for NDAI based on the presence or absence of MEC.

DQO No. 1 – Using trained UXO personnel and handheld magnetometers, a visual search of the Bombing Target AOC will be conducted searching for physical evidence to indicate the presence of MEC (e.g., craters and ground scars, MEC on the surface, munitions debris, and soil discoloration). The visual search will consist of a meandering path survey within the Bombing Target in accessible areas. The following decision rules will apply:

- If no evidence of MEC is found, the AOC will be recommended for NDAI relative to MEC.
- If evidence of MEC is confirmed, the AOC will be recommended for additional investigation.
- If there is an indication of an imminent MEC hazard, the site may be recommended for a removal action.

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

DQO No. 2 – Soil and sediment samples will be collected and analyzed as proposed in Section 4.0. Analytical results will be compared to screening values for human health and ecological risk assessment, and to background values for naturally occurring substances. The following decision rules will apply:

- If sample results do not exceed background, the site will be recommended for NDAI relative to MC.
- If sample results exceed background but are less than human health and ecological screening values, the site will be recommended for NDAI relative to MC.
- If sample results exceed both human health screening values and background values, the site will be recommended for additional investigation.
- If sample results do not exceed human health screening values but do exceed both ecological screening values and background values, additional evaluation of the data will

be conducted in conjunction with the stakeholders to determine if additional investigation is warranted.

1.8 MEC Technical Approach

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

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

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

> "a. (1) The property owner or individual granting rights of entry to the property will be notified of the hazard and advised to call the local emergency response authority (i.e., police, sheriff, or fire department). The individual will also be informed that if they do not call the local response authority within 1 hour, the individual who identified the UXO item will notify the local emergency response authority.
>
> (2) The local response authority will decide how to respond to the reported incident, including deciding not to respond (e.g., if the local response authority is already aware of the hazards on the property). If the local response authority decides to respond, the individual who identified the item or his designee will mark the location of the item and provide accurate location information to the emergency response authority. The individual who identified the item or his designee will generally remain in the area until the local response authority arrives, unless specifically indicated by the appropriate response authority that the individual may leave the area."
>
> "(c) Neither the U.S. Army Corps of Engineers personnel, nor their contractors have the authority to call EOD [Explosive Ordnance Disposal] to respond to an explosive hazard. This call is the responsibility of the local emergency response authority for FUDS properties and it must come through the proper chain of command on installations."

1.9 SSWP Organization

This SSWP supplements the Work Plan (Shaw, 2006), which includes an Accident Prevention Plan and Site Safety and Health Plan (SSHP) in Appendix D, and a Sampling and Analysis Plan (SAP) in Appendix E that includes both the USACE Programmatic SAP and the Shaw SAP. The SAPs contain a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP). The Work Plan, as amended by this SSWP, governs work that will be implemented during the SI at the FUDS. This SSWP provides additional information not available in the Work Plan, including site information (background information, summary of historical documents evaluated,

and resulting data needs), a discussion of activities to be conducted prior to mobilizing to the field, a presentation of field data to be collected, and appendices with supporting documents. Specifically, this SSWP includes the following sections:

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

2.0 Site Information

Unless otherwise referenced, the following historical and physical setting information in Sections 2.1 and 2.2 is taken from the ASR (USACE, 2003) and the *ASR Supplement* (USACE, 2004b). This section provides a summary of site-specific information not available in the Work Plan, which was used to profile the site in development of the CSM.

2.1 Installation History

The Ephrata PBR was used from 1943 to 1945 for high altitude bombing by heavy bombardment crews (the U.S. Army 2nd Air Force was assigned to the Ephrata Army Air Field [AAF]). Ephrata AAF was active from 1942 to 1945 and was initially a training facility for B-17 and B-24 bomber crews (June 1942 through December 1943). In February 1943, a request was made and approved for constructing a pattern bombing range to support training. The site consisted of 2,460.12 acres of land. The practice bombing range consisted of approximately 649 acres. The target was built just south of the intersection of the four sections (Sections 5, 6, 31, and 32). Facilities constructed on the site included one 64-square-foot portable radio shack, one 64-square-foot portable motor generator shed, and several targets (USACE, 2003).

Between 1943 and 1945, the Ephrata AAF experienced a series of deactivations and reactivations in status. In late 1945 the Base was reduced to a "temporarily" inactive status. The Ephrata PBR was made available for deactivation as of September 30, 1945. The leases were terminated in September and October 1946 and the land was returned to private owners.

2.2 Physical Setting

2.2.1 Access and Land Use

The FUDS is located approximately 20 miles north of the town of Ephrata, in Douglas County, Washington. The majority of the FUDS is used for agriculture, primarily for crops with some of the land reportedly being preserved by the State of Washington as natural habitat (high desert). Public roads are present on the FUDS. There is unrestricted access to the site and no fencing.

2.2.2 Topography and Climate

The topography is gently undulating to moderately hilly, most of which lies at altitudes of 1,000 to 2,500 ft. The site is located at an approximate elevation of 2,150 ft. The primary landscape feature is high plain desert with low-lying vegetation. Currently the majority of the site remains in agricultural use primarily for growing crops. Some of the land is reportedly preserved as a natural habitat.

The area is characterized by a combination of damp weather during the winter months and mild, arid interior conditions during the summer months. Annual precipitation totals for the Ephrata area are generally less than 21 inches. Approximately 70 percent of the total annual precipitation

falls between the first of October and the end of March, about half of that falls as snow. The prevailing wind direction is from the southeast (USACE, 2003).

2.2.3 Surface Water

Only intermittent streams exist on the site. All runoff from this site flows into perennial streams that flow westerly, none of which are named on the U.S. Geological Survey quadrangle map (USACE, 2003).

2.2.4 Geology and Hydrogeology

The site is located within the Columbia Basin subprovince of the Columbia Intermontane Province (Thornsbury, 1965).

2.2.4.1 Bedrock Geology

Bedrock in the area consists of the Miocene age Columbia River Basalt Group. This is a thick sequence of flood basalts that covers much of eastern Washington, and adjacent areas of Idaho and Oregon. The basalts in the area have been deeply eroded by the Lake Missoula flood that occurred during the Pleistocene age. The Grande Coulee, a glacial outwash channel, is located east of the FUDS.

2.2.4.2 Overburden Soils

Overlying the basalt in the local area are gravelly glacial outwash deposits from flooding by the glacial Lake Missoula Flood. According to the ASR, in the northern portion of the site where the bombing range existed, the surface layer of the soil is underlain by basalt (4 to 20 inches from the surface) (USACE, 2003). The thickness of the overburden soils in other portions of the site is reportedly less than 20 ft. Overburden soils also include the fine-grained Palouse Loess. This is a wind-blown, fine-grained soil dominant in eastern Washington. Natural Resources Conservation Service (NRCS) soil types for the FUDS primarily consist of silt-loams of the Benway-Selah-Alstown, Renslow, and Toler sequences (NRCS, 2008).

2.2.4.3 Hydrogeology

The Columbia Plateau aquifer system consists of two components: the Columbia River Basalt Group and the overburden. The Columbia River Basalt Group has three hydrogeologic units, from oldest to youngest, the Grande Ronde Basalt, the Wanapum Basalt, and the Saddle Mountains Basalt. The Basalt Group, as a whole, has an average hydraulic conductivity of 0.47 ft per year although interflow zones are much higher. The overburden consists of consolidated and unconsolidated deposits of fluvial, lacustrine, volcanic, and eolian units. The overburden, as a whole, has an average hydraulic conductivity of 66,000 ft per year. The direction of groundwater flow in the overburden is toward discharge points along surface water features. Recharge is primarily through precipitation and applied irrigation water, and secondarily from surface water bodies (Vaccaro, 1982).

2.3 Summary of Previous Investigations

Historical documents were reviewed to collect information regarding the former Ephrata PBR. A summary of these documents is provided in the following subsections.

2.3.1 Inventory Project Report

The INPR site visit was conducted on November 2, 1995 (USACE, 1996). Metal bomb debris and, occasionally, intact spotting charges were found at various locations within the boundaries of the FUDS. It was also reported that there was a possibility that high explosive demolition and incendiary bombs may have been used at the site. The INPR gave a Risk Assessment Code (RAC) of 3 for the FUDS.

The map shown in support of the INPR and the description of the property in the Findings of Fact are incorrect (USACE, 1996). The INPR map shows the site in Sections 31 and 32, T23N, R26E, and in Sections 5 and 6, T22N, R26E, one-half in Douglas and one-half in Grant Counties, Washington. Based on an historical aerial photograph included in the ASR, the actual Bombing Target was approximately 6 miles north of these tracts (USACE, 2003).

2.3.2 Archives Search Report

The ASR site inspection was conducted on August 13, 2002. The ASR indicated that in September 1943, Ephrata AAF stored 100-pound (lb) M38A2 practice bombs (sand filled), as well as, 300-lb, 500-lb, and 1,000-lb bombs (USACE, 2003). There was no evidence of chemical warfare material being stored or used on this FUDS.

The ASR site survey indicated that a small dump was observed in the far northeast corner of the target area, and two piles of bomb debris were observed adjacent to Whitehall Road. The ASR site survey confirmed the presence of M38A2 practice bombs with M3 or M4 spotting charges and miniature bombs (AN-Mk 5, AN-Mk 23, and AN-Mk 43). There was no evidence of MD or cratering on the FUDS indicative of the use of conventional high explosives. MC sampling was not conducted as part of the ASR site survey. A RAC of 4 was assigned to the FUDS.

2.3.3 ASR Supplement

An *ASR Supplement* was completed in 2004 and indicated one range, the Bombing Range (USACE, 2004b). The ASR indicated that no certificates of clearance were found for the Ephrata PBR (USACE, 2003).

2.4 Other Land Uses that May Have Contributed to Contamination

Other than farming and grazing activities, there are no known sources for contamination.

2.5 Munitions Information

In September 1943, Ephrata AAF stored 100-lb M38A2 practice bombs (sand-filled), as well as 300-lb, 500-lb, and 1,000-lb practice bombs. These bombs may have been used on the Ephrata PBR (USACE, 2003). As of February 1945, Ephrata AAF had bombs, incendiaries, one AN-M8

cluster incendiary bomb, and M1 and M2 instructional bombs. Table 1 presents the munitions information for the Ephrata PBR.

The ASR site survey confirmed the presence of 100-lb sand-filled M38A2 practice bombs and miniature practice bombs (AN-Mk 5, AN-Mk 23, and AN-Mk 43) at the FUDS. The ASR also indicated that a small dump was observed in the far northeast corner of the target area and two piles of bomb debris were observed adjacent to Whitehall Road (USACE, 2003).

The INPR indicated that bomb debris and, occasionally, intact spotting charges have been found at various locations within the boundaries of the Ephrata PBR (USACE, 1996). The INPR indicated that there was a possibility that high explosive demolition and incendiary bombs may have been used because they were present at the Ephrata AAF. However, high explosive or incendiary bombs have not been reported in other documents as detected on the Ephrata PBR.

3.0 Pre-Field Activities

3.1 Coordination with State Historic Preservation Office

The presence of archaeological resources within the project area or sites on the National Register of Historic Places will be confirmed with the Washington State Historic Preservation Office prior to conducting any site activities. Sampling activities to be conducted are anticipated to have minimal impact on the environmental setting, so it is believed that there will be no impact to any historic or cultural resources should any be identified at the FUDS property.

3.2 Coordination Regarding Natural Resources

In a letter dated June 10, 2008, the State of Washington Department of Fish and Wildlife (WDFW) indicated that the Sage Grouse is a State threatened species and that Sage Grouse and Pygmy Rabbit Recovery Areas are present within Douglas County, Washington. According to the WDFW, all known Pygmy Rabbits present in Douglas County have been captured and have not been reintroduced.

The range and other areas of interest at the Ephrata PBR addressed by this SI are cultivated for crops. A portion of the site is reportedly preserved for natural habitat by the State of Washington (USACE, 2003). WDFW indicated that Sage Grouse and Pygmy Rabbit Recovery Areas are present in Douglas County; however, exact locations were not provided. However at the TPP Meeting, a representative from the DNR indicated that the DNR leases the parcel owned by the State of Washington and uses it for agricultural activities (dry wheat farming). The DNR representative was not aware of any portions of the parcel being preserved for natural habitat or being managed as a recovery area.

The Ephrata PBR does qualify as an IEP or Sensitive Environment as defined by the USACE (2006) or EPA (1997).

3.3 Review of Historical Aerial Photographs

Review of a 2005 aerial photograph and historical (1949 and 1952) aerial photographs of the FUDS has been completed as part of preparation of this SSWP. Figure 2 is a 1949 aerial photograph from the ASR (Plate 3) that presents the Bombing Range (USACE, 2003). The description states that the range includes a large 950-ft diameter ring target with five concentric circles of diameters of approximately 750 ft, 500 ft, 350 ft, 250 ft, and 125 ft. The area inside and outside the target area does not indicate any significant scarring or craters. The 2005 site aerial photograph (Figure 3) does not show any indications of the former Bombing Range target since the site has been used extensively for agriculture and preserved natural habitat (USDA, 2005). The target is also not visible on a 1952 aerial photograph.

3.4 Coordination of Rights of Entry

Per Section 2.5.2 of the Work Plan (Shaw, 2006) and as the geographic USACE District office for the Ephrata PBR FUDS, the Project Manager from the USACE, Seattle District office is responsible for obtaining the rights of entry (ROEs) for the property where the SI activities will be performed. Access to identified property is necessary for conducting field activities. Table 2 identifies the property of interest and the status of obtaining the ROEs.

3.5 Equipment

A four-wheel drive vehicle will be necessary for access on unpaved roads, with the permission of the landowners. In areas where vehicles are not permitted, access will be on foot or a vehicle of least impact will be utilized (e.g., all-terrain vehicle).

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

3.6 Communications

The primary means of on-site communication will be cellular telephones. The two-person field team (and any other accompanying parties) will remain together throughout all aspects of the field activities.

3.7 Training and Briefing

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

4.0 Site Inspection Activities

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

4.1 Key Personnel

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

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

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

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

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

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

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

UXO Technician – The UXO Technician will be responsible for the UXO avoidance measures to be implemented during field activities. One of the following individuals will serve as the UXO Technician: David Watkins (Registration No. 1420), Rob Irons (1137), Jim Bayne (1212), Ron Stanfield (1161), or Dave Van Deman (1057).

4.2 Field Reconnaissance

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

4.2.1 Objectives

A visual surface reconnaissance will be conducted along a meandering path through portions of the FUDS (Figure 4). The actual path of the reconnaissance may vary from the plotted proposed path. The reconnaissance has three main objectives:

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

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

4.2.1.1 Document General Site Conditions

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

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

4.2.1.2 Document Evidence of Military Activities

Table 1 lists munitions and the associated MC used at the Bombing Range. The following conditions will be recorded in the field logbook and documented by digital photographs and GPS:

- Presence or absence of MEC or other MD; and
- Location and physical description of range features, such as targets.

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

4.2.1.3 Sample Locations

Reconnaissance will also be used to select optimal sample locations; that is, samples will be biased to locations with evidence of former munitions activity, if observed. The following conditions will be recorded in the field logbook (include text and sketches, when applicable) and documented by digital photographs:

- Rationale for selecting sample location (e.g., presence of MEC or MD, staining, distressed vegetation);
- Description of sample location;

- Soil conditions (as appropriate); and
- Surface water or sediment conditions (as appropriate).

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

4.2.2 Reconnaissance Methods

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

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

4.2.3 Extent of Reconnaissance

Site reconnaissance will use available aerial photographs and a Geographic Information System base map developed from the ASR and other sources (USACE, 2003). Field crews will be provided both current and historical aerial photographs. Information shown on the reconnaissance base map will include AOC boundaries, property boundaries, information from reported MEC findings, topography, and current roads and buildings. One objective of reconnaissance is to "ground truth" features seen on aerial photographs (e.g., if targets are still visible, or if buildings have been removed or added).

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

The reconnaissance effort will be concentrated within the Bombing Range with a more concentrated effort near the center of the target (Figure 4). The anticipated total length of the

meandering path is approximately 37,000 linear feet. Additional reconnaissance will be conducted by vehicle along existing roads and trails within and near the FUDS to observe general site conditions.

4.3 Field Sampling

This SSWP details sampling to be conducted, by media, as discussed during the TPP meeting and documented in the *Final Technical Project Planning Memorandum* (Shaw, 2008). Surface soil and sediment samples will be collected at a depth of approximately 0 to 6 inches and 0 to 2 inches below ground surface, respectively. No subsurface samples are planned. No groundwater or surface water samples are planned. A judgmental sampling approach will be used to select sample locations in areas determined by the CSM and/or visual field observations to potentially be impacted by MC. Proposed sample locations are presented on Figure 5. The proposed sampling approach is presented in Table 3.

4.3.1 Soil Samples

Proposed SI soil sampling will consist of the collection of six soil samples from within the Bombing Range as shown on Figure 5. The soil samples will be composited samples (7-point, wheel pattern with a 2-ft radius). The location of the samples may be adjusted to more biased locations based on the reconnaissance survey. If evidence of munitions activity is observed at locations outside the Bombing Range, up to two of the six soil samples may be located in these outlying areas.

4.3.2 Sediment Sample

Proposed SI sediment sampling will consist of the collection of one sediment sample from an intermittent stream channel within the Bombing Range (Figure 5). The sediment sample will be a discrete sample.

4.3.3 Surface Water and Groundwater

No surface water or groundwater samples are planned. The site contains only intermittent stream channels. The sediment from these channels will be sampled. There are no groundwater wells within the Bombing Range or FUDS property.

4.3.4 Background Sampling

Site-specific or regional data regarding background concentrations of metals in soil and sediment are not known to be available. Ten background surface soil samples and one sediment sample will be collected from nearby areas outside the AOC boundary and within the FUDS boundary that do not appear to be have been impacted by past site operations (Figure 5). The background samples will be collected using the same procedures as the original samples and analyzed for select metals (aluminum, antimony, chromium, copper, iron, lead, manganese, nickel, and zinc) and compared to the results from the samples collected at the Bombing Range. The proposed background sampling is summarized in Table 3.

Additionally, one background sediment sample will be collected and analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, and nickel).

4.3.5 Quality Assurance/Quality Control Samples

Quality control samples, including field duplicates and matrix spike/matrix spike duplicate samples, will be collected in accordance with the Work Plan (Shaw, 2006). No quality assurance (field split) samples are planned to be collected for the SI at the site.

4.3.6 Sample Preservation, Packaging, and Shipping

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

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

4.4 Analytical Program

Analysis of the proposed soil and sediment samples collected will use EPA SW-846 Method 6020 to analyze for select metals (aluminum, antimony, chromium, copper, iron, lead, manganese, nickel, and zinc). Antimony, chromium, copper, iron, lead, manganese, nickel, and zinc are considered potential MC. Aluminum, iron, and manganese may also serve as reference elements for a geochemical evaluation of background distributions, if needed. Additionally, during the TPP Meeting, it was agreed that if MEC or MD is observed consistent with explosive components, then the samples should also be analyzed for explosives by EPA SW-846 Method 8330 (Modified).

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

4.5 Background and Screening Values

A comparison of site soil sample data to background data will be necessary to distinguish a munitions-related release from ambient conditions resulting from naturally occurring or anthropogenic sources. Where the body of background data includes sufficient samples (i.e., soil), a background threshold comparison of site concentrations to the background 95th upper tolerance limit or 95th percentile, as appropriate, will be made (EPA, 1989, 1992a, 1994,

and 2002). If one or more site samples exceed the background threshold, the following tests may also be applied:

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

Since the body of background data is limited (i.e., sediment), the site-to-background comparison will be conducted according to guidance for SI activities and HRS scoring (EPA, 1992b). Background concentrations for analytes are taken to be the maximum values observed in the limited background data set (EPA, 1995). A comparison is then made to determine if a hazardous substance in the media is "significantly above the background level" according to the HRS criteria (40 CFR Part 300, Appendix A, Table 2-3):

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

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

Site sample data that exceed background concentrations will be compared to the appropriate human health screening criteria to determine if additional investigation should be recommended. Table 5 lists the human health screening criteria for this SI. Tables 6 and 7 list the ecological screening criteria for this SI. A consensus concerning the criteria to use was reached during the TPP meeting. The human health screening criteria for surface soil and sediment are EPA Region 9 Preliminary Remediation Goals.

4.6 Site-Specific Information/Data

In addition to observations and data directly obtained from field activities discussed in Sections 4.2 and 4.3, site-specific information/data will be collected for the FUDS to supplement that found in the ASR (USACE, 2003) and *ASR Supplement* (USACE, 2004b). Initial information collected has been incorporated in the SSWP. This site information will be supplemented using research via Internet searches, requests from agency contacts and site contacts, if applicable.

Site-specific information/data will include geology, climate, hydrogeology, federally and state-listed threatened and endangered species known to be or potentially be on site, sensitive habitats, wetlands, cultural and archeological resources, water resources, vegetation, waste disposal sites, and impact mitigation measures.

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

5.0 Investigation-Derived Waste

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

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

6.0 Proposed Schedule

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

- Draft SSWP Comments Due — November 2008.
- Final SSWP Submitted — December 2008.
- Field Work Begins — January 2009.
- Draft SI Report Submitted — April 2009.
- Draft SI Report Comments Due — May 2009.
- Draft Final SI Report Submitted — June 2009.
- Draft Final SI Report Comments Due — July 2009.
- Second TPP Meeting — August 2009.
- Final SI Report Submitted — August 2009.

7.0 References

32 CFR 179.3 (Code of Federal Regulation Title 32, Part 179). 2007. *Munitions Response Site Prioritization Protocol (MRSPP).* Website: http://www.gpoaccess.gov/cfr/index.html. Washington, D.C. August 22, 2007.

40 CFR 300 (Code of Federal Regulation Title 40, Part 300). 2006. *National Oil and Hazardous Substances Pollution Contingency Plan.* Website: http://www.gpoaccess.gov/cfr/index.html. Washington, D.C. October 4, 2006.

10 USC 2701 et seq. (U.S. Code Title 10, Part 2701). 2004. *Chapter 160 – Environmental Restoration, Sec. 2701 Environmental restoration program*. U.S. Government Printing Office. Website: http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=browse_usc&docid=Cite:+10USC2701. January 20, 2004.

10 USC 2710 et seq. (U.S. Code Title 10, Part 2710). 2005. *Chapter 160 – Environmental Restoration, Sec. 2710 Inventory of unexploded ordnance, discarded military munitions, and munitions constituents at defense sites (other than operational ranges).* U.S. Government Printing Office. Website: http://frwebgate2.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=33328023600+0+0+0&WAISaction=retrieve. January 3, 2005.

42 USC 9601 (U.S. Code Title 42, Part 9601). 2003. *Hazardous Substances Releases, Liability, and Compensation*. U.S. Government Printing Office. Website: http://frwebgate5.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=209840153119+0+0+0&WAISaction=retrieve. January 7, 2003.

Canadian Council of Ministers of the Environment (CCME). 2003. Environmental Quality Guidelines, Canadian Interim Sediment Quality Guidelines (ISQGs) Summary Table and Canadian Environmental Quality Guidelines (for Freshwater) Summary Table. December 2003.

Department of Defense (DoD). 2001. *Management Guidance for the Defense Environmental Restoration Program*. Office of the Deputy Under Secretary of Defense (Installations and Environment). September 2001.

Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1997. *Preliminary Remediation Goals for Ecological Endpoints*. Lockheed Martin Energy Systems, Inc. Oak Ridge National Laboratory ES/ER/TM-162/R2.

Executive Order 12580. 1987. *Superfund Implementation*. 52 FR 2923. January 23, 1987. Website: http://www.archives.gov/federal-register/codification/executive-order/12580.html.

Executive Order 13016. 1996. *Amendment to Executive Order No. 12580.* 61 FR 45871. August, 28, 1996. Website: http://www.archives.gov/federal-register/executive-orders/1996.html.

Los Alamos National Laboratory (LANL). 2005. *Eco Risk Database*. Release 2.2. September 2005.

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

Myers, J. and K. Thorbjornsen. 2004. "Identifying Metals Contamination in Soil: A Geochemical Approach." *Soil and Sediment Contamination: An International Journal*. Vol. 13, No. 1, pp. 1-16.

National Resources Conservation Service (NRCS). 2008. Soil Map – Douglas County, Washington.

Netherlands Ministry of Housing, Spatial Planning, and Environment. 2000a. Annex A: Target Values, Soil Remediation Intervention Values and Indicative Levels for Serious Contamination. February 4, 2000. Website: http://www2.minvrom.nl/Docs/internationaal/annexS_I2000.pdf.

Netherlands Ministry of Housing, Spatial Planning, and Environment. 2000b. Circular on Target Values and Intervention Values for Soil Remediation. February 4, 2000. Website: http://www2.minvrom.nl/Docs/internationaal/S_I2000.pdf.

Oregon Department of Environmental Quality (ODEQ). 2001. *Guidance for Ecological Risk Assessment: Levels I, II, III, IV*. Waste Management & Cleanup Division. December 2001.

Shaw Environmental, Inc. (Shaw). 2006. *Final Type I Work Plan, Site Inspections at Multiple Sites, NWO Region, Formerly Used Defense Sites, Military Munitions Response Program*. Prepared for U.S. Army Corps of Engineers. February 2006.

Shaw Environmental, Inc. (Shaw). 2008. *Final Technical Project Planning Memorandum, Ephrata Pattern Bombing Range No. 4, FUDS Property No. F10WA0579*. Prepared for U.S. Army Corps of Engineers. October 2008.

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

Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E. Welsh, F.M. Cretella, P.H. Reno, and F.B. Daniel. 1999. "Nitroaromatic Munition Compounds: Environmental Effects and Screening Values." *Reviews of Environmental Contamination and Toxicology*. Vol. 161: 1-156.

Thornsbury, William. J. 1965. *Regional Geomorphology of the United States*. John D. Wiley and Sons, Inc.

U.S. Army Corps of Engineers (USACE). 1996. *DERP-FUDS, Inventory Project Report for Site No. F10WA057901, Ephrata Pattern Bombing Range No. 4, Douglas County, Washington.*

U.S. Army Corps of Engineers (USACE). 2003. *Archives Search Report Findings, Ephrata Pattern Bombing Range No. 4, Douglas County, Washington*. April 17, 2003.

U.S. Army Corps of Engineers (USACE). 2004a. *Defense Environmental Restoration Program (DERP) Formerly Used Defense Sites (FUDS) Program Policy*. Engineer Regulation (ER) 200-3-1. May 10, 2004.

U.S. Army Corps of Engineers (USACE). 2004b. *ASR Supplement, Ephrata Pattern Bombing Range No. 4, Douglas County, Washington.* November 26, 2004.

U.S. Army Corps of Engineers (USACE). 2005. *Formerly Used Defense Sites (FUDS) Military Munitions Response Program (MMRP) Site Inspections. Program Management Plan*. February 2005.

U.S. Army Corps of Engineers (USACE). 2006. *Screening-Level Ecological Risk Assessments for FUDS MMRP Site Inspections*. Prepared by USACE HTRW CX. August 11, 2006.

U.S. Department of Agriculture (USDA). 1999. Topographic Maps, Douglas and Grant Counties, Washington. U.S. Department of Agriculture Service Center Agencies.

U.S. Department of Agriculture (USDA). 2005. Aerial Photograph (Douglas County, Washington). U.S. Department of Agriculture Service Center Agencies, USDA-APFO, National Inventory Project. Website: http//www.datagateway.nrcs.usda.gov/.

U.S. Environmental Protection Agency (EPA). 1989. *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Final Guidance*. Office of Solid Waste, Waste Management Division. USEPA/530/SW-89/026. July 1989.

U.S. Environmental Protection Agency (EPA). 1992a. Statistical *Analysis of Ground-Water Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance*. Environmental Statistics and Information Division, Office of Policy, Planning, and Evaluation. USEPA/530/R-93/003. July 1992.

U.S. Environmental Protection Agency (EPA). 1992b. Guidance *for Performing Site Inspections Under CERCLA, Interim Final.* EPA 540-R-92-021, Office of Emergency and Remedial Response, Washington DC, Directive # 9345.1-05. September 1992.

U.S. Environmental Protection Agency (EPA). 1994. *Statistical Methods for Evaluating the Attainment of Cleanup Standards*. Environmental Statistics and Information Division, Office of Policy, Planning, and Evaluation. USEPA/230/R-94/004. June 1994.

U.S. Environmental Protection Agency (EPA). 1995. *Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites*. Office of Research and Development, EPA/540/S-96/500. December 1995.

U.S. Environmental Protection Agency (EPA). 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecologic I Risk Assessments* (ERAGS). USEPA/540/R-97/006, OSWER Directive # 9285.7-25. June 1997.

U.S. Environmental Protection Agency (EPA). 2000. *Bioaccumulation Testing and Interpretation for the Purposes of Sediment Quality Assessment: Status and Needs.* EPA 823-R-00-001. Website: http://www.epa.gov/waterscience/cs/biotesting/. February 2000.

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

U.S. Environmental Protection Agency (EPA). 2002. *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites*. Office of Emergency and Remedial Response. USEPA/540/R-01/003. September 2002.

U.S. Environmental Protection Agency (EPA). 2003. *U.S. EPA, Region 5, RCRA, Ecological Screening Levels*. Website: http://www.epa.gov/reg5rcra/ca/ESL.pdf. August 23, 2003.

U.S. Environmental Protection Agency (EPA). 2004. *Region 9 Preliminary Remediation Goals (PRGs)*. Website: www.epa.gov/region09/waste/sfund/prg/index.htm. October 2004.

U.S. Environmental Protection Agency (EPA). 2005. *Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs).* Office of Solid Waste and Emergency Response. Website version last updated March 15, 2005: http://www.epa.gov/ecotox/ecossl.

U.S. Environmental Protection Agency (EPA). 2006a. Personal communication between Catherine Wooster-Brown (Eco Risk Assessor, EPA Region 7) and Mark Weisberg (Shaw Environmental, Inc.). Subject: Soil, sediment, and/or surface water ESL recommendations. March 2006.

U.S. Environmental Protection Agency (EPA). 2006b. Personal communication between Dale Hoff (Eco Risk Assessor, EPA Region 8) and Mark Weisberg (Shaw Environmental, Inc.). Subject: Soil, sediment, and/or surface water ESL recommendations. March 2006.

U.S. Environmental Protection Agency (EPA). 2006c. Personal communication between Joseph Goulet (Eco Risk Assessor, EPA Region 10) and Mark Weisberg (Shaw Environmental, Inc.). Subject: Soil, sediment, and/or surface water ESL recommendations. March 2006.

U.S. Environmental Protection Agency (EPA). 2006d. *Risk Based Concentrations*. Region III. April 2006.

U.S. Navy. 2002. *Guidance for Environmental Background Analysis, Volume I: Soil*. NFESC. User's Guide UG-2049-ENV. Naval Facilities Engineering Command. Washington, D.C. April 2003.

U.S. Navy. 2003. Guidance *for Environmental Background Analysis, Volume II: Sediment.* NFESC User's Guide UG-2054-ENV. Naval Facilities Engineering Command. Washington, D.C. April 2003.

Vaccaro, J.J. 1982. *Summary of the Columbia Plateau Regional Aquifer-System Analysis; Washington, Oregon, and Idaho.* U.S. Geological Survey; Aquifers of the Far West, AWRA Monograph Series No. 16.

Washington Department of Ecology (WDOE). 1994. *Natural Background Soil Metals Concentrations in Washington State.* Publication Number 94-115. Website: http://www.ecy.wa.gov/biblio/94115.html. October 1994.

Washington Department of Ecology (WDOE). 1996. *Model Toxics Control Act Statute and Regulation - Model Toxics Control Act Chapter 70.105D RCW, Uniform Environmental Covenants Act Chapter 64.70 RCW, MTCA Cleanup Regulation Chapter 173-340 WAC.* Website: http://www.ecy.wa.gov/biblio/9406.html. January 1996, revised November 2007.

Washington Department of Ecology (WDOE). 2003. Website: http://apps.ecy.wa.gov/welllog/textsearch.asp. February 12, 2003.

Washington Department of Ecology (WDOE). 2004. CLARC, Cleanup Levels and Risk Calculations. Website: https://fortress.wa.gov/ecy/clarc/CLARCOverview.aspx. CLARC Notes updated November 23, 2004.

Figures

DRAWING NUMBER: 109_Ephrata_PBR_013_Fig1_SiteLocation_SSWP

DRAWN BY: M. Mireiter 6/2/08

OFFICE: DEN

281000 292000 303000 314000 325000

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Grimes Lake
Fisher Lakes
Haynes Lake
Stallard Lake
Jollys Lake
Heinlen Lake
Sullivan Lake
Douglas Creek
Jameson Lake
Banks Lake
Banks Lake South
Table Lake
Coulee Lake
Coulee City
Dry Falls Lake
Perch Lake
Green Lake
Castle Lake
Park Lake
Meadow Lake
Deep Lake
Main Canal
Blue Lake
Trail Lake
Arbuckle Draw
Alkali Lake
Bluff Lake
Williams Lake
Main Canal
Long Lake Reservoir
Lake Lenore
McCartney Creek
Dry Lake
Moses Coulee
Little Soap Lake
Billy Clap Lake
Main Canal
Brook Lake
Grant
Soap Lake
Crab Creek
Round Lake
Soap Lake
Lakeview
West Canal
Willow Lake
South Willow Lake
East Low Canal
Ephrata
Rocky Ford Creek
Crab Creek
Lynch Coulee

Douglas
Grant

172 2 17 155 17 28 171 17

Legend

- Ephrata Pattern Bombing Range FUDS Boundary
- Nature Conservancy Preserve
- Sagebrush Flat Wildlife Area

NOTES:
1) FUDS property and range boundaries were obtained from a GIS dataset provided by the USACE.
2) Nature Conservancy Preserve and Wildlife Area boundaries were obtained from the following website: http://conserveonline.org/workspaces/WAFO.CAP/Moses/MosesCAPBoundary.pdf/view.html.
3) Topographic maps (Douglas and Grant Counties) were obtained from the U.S. Department of Agriculture, Service Center Agencies, 1999.

N

0 1.5 3 6 Miles

REFERENCE/PROJECTION: NAD 83 UTM Zone 11N

FIGURE 1

SITE LOCATION

EPHRATA PATTERN BOMBING RANGE
FUDS PROPERTY NUMBER F10WA0579

US Army Corps of Engineers®
Omaha District

Shaw®

OFFICE	DRAWN BY	
DEN	M. Mireiter	6/2/08

DRAWING NUMBER: *109_Ephrata_PBR_014_Fig2_OrigSiteLayout_SSWP*

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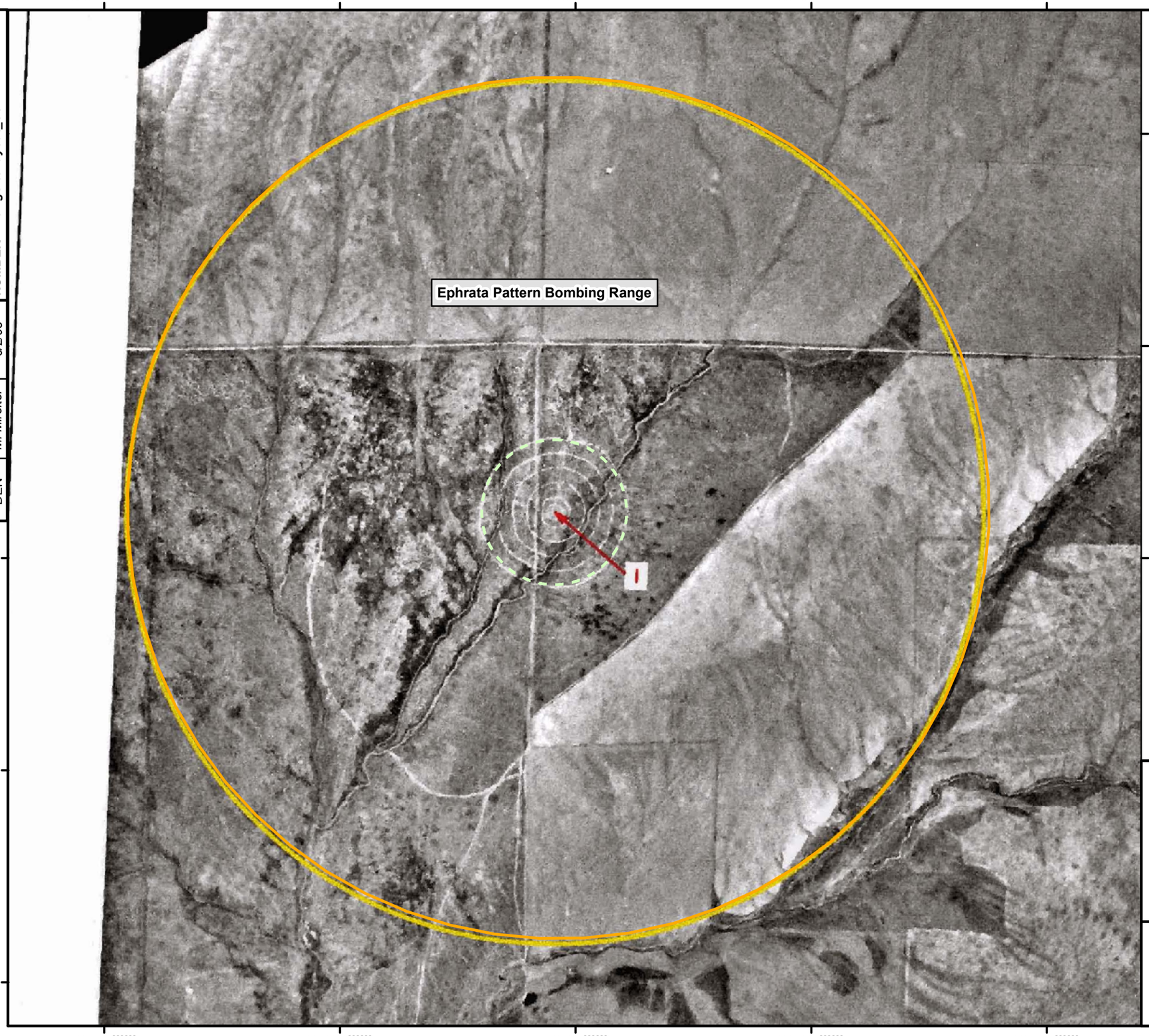
5267500.000000 5267050.000000 5266600.000000 5266150.000000 5265700.000000

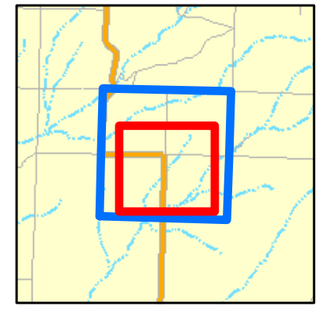


Legend

- Range in the MMRP Inventory
- Central Target Area

NOTES:

1) FUDS property and range boundaries were obtained from a GIS dataset provided by the USACE.
2) Text note on figure (1) is defined in the ASR as: 950' diameter concentric ring target is visible. Small, linear cleared areas to the immediate north of the target show no signs of military use. Significant scarring or cratering is not visible in the study area.
3) Aerial photograph is from Plate 3 of the ASR (USACE, 2003) and is dated 1949.



0 350 700 1,400 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 11N

FIGURE 2

ORIGINAL SITE LAYOUT

EPHRATA PATTERN BOMBING RANGE
FUDS PROPERTY NUMBER F10WA0579

US Army Corps of Engineers®
Omaha District

Shaw®

OFFICE	DRAWN BY		DRAWING NUMBER
DEN	M. Mireiter	6/2/08	109_Ephrata_PBR_015_Fig3_CurrentAerial_TPP

302700.000000 303600.000000 304500.000000 305400.000000 306300.000000

5268400.000000
5267500.000000
5266600.000000
5265700.000000

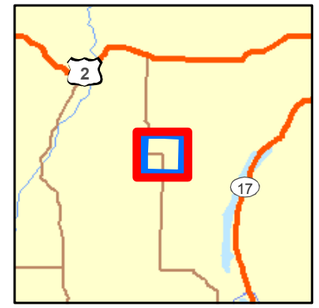
5th Rd
K Rd
K Rd
G Rd
H Rd
6th Rd
Whitehall Rd
Highland School Rd

Ephrata Pattern Bombing Range

Legend

- Ephrata Pattern Bombing Range FUDS Boundary
- Range in the MMRP Inventory
- Central Target Area
- Reported Bomb Debris (ASR Site Survey)
- Intermittent Stream

NOTES:
1) FUDS property and range boundaries were obtained from a GIS dataset provided by the USACE.
2) Locations of reported bomb debris were derived from the ASR (USACE, 2003).
3) Aerial photograph (Douglas County) was obtained from the U.S. Department of Agriculture, Service Center Agencies; photograph is from the USDA-APFO National Agricultural Inventory Project (NAIP), 2005.



N

0 625 1,250 2,500
Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 11N

FIGURE 3

CURRENT AERIAL PHOTOGRAPH

EPHRATA PATTERN BOMBING RANGE
FUDS PROPERTY NUMBER F10WA0579

US Army Corps of Engineers®
Omaha District

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302700.000000 303600.000000 304500.000000 305400.000000 306300.000000

5268400.000000
5267500.000000
5266600.000000
5265700.000000

5th Rd
K Rd
K Rd
6th Rd
Whitehall Rd
Highland School Rd
C Rd
B1 Rd

Ephrata Pattern Bombing Range

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

DRAWING NUMBER: 109_Ephrata_PBR_016_Fig4_PropRecon_SSWP

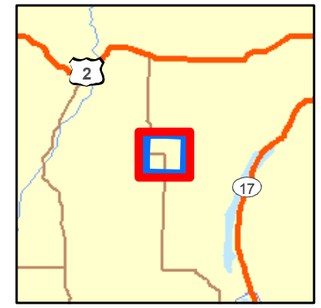
DRAWN BY: M. Mireiter 6/2/08

OFFICE: DEN

Legend

- Ephrata Pattern Bombing Range FUDS Boundary
- Range in the MMRP Inventory
- Central Target Area
- Taxlot Parcel
- Proposed Reconnaissance Path
- Intermittent Stream

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



N

0 625 1,250 2,500
Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 11N

FIGURE 4

PROPOSED RECONNAISSANCE PATH

EPHRATA PATTERN BOMBING RANGE
FUDS PROPERTY NUMBER F10WA0579

US Army Corps of Engineers®
Omaha District

Shaw®

OFFICE: DEN

DRAWN BY: M. Mireiter 6/2/08

DRAWING NUMBER: 109_Ephrata_PBR_017_Fig5_PropSamplingLocs_SSWP

302700.000000 303600.000000 304500.000000 305400.000000 306300.000000

5268400.000000

5267500.000000

5266600.000000

5265700.000000

5th Rd

K Rd

K Rd

G Rd

H Rd

Ephrata Pattern Bombing Range

6th Rd

Whitehall Rd

Highland School Rd

Legend

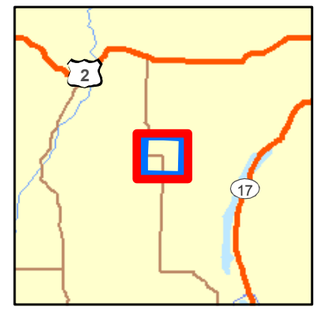
- Ephrata Pattern Bombing Range FUDS Boundary
- Range in the MMRP Inventory
- Central Target Area
- Intermittent Stream

Proposed Sample Location

- Soil
- Sediment
- Background Soil
- Background Sediment

NOTES:

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



N

0 625 1,250 2,500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 11N

FIGURE 5

PROPOSED SAMPLING LOCATIONS

EPHRATA PATTERN BOMBING RANGE
FUDS PROPERTY NUMBER F10WA0579

US Army Corps of Engineers®
Omaha District

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Tables

Table 1
Munitions Information
Ephrata Pattern Bombing Range

Munitions Item	Model/Type	Components and MC
100-pound Practice Bomb	M38A2	Sheet metal (chromium, copper, iron, lead, manganese, and nickel) Sand (silica, quartz and other naturally occurring minerals)
Spotting Charges	M1A1	Black powder (potassium nitrate, sulfur, carbon) and black smoke
	M3	Black Smoke Producing Mixture (unknown mixture), 28-gauge blank shotgun shell (black powder [potassium nitrate, sulfur, carbon]), commercial primer
	M4	FS Smoke Mixture (Sulfur-Trioxide Chlorosulfonic Acid)
Miniature Practice Bombs	AN-Mk 5	Alloy of zinc, lead, and antimony
	AN-Mk 23	Cast iron
	AN-Mk 43	Alloy of lead and antimony
Spotting Charge (for Miniature Practice Bombs)	AN-Mk 4 Mod 0	Black powder (potassium nitrate, sulfur, carbon) Red phosphorous pyrotechnic mixture
	AN-Mk 4 Mod 1	Black powder (potassium nitrate, sulfur, carbon) Inert Marker Charge (composition unknown)
	AN-Mk 4 Mod 2	Black powder (potassium nitrate, sulfur, carbon) Inert Marker Charge (composition unknown)
	AN-Mk 4 Mod 3	Smokeless powder Red phosphorous pyrotechnic mixture
	AN-Mk 4 Mod 4	Smokeless powder Zinc Oxide

Table 2
Rights of Entry Status
Ephrata Pattern Bombing Range

Landowner	Parcel ID	Map ID	Date Signed by Landowner	Right of Entry Duration	Estimated Date to Contact Prior to Field Work
Private Owner	24263120001	1	Pending	—	—
Private Owner	24263110001	2	Pending	—	—
Private Owner	24263110002	3	Pending	—	—
Private Owner	24263110003	4	Pending	—	—
Private Owner	24263130000	5	Pending	—	—
Private Owner	24263120001	6	Pending	—	—
Private Owner	24263110002	7	Pending	—	—
Private Owner	24263210000	8	Pending	—	—
Private Owner	24263230000	9	Pending	—	—
Private Owner	24263240001	10	Pending	—	—
Private Owner	23260510001	11	Pending	—	—
Private Owner	23260510004	12	Pending	—	—
Douglas County	23260540002	13	Pending	—	—
Private Owner	23260510003	14	Pending	—	—
Private Owner	23260510002	15	Pending	—	—
Private Owner	23260530002	16	Pending	—	—
Private Owner	23260540001	17	Pending	—	—
State of Washington	23260600000	18	Pending	—	—

Note:
Map IDs for parcels are shown on Figure 4.

Table 3
Sample Location Rationale
Ephrata Pattern Bombing Range

Area of Concern	Sample Location	Sample Media	Sample Location Rationale
Bombing Range	109A001	Sediment	Sediment sample will be collected within an intermittent stream channel located within the Bombing Range. Sampling location to be determined in the field based on the visual identification of the Area of Concern, the reconnaissance survey, and presence of MEC, munitions debris, or other indicators of potentially impacted sediment.
	109A002	Surface Soil	Surface soil samples will be collected in the area of the former Bombing Range. Sampling locations to be determined in the field based on the visual identification of the Area of Concern, the reconnaissance survey, and presence of MEC, munitions debris, or other indicators of potentially impacted soils.
	109A003		
	109A004		
	109A005		
	109A006		
	109A007		
Background	109A008	Surface Soil	Ten background surface soil samples will be collected. Sampling locations will be determined in the field based on visual observation that the area does not appear to be impacted by past site operations.
	109A009		
	109A010		
	109A011		
	109A012		
	109A013		
	109A014		
	109A015		
	109A016		
	109A017		
	109A018	Sediment	One background sediment sample will be collected. Sampling location will be determined in the field based on visual observation that the area does not appear to be impacted by past site operations.

Table 4
Sample Designations, Quality Assurance/Quality Control, and Analyses
Ephrata Pattern Bombing Range

Area of Concern	Sample Location	Sample Type	Sample Number	Sample Media	Quality Assurance/Quality Control Samples		Analysis/U.S. Environmental Protection Agency (EPA) Method
					Field Duplicate	MS/MSD	
Bombing Range	109A001 [1]	Discrete	NWO-109-1001	Sediment	NWO-109-1002		Select metals (aluminum, antimony, chromium, copper, iron, lead, manganese, nickel, and zinc) by EPA SW-846 Method 6020
	109A002 [1]	Composite	NWO-109-0001	Soil		NWO-109-0001-MS/MSD	
	109A003 [1]	Composite	NWO-109-0002	Soil			
	109A004 [1]	Composite	NWO-109-0003	Soil			
	109A005 [1]	Composite	NWO-109-0004	Soil			
	109A006 [1]	Composite	NWO-109-0005	Soil			
	109A007 [1]	Composite	NWO-109-0006	Soil	NWO-109-0007		
Background	109A008	Composite	NWO-109-5001	Soil			Select metals (aluminum, antimony, chromium, copper, iron, lead, manganese, nickel, and zinc) by EPA SW-846 Method 6020
	109A009	Composite	NWO-109-5002	Soil			
	109A010	Composite	NWO-109-5003	Soil			
	109A011	Composite	NWO-109-5004	Soil			
	109A012	Composite	NWO-109-5005	Soil			
	109A013	Composite	NWO-109-5006	Soil			
	109A014	Composite	NWO-109-5007	Soil			
	109A015	Composite	NWO-109-5008	Soil			
	109A016	Composite	NWO-109-5009	Soil			
	109A017	Composite	NWO-109-5010	Soil			
	109A018	Discrete	NWO-109-5011	Sediment			

Notes:

[1] Explosives by EPA SW-846 Method 8330 (Modified) (including nitroglycerin and pentaerythritol tetranitrate) will be analyzed at this location if MEC or MD is observed consistent with explosive components

MS/MSD denotes matrix spike/matrix spike duplicate.

Table 5
Human Health Soil and Sediment Screening Criteria
Ephrata Pattern Bombing Range

Analyte	EPA Region 9[a]		Washington Department of Ecology - Soil Cleanup Levels[b]					Final Screening Value[h] (mg/kg)
	Residential PRGs (mg/kg)	Industrial PRGs (mg/kg)	Method B Level - Unrestricted[c] (mg/kg)	Leaching - Phase 3 Model - Unrestricted[d] (mg/kg)	Method B Level - Industrial[e] (mg/kg)	Leaching - Phase 3 Model - Industrial[f] (mg/kg)	Natural Background Level[g] (mg/kg)	
Metals								
Aluminum	76,000	100,000	NVA	NVA	NVA	NVA	33,400	76,000
Antimony	31	410	NVA	NVA	NVA	NVA	NVA	31
Chromium (Total)	210	500	NVA	NVA	NVA	NVA	38	210
Copper	2,900	42,000	NVA	NVA	NVA	NVA	27	2,900
Iron	55,000	100,000	NVA	NVA	NVA	NVA	51,500	55,000
Lead	400	800	NVA	3,000	NVA	3,000	11	400
Manganese	3,200	35,000	NVA	NVA	NVA	NVA	1,100	3,200
Nickel	1,600	23,000	NVA	NVA	NVA	NVA	46	1,600
Zinc	23,000	100,000	NVA	NVA	NVA	NVA	79	23,000

Acronyms and Abbreviations:

CLARC = Cleanup Level and Risk Calculation
EPA = U.S. Environmental Protection Agency
mg/kg = milligrams per kilogram.
PRGs = Preliminary Remediation Goals
NVA = no value available
WAC = Washington Administrative Code

Notes:

[a] Region 9 PRGs table; October 2004. Values are based on residential and industrial exposure to single chemicals.

[b] Cleanup levels are established under the Model Toxics Control Act (MCTA) Cleanup Regulation. Chapter 173-340 WAC.

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

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

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

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

[g] Values from "Natural Background Soil Metals Concentrations in Washington State," Publication #94-115, October 1994. Based on data for the Yakima Basin.

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

Table 6
Ecological Soil Screening Criteria and Selected Values for Potential Munitions Constituents
Ephrata Pattern Bombing Range

Analyte	Proposed Benchmarks										Potential Bioaccumulative Constituent?[h]	Final Proposed Ecological Screening Value Soil[i] (mg/kg)
	Washington Department of Ecology Lowest Value for Plants/ Soil Biota/Wildlife[a] (mg/kg)	EPA Region 5 ESLs[b] (2003) (mg/kg)	EPA Region 7[c] (mg/kg)		EPA Region 8[d] (mg/kg)		EPA Region 10[e] (mg/kg)		Other Values: Talmage et al. (1999)[f] or LANL (2005)[g] (mg/kg)			
Metals												
Aluminum	50	NVA	50	EPA-R4	NVA		50	EPA-R4	5.5	LANL		50
Antimony	5	0.142	0.27	SSL	0.27	SSL	0.27	SSL	0.05	LANL		5
Chromium (total)	42	0.4	26	SSL	26	SSL	26	SSL	2.3	LANL	Yes	42
Copper	50	5.4	28	SSL	28	SSL	28	SSL	10	LANL	Yes	50
Iron	NVA	NVA	200	EPA-R4	NVA		200	EPA-R4	NVA			200
Lead	50	0.0537	11	SSL	11	SSL	11	SSL	14	LANL	Yes	50
Manganese	1,100	NVA	220	SSL	220	SSL	220	SSL	50	LANL		1,100
Nickel	30	13.6	38	SSL	38	SSL	38	SSL	20	LANL	Yes	30
Zinc	86	6.62	46	SSL	46	SSL	46	SSL	10	LANL	Yes	86

Acronyms and Abbreviations:
EPA = U. S. Environmental Protection Agency
EPA-R4 = EPA Region 4
LANL = Los Alamos National Laboratory
mg/kg = milligrams per kilogram
NVA: No value available
ORNL = Oak Ridge National Laboratory Ecological PRGs (Efroymson et al.)
SSL = EPA Eco Soil Screening Levels
WAC = Washington Administrative Code

Notes:

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

[b] Ecological Screening Levels (ESLs), EPA Region 5, August 2003.

[c] EPA Region 7: Catherine Wooster-Brown (Eco Risk Assessor) recommends the following hierarchy: EPA EcoSSLs; ORNL Efroymson values; EPA Region 4 values; other published values.

[d] EPA Region 8: Dale Hoff (Eco Risk Assessor) recommends the following hierarchy: EPA SSLs; Dutch Intervention Values or ORNL Efroymson values.

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

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

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

[h] Potential bioaccumulative constituents will be evaluated in more detail, as some screening values do not take into account bioaccumulation.
Potential bioaccumulative potential from: *Bioaccumulation Testing and Interpretation for the Purposes of Sediment Quality Assessment: Status and Needs* (USEPA, 2000) and ODEQ Environmental Quality Screening Level Values (ODEQ, 2001).

[i] Final Screening Value selected using the following hierarchy:

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

Other References:

U.S. Environmental Protection Agency (EPA). 2005. *Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs)* . Office of Solid Waste and Emergency Response. Website version last updated March 15, 2005: http://www.epa.gov/ecotox/ecossl.

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

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

Dutch Intervention Values:

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

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

Table 7
Ecological Sediment Screening Criteria and Selected Values for Potential Munitions Constituents
Ephrata Pattern Bombing Range

.	Proposed Benchmarks										Potential Bioaccumulative Constituent?[g]	Final Ecological Screening Value Sediment[h] (mg/kg)
	Washington Department of Ecology Screening Level Values Freshwater[a] (mg/kg)	EPA Region 5 Ecological Screening Levels[b] (mg/kg)	EPA Region 7[c] (mg/kg)		EPA Region 8[d] (mg/kg)		EPA Region 10[e] (mg/kg)		Other Ecological Screening Levels[f] (mg/kg)			
Metals/Inorganics												
Aluminum	NVA	NVA	NVA		NVA		NVA		2.80E+02	LANL		2.80E+02
Antimony	3.00E+00	NVA	NVA		NVA		NVA		3.60E-01	LANL		3.00E+00
Chromium	2.60E+02	4.34E+01	4.34E+01	MAC	4.34E+01	MAC	4.34E+01	MAC	5.60E+01	LANL	Yes	2.60E+02
Copper	3.90E+02	3.16E+01	3.16E+01	MAC	3.16E+01	MAC	3.16E+01	MAC	1.70E+01	LANL	Yes	3.90E+02
Iron	NVA	NVA	NVA		NVA		NVA		2.00E+01	LANL		2.00E+01
Lead	2.60E+02	3.58E+01	3.58E+01	MAC	3.58E+01	MAC	3.58E+01	MAC	2.70E+01	LANL	Yes	2.60E+02
Manganese	1.80E+03	NVA	NVA		NVA		NVA		7.20E+02	LANL		1.80E+03
Nickel	4.60E+02	2.27E+01	2.27E+01	MAC	2.27E+01	MAC	2.27E+01	MAC	3.90E+01	LANL	Yes	4.60E+02
Zinc	4.10E+02	1.21E+02	1.21E+02	MAC	1.21E+02	MAC	1.21E+02	MAC	3.70E+01	LANL	Yes	4.10E+02

Acronyms and Abbreviations:
EPA = U. S. Environmental Protection Agency
LANL = Los Alamos National Laboratory
MAC = MacDonald Consensus Values
mg/kg = milligram per kilogram
NVA = No Value Available

Notes:
[a] Washington Department of Ecology, Creation and Analysis of Freshwater Sediment Quality Values in Washington State, July, 1997, Pub. No. 97-323a (Table 11).
[b] Ecological Screening Levels (ESLs), EPA Region 5, August 2003.
[c] EPA Region 7: Catherine Wooster-Brown (Eco Risk Assessor) recommends the following hierarchy: MacDonald Consensus Values (MacDonald, 2000); ORNL Efroymson values (ORNL, 1997)
[d] EPA Region 8: Dale Hoff (Eco Risk Assessor) recommends the following hierarchy: MacDonald Consensus Values (MacDonald, 2000); Canadian ISQG values (CCME, 2003) or ORNL Efroymson values (ORNL, 1997).
[e] EPA Region 10: Joseph Goulet (Eco Risk Assessor) says Region 10 has no recommended hierarchy, therefore, values from the EPA Region 7 Approach were used.
[f] Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E. Welsh, F.M. Cretella, P.H. Reno, and F.B. Daniel (Talmage et al.), 1999, *Nitroaromatic Munition Compounds: Environmental Effects and Screening Values* , Rev. Environ. Contam. Toxicol. or Los Alamos National Laboratory (LANL), Eco Risk Database, Release 2.2, September 2005; the Talmage screening values assume 10% organic carbon in the sediment.
[g] Potential bioaccumulative constituents will be evaluated in more detail, as some screening values do not take into account bioaccumulation. Potential bioaccumulative potential from: *Bioaccumulation Testing and Interpretation for the Purposes of Sediment Quality Assessment: Status and Needs* (EPA, 2000) and ODEQ Environmental Quality Screening Level Values (ODEQ, 2001).
[h] Final Screening Value selected using the following hierarchy:
1. State Value (Washington)
2. EPA Region State Located In (EPA Region 10)
3. Lower of Talmage et al. [TAL] (1999) or LANL (2005) values.

Other References:
Efroymson, R.A., et al., 1997, *Preliminary Remediation Goals* (EPRGs), ORNL, ES/ER/TM-162/R2,
Canadian Interim Sediment Quality Guidelines (ISQGs) Summary Table, CCME, December 2003.
MacDonald, D.D, C.G. Ingersoll and T.A. Berger, 2000, *Development and Evaluation of Consensus-Based Sediment Quality Criteria for Freshwater Ecosystems* , Archives of Environmental Contamination and Toxicology 39:20-31.

Appendix A
Conceptual Site Model

1.0 Conceptual Site Model – Bombing Range

1.1 Overview

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

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

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

1.2 Background

1.2.1 Overview of Site Characteristics

This CSM for the Ephrata Pattern Bombing Range (PBR) is based on information presented in the *Inventory Project Report* (INPR) (USACE, 1996), *Archives Search Report* (ASR) (USACE, 2003), and *ASR Supplement* (USACE, 2004). The CSM evaluates potential exposure pathways related to range operation and configuration relative to physical features and land use. Based on the CSM, sampling schemes are proposed to evaluate potential human health and ecological impacts. Historical photographs (if available) are carefully examined for possible disturbances or other site features of interest in order to focus the efforts on areas where MC impacts are most likely to occur.

1.2.2 Current and Future Land Use

The Ephrata PBR FUDS is currently uninhabited. Washington Department of Fish and Wildlife indicated that Sage Grouse and Pygmy Rabbit Recovery Areas are present in Douglas County; however, exact locations were not provided. A Washington State Department of Natural Resources (DNR) representative (who attended the public TPP

Meeting) indicated that the DNR leases the State of Washington-owned parcel on the FUDS and uses it for dry wheat farming. The DNR representative was not aware of any portions of the parcel being preserved for natural habitat or being managed as a recovery area. The site is an Important Ecological Place (IEP) based on the potential that federal and state listed threatened and endangered species occur in Douglas County, Washington. However, the Ephrata PBR may not have suitable habitat for these identified species.

Human receptors in the area of the Bombing Target consist of the landowners and workers. The FUDS can be accessed by the general public since there is no fencing and public roads run through the FUDS. Future land use is expected to remain the same as current land use.

1.2.3 History of Use

The Ephrata Army Air Field was active from 1942 to 1945 and was initially a training facility for B-17 and B-24 bomber crews (June 1942 through December 1943) and P-38, P-39, and P-63 aircraft (April 1944 through February 1945).

In February 1943, a request was made for approval of a pattern bombing range to support training. The Ephrata PBR was used between 1943 and 1945 for high altitude practice bombing by heavy bombardment crews (U.S. Army 2nd Air Force) assigned to the Ephrata AAF.

Historical records indicate the target was used with M38A2 practice bombs and miniature practice bombs.

Between 1943 and 1945, the Ephrata AAF experienced a series of deactivations and reactivations in status. In late 1945 the Base was reduced to a "temporarily" inactive status; and the Ephrata PBR was made available for deactivation as of September 30, 1945. The leases were terminated in September and October 1946 and the land was returned to private owners.

1.2.4 Munitions and Associated MC

The ASR indicated the confirmed presence of M38A2 practice bombs with M3 or M4 spotting charges and miniature bombs (AN-Mk 5, AN-Mk 23, and AN-Mk 43) (USACE, 2003). The INPR indicated that bomb debris and, occasionally, intact spotting charges have been found at various locations within the boundaries of the Ephrata PBR (USACE, 1996). Table 1 of the Site-Specific Work Plan (SSWP) presents the munitions information for the Ephrata PBR.

1.2.5 Previous MEC Finds

Historical evidence indicated that munitions debris (MD) from the M38A2 and miniature practice bombs is present at the site. The INPR indicated there is a possibility that high explosive demolition and incendiary bombs may have been used on the site; however,

this type of MEC has not been reported in other documents as detected on the Ephrata PBR (USACE, 1996). There is no evidence of MD or cratering on the FUDS indicative of the use of conventional high explosives.

1.2.6 Previous MC Sample Results

There has been no sampling for MC.

1.3 MEC Evaluation

This section provides an evaluation of the potential MEC associated with the munitions formerly used at the Bombing Target, including M38A2 sand-filled 100-pound (lb) practice bombs and miniature AN-Mk 5, AN-Mk 23, and AN-Mk 43 practice bombs.

1.3.1 Types of MEC

The only documented use of the site was from 1943 to 1945 as high altitude practice bombing range using M38A2 sand-filled 100-lb practice bombs and miniature AN-Mk 5, AN-Mk 23, and AN-Mk 43 practice bombs. The ASR indicated that in September 1943, the Ephrata AAF stored 100-lb M38A2 practice bombs (sand-filled), as well as 300-lb, 500-lb, and 1,000-lb practice bombs (USACE, 2003). As of February 1945, the Ephrata AAF had bombs, incendiaries, one AN-M8 cluster incendiary bomb, and M1 and M2 instructional bombs. The ASR reported that these items could have been used on the Ephrata PBR.

Historical evidence indicated MD from the M38A2 and miniature practice bombs is present on the site. There has been no MEC reported or detected on the Ephrata PBR from the potential use of high explosive demolition or incendiary bombs.

1.3.2 Human and Ecological Receptors

The most likely current and future human receptors at the site would be the landowners and workers. Federally listed and state listed threatened and endangered species may occur within Douglas County, Washington, and therefore may be present within the FUDS.

1.3.3 Route of Exposure

Humans may come in direct contact with MEC through intrusive and nonintrusive activities.

1.3.4 Predicted Risk Level

The only documented use of the FUDS was from 1942 to 1945 as a high altitude practice bombing range on which only practice munitions (without sensitive fuzes) were used. Records indicate the confirmed presence of MD from M38A2 sand-filled 100-lb practice bombs and miniature AN-Mk 5, AN-Mk 23, and AN-Mk 43 practice bombs on the site. Records also indicate that there is a potential for MEC and MC associated with high

explosive demolition or incendiary bombs that may have been used on the site. However, there is no evidence of MD or cratering on the FUDS indicative of the use of conventional high explosives. Data from site reconnaissance, especially presence or absence of evidence for use of high explosive bombs, is needed to evaluate MEC risk. There has been no reported MEC found on the FUDS.

The FUDS is located approximately 20 miles north of Ephrata, Washington in Douglas County. There are no physical barriers (e.g., fencing) preventing public access to the FUDS. Public roads are present within the FUDS. The majority of the FUDS is used for agriculture, primarily for the growing of crops. Some of the land is reportedly being preserved as natural habitat (high desert). Private parties, the State of Washington, and Douglas County currently own the property.

The 2000 Census data indicates that populations within a 2-mile and 4-mile radius of the FUDS boundary are 12 and 25 persons, respectively. Also, the numbers of households and housing units within a 2-mile and 4-mile radius of the FUDS boundary are five and eight, respectively.

1.4 MC Pathway Evaluation

This section provides an evaluation of the potential MC associated with the munitions formerly used at the range. Select metals are considered to be the MC of potential concern at the FUDS.

1.4.1 Types of MC

MC from the practice bombs could include metals (antimony, chromium, copper, iron, lead, manganese, nickel, and zinc) from the bomb bodies. MC from the spotting charges could include black powder (potassium nitrate, sulfur, carbon), FS smoke mixture (sulfur-trioxide chlorosulfonic acid), and smokeless powder (zinc oxide). MC from black powder is not evaluated further because the constituents are not hazardous substances and/or were not present in significant quantities.

1.4.2 Soil Exposure (Terrestrial) Pathway

1.4.2.1 Sources of MC

MC could be present at the Bombing Target from the practice bombs (bomb bodies) and associated spotting charges (Table 1 of the SSWP). Previous MC sampling has not been conducted.

The ASR indicated that the site survey conducted in 2002 observed evidence of past use (M-38 series 100-lb practice bomb parts) on the pattern bombing range (USACE, 2003). The landowners indicated they previously collected practice bomb debris and piled the items near the center of the target. Also one landowner showed the inspection team an

example of the "rockets" he collected from the site. This was identified by the Safety Officer as a miniature practice bomb (AN-Mk 5, AN-Mk 23, AN-Mk- 43 series).

1.4.2.2 Migration Pathway

The majority of the site remains in agricultural use primarily for the growing of crops. Some of the land is reportedly being preserved as natural habitat. Intermittent stream channels are also present on the site. All runoff from this site flows into perennial streams that flow westerly, none of which are named on the U.S. Geological Survey quadrangle map (USACE, 2003).

The land is privately owned and access to the site is unrestricted. There is no fencing and public roads run through the FUDS.

Humans may come in contact with MC through intrusive and nonintrusive work where MD may be present. Federally listed and state listed threatened and endangered species may occur within Douglas County, Washington.

1.4.2.3 Land Use and Access

The majority of the site is used for agricultural use primarily for the growing of crops. Some of the land is reportedly being preserved as natural habitat (high desert). At the TPP Meeting, a DNR representative indicated that the DNR leases the State of Washington-owned parcel on the FUDS and uses it for dry wheat farming. The DNR representative was not aware of any portions of the parcel being preserved for natural habitat or being managed as a recovery area. Future use of the land is likely to remain the same. Private parties, the State of Washington, and Douglas County currently own the property. Public access to the property is unrestricted since there is no fencing and public roads are present on the FUDS.

1.4.2.4 Human Receptors

The most likely current and future human receptors at the site would be the landowners and workers. The soil pathway to human receptors is potentially complete if there is a source of MC present.

1.4.2.5 Ecological Assessment

Federally listed and state listed threatened and endangered species may occur within Douglas County, Washington. Therefore, the FUDS does qualify as an IEP. The potential federal endangered species in the area of the former Ephrata PBR are shown in the chart below.

Class	**Status**	**Common Name**	**Scientific Name**
Federal	Endangered	Pygmy Rabbit	*Brachylagus idahoensis*

The range and other areas of interest at the Ephrata PBR addressed by this Site Inspection are cultivated for crops. A portion of the site is reportedly preserved by the State of Washington as natural habitat. However at the TPP Meeting, a representative from the DNR indicated that the DNR leases the parcel owned by the State of Washington and uses it for agricultural activities (dry wheat farming). The DNR was not aware of any portions of the parcel being preserved for natural habitat.

The soil pathway to ecological receptors is potentially complete if there is a source of MC present.

1.4.3 Surface Water/Sediment Pathway

The Ephrata PBR is drained by intermittent stream channels. Surface runoff drainages within the FUDS are considered a potentially complete pathway if there is a source of MC present. Sediment within the stream channel provides potential exposure to MC.

1.4.3.1 Sources of MC

MC from the practice bombs could include metals (antimony, chromium, copper, iron, lead, manganese, nickel, and zinc) from the bomb bodies. MC from the spotting charges could include black powder (potassium nitrate, sulfur, carbon), FS smoke mixture (sulfur-trioxide chlorosulfonic acid), and smokeless powder (zinc oxide). MC from black powder is not evaluated further because the constituents are not hazardous substances and/or were not present in significant quantities. At the TPP meeting it was agreed that the surface water pathway could be evaluated by sampling sediment to determine if there is a source of MC.

1.4.3.2 Migration Pathway

Any runoff from the site will flow into a series of intermittent streams that run though the target area and FUDS property and would flow westerly. The ASR indicates that none of the intermittent streams are named on the U.S. Geological Survey quadrangle map (USACE, 2003). Sediment within the intermittent stream channel provides a potential complete pathway between MC and the receptor.

1.4.3.3 Use and Access

Intermittent stream channels are present on the site. Surface water may be present.

1.4.3.4 Human Receptors

Landowners and workers may come in contact with MC though intrusive and nonintrusive activities in the stream channel. The pathway of sediment to human receptors is potentially complete if MC are present. The pathway would be similar to the surface soil pathway since the streams are intermittent.

1.4.3.5 Ecological Assessment

Surface water may be present on the FUDS in the form of intermittent streams. The pathway of sediment to ecological receptors is potentially complete if MC are present. The pathway would be similar to the surface soil pathway since the streams are intermittent.

1.4.4 Groundwater Pathway

1.4.4.1 Sources of MC

MC in the soils may include metals (antimony, chromium, copper, iron, lead, manganese, nickel, and zinc) from the bomb bodies and black powder (potassium nitrate, sulfur, and carbon), FS smoke mixture (sulfur-trioxide chlorosulfonic acid), zinc oxide, and red phosphorous from the spotting charges.

1.4.4.2 Migration Pathway

According to the ASR, in the northern portion of the site where the Bombing Range existed, the surface layer of the soil is underlain by basalt (4 to 20 inches from the surface) (USACE, 2003). Underlying the soils is a basalt layer that would prevent migration of MC to the groundwater. Metals are relatively immobile in soils.

1.4.4.3 Groundwater Use and Access

Groundwater wells are not present within the FUDS boundary.

1.4.4.4 Human Receptors

There is no completed pathway to human receptors.

1.4.5 Air Pathway

Air is a possible completed pathway through inhalation of MC-impacted soil particles by landowners or workers. The prevailing wind direction is from the southeast. Exposure to the air pathway is considered in the human health screening values and is not assessed further.

1.5 CSM Summary/Data Gaps

There is physical evidence of munitions debris from the M38-series and miniature practice bombs on the FUDS. No MEC have been observed or reported. There has been no historic sampling for MC. MC in the soils may include metals (antimony, chromium, copper, iron, lead, manganese, nickel, and zinc) from the bomb bodies and black powder (potassium nitrate, sulfur, carbon), FS smoke mixture (sulfur-trioxide chlorosulfonic acid), zinc oxide, and red phosphorous from the spotting charges.

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

Pathway	Presence of MEC	Presence of MC	Notes
Soil	None. Only documented finding was munitions debris consisting of M38 series sand-filled 100-lb practice bombs and miniature (AN-Mk 5, AN-Mk 23, and AN-Mk 43) practice bombs.	No sampling conducted.	Visual reconnaissance and surface soil sampling are proposed.
Surface Water / Sediment	None. Only documented finding was munitions debris consisting of M38 series sand-filled 100-lb practice bombs and miniature (AN-Mk 5, AN-Mk 23, and AN-Mk 43) practice bombs.	No sampling conducted.	Visual reconnaissance and sediment (intermittent stream channel) sampling are proposed.
Groundwater	None.	No sampling conducted.	No sampling. No groundwater use on FUDS property. Incomplete exposure pathway.
Air	None.	No sampling conducted.	Included in the evaluation of the soil pathway.

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

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

REPLY TO
ATTENTION OF:

MAR 1 6 2006

CEHNC-OE-CX

MEMORANDUM FOR SEE DISTRIBUTION

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

1. PURPOSE: This procedure describes the responsibilities of project teams during the preliminary assessment and site investigation phases should unexploded ordnance (UXO) be discovered.

2. APPLICABILITY: This guidance is applicable to the geographic military Districts, Military Munitions Response Program (MMRP) Design Centers, Major Subordinate Commands (MSCs), and designated Remedial Action Districts performing MMRP response actions.

3. REQUIREMENTS AND PROCEDURES:

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

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

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

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

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

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

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

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

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

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

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

Carol G. Youkey

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

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

May 23, 2006

REPLY TO
ATTENTION OF:

OE Safety Division for Ordnance
and Explosives Directorate

Shaw Environmental
4171 Essen Lane
Baton Rouge, Louisiana 70809

Dear Sir/Madam:

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

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

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

a. MEC items are not to be moved or disturbed during the above subject SI, Pre-Work Plan visits, ASR Investigations and other site visits of a non-intrusive nature.

b. The locations of any discovered explosive hazardous items should be marked for accurate relocating purposes and the information provided to the designated Point of Contact (POC) and any emergency response authorities as may be required.

c. During site visits to active Installations and/or Base Realignment and Closure (BRAC) sites the identified Installation POC or the BRAC coordinator should be notified of discovered MEC hazards. They then will request any appropriate emergency response action as deemed necessary through their channels if required.

d. When a site visit is on a Formerly Utilized Defense Site, the property owner shall be notified in the event of finding any found explosive hazards along with the location of the explosive item(s) found, the property owner should then in turn notify their local emergency response authorities.

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

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

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

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

Sincerely,

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

Appendix C
Site Safety and Health Plan Addendum

ADDENDUM WA-6 TO SITE SAFETY AND HEALTH PLAN (SSHP) **REVIEWS AND APPROVAL** US Army Corps of Engineers, Omaha District	This SSHP is a part of the Omaha District Safety Program. Please read and comply with USACE EM 385-1-1 and CENWO OM 385-1-1.	
Reviewer	**Date**	**Signatures**
Authored by: Anthony Searls	9/26/08	**Signature:** 
Peer Review by: David Mummert, CIH	10/8/08	**Signature:** 
Quality Control Review (QCR) by: Kathy Stroppel-Holl	10/14/08	**Signature:** 
Project Manager Review by: Peter Kelsall	10/3/08	**Signature:** **Signature on File**
USACE Omaha District MM DC OE Safety Specialist Review: Chris Bryant		**Signature:**
USACE Omaha District MM DC Project Manager Approval: John Miller		**Signature:**

ADDENDUM WA-6 TO SITE SAFETY AND HEALTH PLAN (SSHP) **TITLE PAGE** US Army Corps of Engineers, Omaha District	This SSHP is a part of the Omaha District Safety Program. Please read and comply with USACE EM 385-1-1 and CENWO OM 385-1-1.

PROJECT NAME: Formerly Used Defense Sites (FUDS) Site Inspection (SI) – Ephrata Pattern Bombing Range (PBR)

PURPOSE OF ADDENDUM:

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

DESCRIBE THE CHANGES EFFECTED BY THIS ADDENDUM:

Site-specific supplemental information noted in following text.

SITE SAFETY AND HEALTH PLAN ADDENDUM

Site Name:	Ephrata Pattern Bombing Range
Site Location:	The former Ephrata PBR is located approximately 20 miles north of the town of Ephrata, in Douglas County, Washington. The area of concern is the Bombing Range.
Purpose of Visit:	Site Inspection to conduct visual site reconnaissance for munitions and explosives of concern (MEC) and collect soil and sediment samples to evaluate the presence of select metals.
Date(s) of Site Visit:	December 2008
Office:	Shaw Environmental, Inc., Denver, Colorado
Address:	7604 Technology Way, Suite 300 Denver, CO 80237
Telephone:	720-554-8178

Date Prepared: September 26, 2008

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

I. SITE DESCRIPTION AND PREVIOUS INVESTIGATIONS

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

A. SITE DESCRIPTION:

- Size: The *Archive Search Report* (ASR) (USACE, 2003) indicated that the area of the FUDS consists of 2,460.12 acres, and the *ASR Supplement* (USACE, 2004) indicated that the area of the range (Bombing Range [practice]) is 649.04 acres. The ASR description states that the range includes a large 950-foot (ft)-diameter ring target with five concentric circles of diameters of approximately 750 ft, 500 ft, 350 ft, 250 ft, and 125 ft.
- Present Usage (Check all that apply):

☐ Military	☐ Recreational	☒ Agricultural (primary use)
☒ Residential	☐ Commercial	☐ Landfill
☒ Natural Area	☐ Industrial	
☐ Other Specify		

☐ Secured	☐ Active	☐ Unknown
☒ Unsecured	☒ Inactive	

B. PAST USES:

The Ephrata PBR was used from 1943 to 1945 for high-altitude bombing by heavy bombardment crews (the U.S. Army 2nd Air Force was assigned to the Ephrata Army Air Field [AAF]). Ephrata AAF was active from 1942 to 1945 and was initially a training facility for B-17 and B-24 bomber crews (June 1942 through December 1943). In February 1943, a request was made and approved for constructing a pattern bombing range to support training. The Ephrata PBR was made available for deactivation as of September 30, 1945. The leases were terminated in September and October 1946 and the land was returned to private owners. The ASR site survey confirmed the presence of 100-pound (lb) sand-filled M38A2 practice bombs and miniature practice bombs (AN-Mk 5, AN-Mk 23, and AN-Mk 43) at the FUDS.

A 1949 aerial photograph from the ASR (Plate 3) shows that the Bombing Range includes a large 950-ft-diameter ring target with five concentric circles of diameters of approximately 750 ft, 500 ft, 350 ft, 250 ft, and 125 ft. The area inside and outside the target area does not indicate any significant scarring or craters.

C. SURROUNDING POPULATION:

☒ Rural	☒ Residential	☐ Commercial
☐ Urban	☐ Industrial	
☐ Other Specify		

D. PREVIOUS SAMPLING/INVESTIGATION RESULTS:

The *Inventory Project Report* (INPR) site visit was conducted on November 2, 1995 (USACE, 1996). Metal bomb debris and, occasionally, intact spotting charges were found at various locations within the boundaries of the FUDS. It was also reported that there was a possibility that high explosive (HE) demolition and incendiary bombs may have been used at the site. The INPR gave a Risk Assessment Code (RAC) of 3 for the FUDS.

The ASR site survey indicated that a small dump was observed in the far northeast corner of the target area and two piles of bomb debris were observed adjacent to Whitehall Road. The ASR site survey confirmed the presence of M38A2 practice bombs with M3 or M4 spotting charges and miniature bombs (AN-Mk 5, AN-Mk 23, and AN-Mk 43). There was no evidence of munitions debris (MD) or cratering on the FUDS indicative of the use of conventional HE. Munitions constituents (MC) sampling was not conducted as part of the ASR site survey. A RAC of 4 was assigned to the FUDS.

(1) MEC ENCOUNTERED: MEC has not be observed on the range. However, munitions (practice bombs) debris has been reported and observed.

(2) SAMPLES: None collected

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

II. DESCRIPTION OF ON-SITE ACTIVITIES

☒ Walk Through	☐ Drive Through	☐ Fly Over
☒ On-Road	☒ Off-Road	☐ On-Path
☐ Off-Path		
☐ Other Specify		

Activities/Tasks to be Performed

Reconnaissance

A visual reconnaissance of the former Bombing Range area of concern (AOC) will be conducted to identify evidence of MEC and/or range activities (presence of MEC or MD and ground-scarring suggestive of bombing activities). Direct contact is not to be made with any foreign matter, only visual observation. Suspect areas of interest, as indicated in the SSWP, will be inspected as part of the field reconnaissance. The reconnaissance team will locate, identify, and stake sampling locations within these areas. The density and type of MEC or MD (e.g., practice bombs) observed on the ground will be noted.

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

- Presence or absence of MEC, spotting charges, or bomb debris,
- Coordinates of staked sampling locations (using a hand-held global positioning system [GPS] unit),

- Access limitations,
- Vegetative cover,
- Soil conditions,
- Presence or absence of water for surface water samples, and
- Other conditions encountered that impact sample collection.

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

Sampling (Soil and Sediment)

Proposed soil sampling will consist of the collection of six soil samples from within the Bombing Range as shown on Figure 5 of the SSWP. The soil samples will be composited samples (7-point, wheel pattern with a 2-ft radius). The location of the samples may be adjusted to more biased locations based on the reconnaissance survey. If evidence of munitions activity is observed at locations outside the Bombing Range, up to two of the six soil samples may be located in these outlying areas. Proposed sediment sampling will consist of the collection of one discrete sediment sample from an intermittent stream channel within the Bombing Range.

Analysis of the proposed soil and sediment samples collected will use U.S. Environmental Protection Agency (EPA) SW-846 Method 6020 to analyze for select metals (aluminum, antimony, chromium, copper, iron, lead, manganese, nickel, and zinc). Antimony, chromium, copper, iron, lead, manganese, nickel, and zinc are considered potential MC. Aluminum, iron, and manganese may also serve as reference elements for a geochemical evaluation of background distributions, if needed. By agreement of the Technical Project Planning (TPP) team, if MEC or MD are observed consistent with explosive components, then the samples will also be analyzed for explosives by EPA SW-846 Method 8330 (Modified).

By agreement with the TPP team, no surface water or groundwater sampling is planned.

III. SITE PERSONNEL AND RESPONSIBILITIES

Name/Responsibility	Training					
	HAZWOPER 40-hour	8-hour HAZWOPER refresher	Hazardous Waste Site Supervisor	First Aid	Cardiopulmonary Resuscitation	UXO Specialist
Anthony Searls Technical Lead/Field Team Leader/Site Safety and Health Officer (SSHO)	X	X	X	X	X	
UXO Technician David Watkins (1420) or Rob Irons (1137) or Jim Bayne (1212) or Ron Stanfield (1161) or Dave Van Deman (1057)	X	X		X	X	X

IV. HAZARD ANALYSIS

A. Safety and Health Hazards Anticipated:

☐ Heat Stress	☒ Cold Stress	☒ Tripping Hazard
☐ Noise	☐ Electrical	☐ Falling Objects
☒ Foot Hazard	☐ Biological	☐ Overhead Hazard
☐ Radiological	☐ Confined Space	☐ Water
☐ Explosive	☒ Climbing	☐ Flammable
☐ Other Specify		

B. Overall Hazard Evaluation:

☐ High	☐ Moderate	☒ Low	☐ Unknown

JUSTIFICATION:

Historical documentation indicates that M38A2 practice bombs with spotting charges and miniature practice bombs (AN-Mk 5, AN-Mk 23, and AN-Mk 43) were used at the bombing range. There is no evidence the site ever used HE bombs. The area is extensively farmed and only MD from practice bombs have been reported and observed. Undetonated practice bomb spotting charges have never been observed. HE bombs have not been encountered.

V. SITE INSTRUCTIONS FOR MEC AVOIDANCE

See Section 4.3 of the SSHP (Shaw, 2006) for full scope of MEC avoidance requirements.

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

Section 4.3 of the SSHP defines on-site MEC avoidance requirements for FUDS properties. In general, the purpose of MEC or anomaly avoidance during SI activities is to avoid any potential

surface or subsurface anomalies. Intrusive anomaly investigation is not authorized during MEC avoidance operations. The reconnaissance and sampling field work shall include a minimum of two people, one of whom shall be a UXO Technician. This team will be on-site during all sampling activities. Sampling personnel must be escorted at all times in areas potentially containing MEC until the UXO team has completed the access surveys and the cleared areas are marked. If anomalies or MEC are detected, the UXO team will halt escorted personnel in place, select a course around the item, and instruct escorted personnel to follow. If MEC is encountered, the team will stop work in the vicinity and make notifications as outlined in the Work Plan. The team is not to conduct further investigation or removal of any MEC.

VI. SITE CONTROL AND COMMUNICATIONS

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

B. COMMUNICATIONS:

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

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

HAND GRIPPING NOSE – Unusual smell detected.

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

THUMBS DOWN – No, negative.

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

☒ Cellular Phone: (509) 531-9028
☐ Public/Private phone

TELEPHONE NUMBERS:	
1. MEDICAL FACILITY (Emergency Care): Columbia Basin Hospital, 200 Nat Washington Way, Ephrata, WA	(509) 754-4631
2. MEDICAL FACILITY (Non-Emergency Care): Wenatchee Valley Clinic, 820 North Chelan Avenue, Wenatchee, WA	(509) 663-8711
3. FIRE DEPARTMENT: Douglas County Fire District 377 Eastmont Avenue, East Wenatchee, WA	(509) 884-0941 or 911
4. POLICE DEPARTMENT: Douglas County Sheriff 110 N.E. 2nd Street, East Wenatchee, WA	(509) 884-0941 or 911
5. POISON CONTROL CENTER:	(800) 222-1222
6. USACE MM DC PROJECT MANAGER: John Miller	(402) 995-2735 (office) (402) 350-3735 (cell)
7. USACE DISTRICT PROJECT MANAGER: Rodney Taie	(206) 764-3498 (office) (206) 617-0341 (cell)
8. USACE OE SAFETY: Chris Bryant	(402) 995-2279 (office) (402) 917-7476 (cell)
9. SHAW PROJECT MANAGER: Peter Kelsall	(720) 554-8178 (office) (303) 981-8435 (cell)
10. SHAW TECHNICAL LEAD: Anthony Searls	(509) 735-9736 (office) (509) 531-9028 (cell)
11. SHAW FIELD LEADER: Anthony Searls	(509) 735-9736 (office) (509) 531-9028 (cell)
12. SHAW OE SAFETY: Brian Hamilton	(303) 690-3117 (office) (303) 809-0416 (cell)
13. SHAW UXO TECHNICIANS: David Watkins (#1420), Rob Irons (#1137), Jim Bayne (#1212), Ron Stanfield (#1161), or Dave Van Deman (#1057) (Contact: Morey Engle)	(303) 690-3870 (720) 480-3204 (cell)
14. SHAW HOTLINE/HELPDESK	(866) 299-3445
15. SHAW HEALTH AND SAFETY MANAGER: David Mummert	(419) 425-6129 (office) (419) 348-1544 (cell)
16. HEALTH RESOURCES	(800) 350-4511

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

☒ Verbal ☐ Nonverbal (Specify)

VII. INCIDENT REPORTING

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

A copy of the Shaw Incident Notification, Reporting, and Management Procedure will be on site with the field team.

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

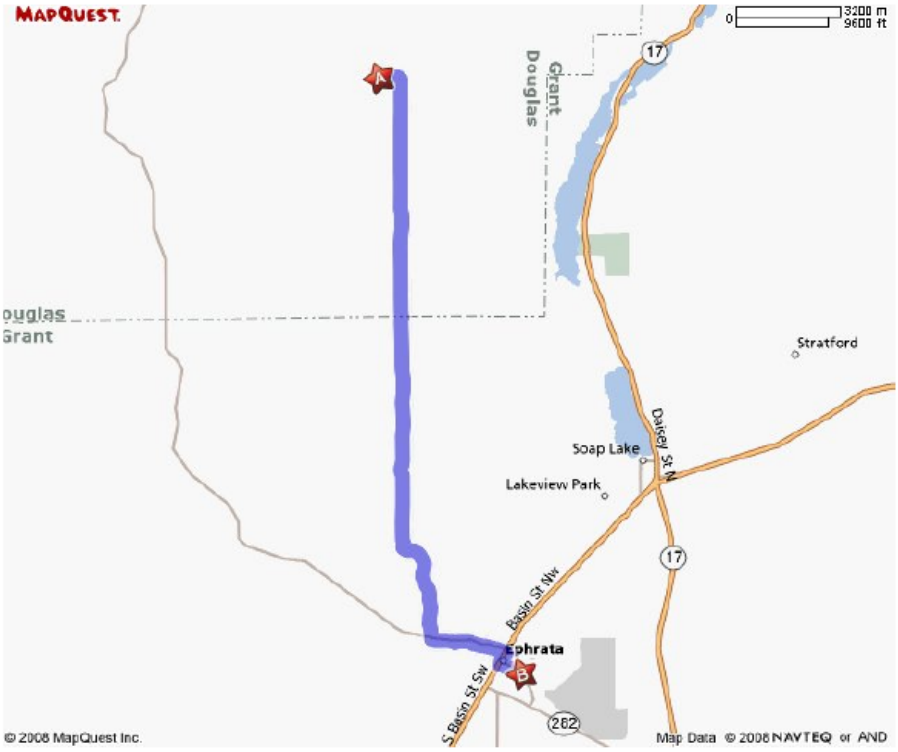
Emergency medical care is available at Columbia Basin Hospital, 200 Nat Washington Way, Ephrata, Washington 98823 (509) 754-4631.

A: [948-1009] Whitehall Rd SE, Waterville, WA 98858

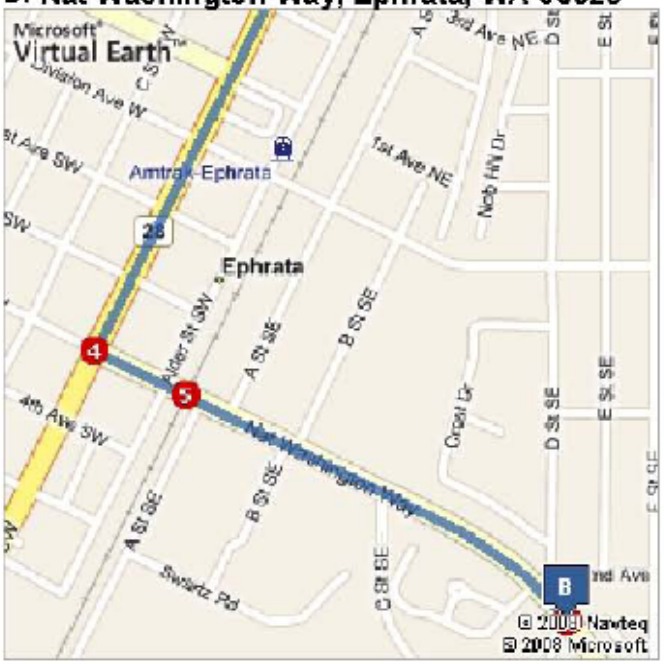
START	1: Start out going EAST on WHITEHALL RD SE.	0.5 mi
	2: Keep RIGHT at the fork to continue on WHITEHALL RD SE.	6.0 mi
	3: WHITEHALL RD SE becomes E-NW RD.	6.5 mi
	4: E-NW RD becomes NORTON RD NW.	1.9 mi
	5: Turn LEFT onto BAIRD SPRINGS RD NW/SAGEBRUSH FLATS RD NW.	0.8 mi
	6: BAIRD SPRINGS RD NW/SAGEBRUSH FLATS RD NW becomes 1ST AVE NW.	0.7 mi
	7: Turn RIGHT onto BASIN ST NW/WA-28.	0.3 mi
	8: Turn LEFT onto 3RD AVE SW.	0.1 mi
	9: 3RD AVE SW becomes NAT WASHINGTON WAY/SOUTHEAST BLVD.	0.4 mi
END	10: End at 200 Southeast Blvd Ephrata, WA 98823-1973	

B: 200 Southeast Blvd, Ephrata, WA 98823-1973

Total Time: 36 minutes Total Distance: 17.17 miles



B: Nat Washington Way, Ephrata, WA 98823



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

Wenatchee Valley Clinic, 820 North Chelan Avenue, Wenatchee, Washington 98801 (509) 663-8711.

Directions start from Ephrata, Washington. Add 17 miles and approximately 35 minutes to reach the town of Ephrata from the FUDS (see directions and map on previous pages). Total trip: 67.1 miles, 1 hour 37 minutes.

Live Search Maps

Wenatchee Valley Clinic

A: **Ephrata, WA**
B: **820 N Chelan Ave, Wenatchee, WA 98801-2028**
Trip: **50.1 mi, 1 hr 2 min**

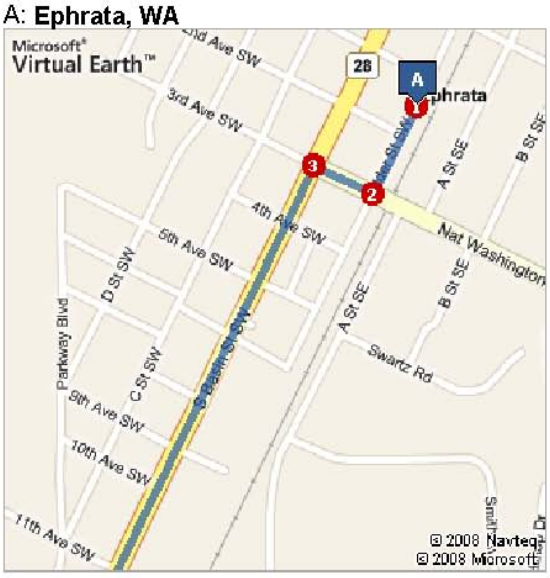
FREE! Use **Live Search 411** to find movies, businesses & more: **800-CALL-411.**

A	**Ephrata, WA**	**A–B: 50.1 mi** 1 hr 2 min
	1. Depart **Alder St SW**	0.1 mi
→	2. Turn **right** onto **3rd Ave SW**	0.1 mi
←	3. Turn **left** onto **SR-28 / S Basin St SW** *Pass BEST WESTERN in 1.1 mi*	5.1 mi
↗	4. Keep **right** toward **SR-28**	0.2 mi
↑	5. Keep **straight** onto **SR-28**	41.8 mi 47 min
↖	6. Bear **left** onto **SR-285**	0.7 mi
↗	7. Turn **right** to stay on **SR-285 / S Mission St**	2.0 mi
↶	8. Turn **left** onto **9th St E**, and then immediately turn **left** onto **SR-285 South / N Chelan Ave**	0.1 mi
B	9. Arrive at **820 N Chelan Ave** *The last intersection is 9th St E* *If you reach 7th St, you've gone too far*	

Trip: **50.1 mi, 1 hr 2 min**

This map is based on the map view in the browser window when you clicked **Print**.

A: **Ephrata, WA**



B: **820 N Chelan Ave, Wenatchee, WA 98801-2.**

VIII. PERSONAL PROTECTIVE EQUIPMENT

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

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

IX. DECONTAMINATION PROCEDURES

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

X. TRAINING

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

XI. GENERAL

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

XII. SEVERE WEATHER CONTINGENCY PLAN

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

Weather conditions will be monitored throughout the day by all field team members. Additionally, field personnel should be aware of/informed of daily weather forecasts. Local weather broadcasts and information from a severe weather alert radio will be monitored by the Field Team Leader, SSHO, or designee when the likelihood for severe weather exists. The National Weather Service (http://www.nws.noaa.gov) should be consulted frequently. Personnel

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

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

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

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

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

Routinely monitoring weather conditions and reports may help reduce the impact of severe weather and natural disasters. The best protection against most severe weather episodes and natural disasters is to avoid them. This means seeking shelter before the storm hits.

If lightning is a threat, stay away from pipes and electrical equipment and watch for damage caused by nearby lightning strikes. The "flash/bang" (f/b) technique of measuring the distance to lightning will be reviewed with all personnel. The f/b technique is defined as: for each 5 seconds from the time of observing the lightning flash to hearing the associated thunder, the lightning is one mile away. All outside activities will be suspended when a lightning flash is immediately in the area or the f/b measuring 30 seconds (6 miles away) is noted. Personnel will gather in the support zone for a head count and further instructions. When a safe location is not present and personnel are caught by a sudden lightning event, they should seek the lowest possible area, away from large objects that might attract lightning or fall over; e.g., trees or utility poles. Personnel should assume a crouching position with their heads lowered and hands over their ears. ***AVOID: WATER, HIGH GROUND, HEAVY EQUIPMENT, AND TALL ISOLATED OBJECTS.***

Personnel may continue indoor work activities excluding use of electrical equipment, telephones, and computers. Outdoor activities will resume when 30 minutes has elapsed since the last observable f/b equaled 30 seconds or greater.

XIII. POISONOUS SNAKE AVOIDANCE

Personnel conducting investigations in rural areas have the potential to come in contact with snakes. While most snakes are harmless and are generally a sign of a healthy ecosystem, two families of venomous snakes are native to the United States. The first family of poisonous snakes is that of the pit vipers, which includes rattlesnakes, copperheads, and cottonmouths. The other family of poisonous snakes includes two species of coral snakes found chiefly in the southern states.

For people operating in rural areas, it may be impossible to completely prevent contact with poisonous snakes. However, there are several precautions which can lower the risk of being bitten:

- Be aware of the types of snakes that may exist in your field area, the habitats they prefer, and their seasonal occurrence. Within "snake season," review potential hazards each day and/or each time you move into a new area.
- Leave snakes alone. Many people are bitten because they try to kill a snake or get a closer look at the snake.
- Use caution when walking in high grass areas. Wear high-top leather boots (greater than or equal to 8 inches) or snake chaps depending on the geographical location and season.
- Remain on hiking paths or cleared walking areas as much as possible.
- Keep hands and feet out of areas you can't see. Don't pick up rocks or other ground items if it can be avoided.
- Be cautious and alert when climbing rocks.
- Make noise while walking through brushy weeded areas. Vibrations may cause snakes to leave the area.
- If a snake is observed, give it a wide berth of approximately 6 feet. Leave it alone and don't try to catch it or scare it off.

If a person is bitten by a snake, some basic steps should be taken:

- Call 911 or seek immediate medical care.
- Wash the bite with soap and water if possible.
- Immobilize the bitten area and keep it lower than the heart.
- Attempt to identify the snake if this can be done without putting a person at risk. Type of information to be collected would include the species of snake if known, its size, coloration, length, and a description of the head. All of this information would be useful to the emergency room personnel or the local poison control center in determining if the snake was poisonous.

SAFETY BRIEFING CHECKLIST

SITE NAME: Ephrata Pattern Bombing Range	DATE/TIME: /

GENERAL INFORMATION

(Check subjects discussed)

☐ PURPOSE OF VISIT

☐ IDENTIFY KEY SITE PERSONNEL

☐ TRAINING AND MEDICAL REQUIREMENTS

SPECIFIC INFORMATION

☐ SITE DESCRIPTION/PAST USES

☐ RESULTS OF PREVIOUS STUDIES

☐ POTENTIAL SITE HAZARDS

☐ MEC SAFETY PROCEDURES

☐ SITE SOPs

☐ SITE CONTROL AND COMMUNICATIONS

☐ EMERGENCY RESPONSE

- ☐ LOCATION OF FIRST AID KIT
- ☐ EMERGENCY PHONE NUMBERS AND LOCATION
- ☐ LOCATION AND MAP TO NEAREST MEDICAL FACILITY
- ☐ PPE AND DECONTAMINATION

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

PLAN ACCEPTANCE FORM

SITE SAFETY AND HEALTH PLAN ADDENDUM
FOR

Site Name: Ephrata Pattern Bombing Range
Location: Ephrata, Washington

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

NAME (PRINTED)	OFFICE	SIGNATURE	DATE

Person presenting the safety briefing:

_____ _____

SIGNATURE DATE