

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

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**Final Site-Specific Work Plan  
Central Oregon Gunnery Range  
FUDS ID F10OR0170**

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

**Contract No. W912DY-04-D-0010  
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Appendix C Site Safety and Health Plan Addendum

## ABBREVIATIONS AND ACRONYMS

AOC	area of concern
ASR	Archives Search Report
BLM	Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COGR	Central Oregon Gunnery Range
CSM	Conceptual Site Model
DERP	Defense Environmental Restoration Program
DFW	Department of Fish and Wildlife
DMM	discarded military munitions
DoD	U.S. Department of Defense
EOD	Explosive Ordnance Disposal
°F	degrees Fahrenheit
FS	Feasibility Study
FSP	Field Sampling Plan
ft	feet
FUDS	Formerly Used Defense Site
GPS	Global Positioning System
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HRS	Hazard Ranking System
IDW	Investigation-Derived Waste
INPR	Inventroy Project Report
LC/MS	liquid chromatography/mass spectrometry
MC	munitions constituents
MEC	munitions and explosives of concern
mm	millimeter
MMRP	Military Munitions Response Program
MRA	Munitions Response Area
MRS	Munitions Response Site
MRSPP	Munitions Response Site Prioritization Protocol
MS/MSD	matrix spike/matrix spike duplicate
NCP	National Contingency Plan
NDAI	No Department of Defense Action Indicated
NWO	U.S. Army Corps of Engineers, Omaha District Military Munitions Design Center
ODEQ	Oregon Department of Environmental Quality
OR	Oregon
PA	Preliminary Assessment
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QC	Quality Control
RAC	Risk Assessment Code
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RI	Remedial Investigation
ROE	Right of Entry
SAP	Sampling and Analysis Plan
Shaw	Shaw Environmental, Inc.

## ABBREVIATIONS AND ACRONYMS (Continued)

SHPO	State Historic Preservation Office
SI	Site Inspection
SOP	Standard Operating Procedure
Tetryl	methyl-2,4,6-trinitrophenylnitramine
SSHP	Site Safety and Health Plan
SSWP	Site-Specific Work Plan
TNT	trinitrotoluene
TPP	Technical Project Planning
U.S.	United States
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
UXO	unexploded ordnance
UTL	upper tolerance limit

## **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 Central Oregon Gunnery Range (COGR).

### **1.1 Project Authorization**

The United States (U.S.) Army Corps of Engineers (USACE) is conducting environmental response activities at Formerly Used Defense Sites (FUDS) in accordance with Engineer Regulation 200-3-1 (USACE, 2004a) and U.S. Department of Defense (DoD) guidance document, *Management Guidance for the Defense Environmental Restoration Program* (DERP) (DoD, 2001). USACE is conducting these activities under provision of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Executive Orders 12580 and 13016, and the National Oil and Hazardous Substances Pollution Control Plan, which is commonly referred to as the National Contingency Plan (NCP). As such, USACE is required to conduct remedial preliminary assessments (PAs) and SIs (U.S. Environmental Protection Agency [USEPA], 2005a, 2005b) to evaluate hazardous substance releases or threatened releases from eligible FUDS.

USACE is evaluating FUDS that were historically used for military training and testing under the DERP's Military Munitions Response Program (MMRP). Based on historical records, these FUDS may contain munitions and explosives of concern (MEC) or 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 non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions (U.S. Department of Army, 2005, and DoD, 2003).

Shaw Environmental, Inc. (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, Site Inspections at Multiple Sites, NWO Region, Formerly Used Defense Sites, Military Munitions Response Program* (Shaw, 2006a). This document is hereafter referred to as the *Final Type I Work Plan*. Shaw is responsible for conducting SIs at FUDS in the Northwest Region (Omaha District Military Munitions Design Center [NWO]).

### **1.2 Site Name and Location**

The former COGR (identification number F10OR0170) is located in Lake County, Oregon (OR). Lake County is located in south central Oregon. The southern boundary of the FUDS is located approximately 50 miles north of Lakeview, OR. The location of the former range is shown in Figure 1.

### **1.3 Scope and Objectives**

The scope of the SI is restricted to evaluation of the presence of MEC or MC related to historical use of the FUDS prior to transfer of the property. Potential releases of hazardous, toxic, or radioactive wastes are not addressed within this 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 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 primary objective of the SI is to determine whether conditions at COGR warrant further response action pursuant to CERCLA and the NCP. The SI will collect the minimum amount of information necessary to (i) eliminate from further consideration those releases that pose no significant threat to public health or the environment; (ii) determine the potential need for removal action; (iii) collect or develop additional data, as appropriate, for Hazard Ranking System (HRS) scoring by the USEPA (USEPA, 1990); and (iv) collect data, as appropriate, to characterize the release for effective and rapid initiation of the remedial investigation (RI) and feasibility study (FS) process. A secondary objective of the SI is to collect the appropriate data to complete the Munitions Response Site Prioritization Protocol (MRSPP) (DoD, 2005).

### **1.4 Site Inspection Process**

The steps involved in conducting an SI include the following:

- Review of existing data,
- Application of the Technical Project Planning (TPP) process,
- Preparation of an SSWP,
- Performance of SI field activities (site reconnaissance, media sampling, and analysis),
- Preparation of an 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 attends 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:

- A Defense Site refers to the entire property that was owned, leased, or otherwise possessed or used by the DoD. This definition includes FUDS.
- An MRA refers to any area on a Defense Site that is known or suspected to contain UXO, DMM, or MC. An MRA can be comprised of one or more MRSs.
- An MRS is a discrete location within an MRA that is known to require a munitions response (e.g., remedial response). An MRSPP scoring is completed for each MRS.

Previous documents for FUDS have used the term areas of concern (AOCs). In some cases, one AOC may be identified as a discrete MRS; in other cases it may be logical to group adjacent or overlapping AOCs as a single MRS. The term AOC is retained for this SSWP as it is logical to defer the decision on how to potentially group AOCs until after the SI data collection is complete. Recommendations on how to group AOCs as MRSs will be included in the draft SI Report.

## 1.6 TPP Summary

A TPP meeting for the former COGR was held at the Bureau of Land Management (BLM) offices in Lakeview, OR on July 17, 2006. Representatives from the USACE – Seattle District, Oregon Department of Environmental Quality (ODEQ), BLM – Lakeview office, and Shaw were in attendance. A representative from the USACE – Omaha District was unable to attend this meeting.

Shaw reviewed the site information and presented a summary of the site and the proposed approach for the SI, addressing reconnaissance for MEC and sampling for MC. All parties were in general agreement with the approach, but reserved judgment until the Draft TPP Memorandum was issued. Comments on the *Draft Technical Project Planning Memorandum* (Shaw, 2006b) have been received from the stakeholders and incorporated in the *Final Technical Project Planning Memorandum* (Shaw, 2006c) and this SSWP. Specific discussions included:

**Types of MEC Used at the Site:** The archeologist for BLM pointed out that scattered occurrences of practice bombs had been identified throughout the range. An inert example was shown to the meeting participants and the practice bomb appeared to be an AN-MK 23, AN-MK 43 type. The archeologist indicated that anecdotal accounts suggest that pilots would target small playa lakes (ponds) within the range for unregulated bombing practice.

**AOCs:** It was agreed that while the entire 795,056 acres were used for air-to-air and air-to-ground gunnery practice and unregulated bombing practice, the SI would focus on the two target areas located near Alkali Lake where air-to-ground gunnery practice occurred. It was discussed and agreed upon that because 50-caliber and 20-millimeter (mm) small and medium arms were the primary MEC used at the site was for air-to-air gunnery practice, identifying a particular location for sampling for either MEC or MC related to air-to-air gunnery practice was neither warranted nor practical.

The BLM archeologist discussed that he had walked most of the area and had found projectiles and casings (mostly 50-caliber and very few 20-mm) throughout the FUDS. He also noted that he had found a few discarded 50-caliber ammunition belts within the range. He has prepared several archeological reports that include discussions of the density of munitions. Follow up

discussions were held with the BLM archeologist. He stated that it appears that the Army pilots would use the barren playa lakes as targets for practice bombing and strafing with 50 caliber guns. The occurrence was scattered throughout the COGR area. Fewer practice bombs are being discovered now than at previous times, due to collectors picking them up. He has never seen bombs other than expended practice bombs and 50 and 30 caliber bullets and casings.

ODEQ discussed the fact that the COGR lies within the Northwest Maneuver Area FUDS that was used in 1943 by the U.S. Army. Several of the reported training areas in COGR (e.g., Alkali Lake machine gun and rocket firing, the sand dune area in the northern portion of the COGR with UXO finds) are likely from activity during the Northwest Maneuver Area operations. It was agreed that those locations would not be included in the COGR SI but would be addressed in the Northwest Maneuver Area FUDS project.

**Pathways:** ODEQ indicated that because of the arid environment and likely blowing dust and sand problem, the air pathway should be addressed using the soil data.

**Background:** ODEQ indicated that a soil background study is currently being completed for the south central and southeastern part of Oregon, and that that data would be made available for use as background soil data. The data has been received from the ODEQ.

**General Discussion:** A report was prepared by the Oregon National Guard in 1991 evaluating the use of a portion of the COGR as a new practice bombing range for the Guard. In 1987, the Sierra Army Depot Explosive Ordnance Disposal (EOD) unit responded to a UXO find in the northern portion of the COGR. USACE agreed to follow up with the Sierra Army Depot to obtain the report. A copy of the report was provided to Shaw by USACE following the TPP Meeting.

## 1.7 Decision Rules

The following is a list of decision rules that will guide Shaw's technical approach at various stages of the SI as the specific AOCs are being evaluated:

### **Objective 1: Determine if the site requires additional investigation or can be recommended for No DoD Action Indicated (NDAI) based on the presence or absence of MEC.**

DQO #1 – Utilizing trained UXO personnel and handheld magnetometers, a visual search of the air-to-ground gunnery range will be conducted searching for physical evidence to indicate the presence of MEC (ammunition belts, MEC on the surface, munitions debris, and soil discoloration indicative of explosives). The visual search will consist of a meandering path survey along trails and in accessible areas. The following decision rules will apply:

- The following reconnaissance results would support a recommendation for further action with respect to MEC:
  - Direct evidence is found of the presence of MEC, other than incidental small and medium arms rounds, or evidence of potential MEC that is inconsistent with the air-to-ground gunnery range CSM (e.g., debris from munitions other than small and medium arms).
  - Direct evidence of MEC is not found, but abundant munitions debris and/or magnetic anomalies, other than from small or medium arms, are identified

suggesting a potential for the presence of unexploded spotting charges or other MEC.

- The following reconnaissance results would support a recommendation for NDAI with respect to MEC:
  - Direct evidence of MEC or finding of MEC is not found, isolated munitions debris and/or magnetic anomalies consistent with either the air-to-air or the air-to-ground gunnery range CSM are identified.
  - No evidence of MEC, munitions debris, or magnetic anomalies is identified.
- If there is indication of an imminent MEC hazard, the site may be recommended for a time-critical 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#2 – Soil, sediment, surface water, and groundwater samples will be collected and analyzed as proposed in Table 3. 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 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**

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

- 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 one hour, the individual who identified the UXO item will notify the local emergency response authority.
- 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.

- 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.

The technical approach is based on the *Final Type I Work Plan* (Shaw, 2006a), *Final Technical Planning Project Memorandum, Central Oregon Gunnery Range* (Shaw, 2006c) and the *Formerly Used Defense Sites, Military Munitions Response Program, Site Inspections, Program Management Plan* (USACE, 2005).

## **1.9 SSWP Organization**

This SSWP supplements the *Final Type I Work Plan* (Shaw, 2006a), which includes an Accident Prevention Plan and Site Safety and Health Plan (SSHP) (Appendix D), and a Sampling and Analysis Plan (SAP) (Appendix E) that includes both the USCAE SAP and the Shaw SAP. The SAPs contain the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP). The *Final Type I Work Plan* (Shaw, 2006a), as amended by this SSWP, governs work that will be implemented during the SI at the COGR. 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,
- Figures,
- Tables,
- Appendix A Conceptual Site Model,
- Appendix B USACE Interim Guidance Document 06-05 and Safety Advisory 06-2,
- Appendix C Site Safety and Health Plan Addendum.

## **2.0 SITE INFORMATION**

### **2.1 Installation History**

In 1942, the U. S. Government acquired 795,056 acres for the purpose of establishing an aerial gunnery range. The COGR was primarily used for air-to-air and air-to-ground gunnery training. Air-to-air gunnery training used towed targets. No remnants of these targets have been reported.

The BLM archeologist reported that spent 50-caliber cartridges, as well as lesser amounts of spent 20-mm cartridges, have been found throughout the 795,056-acre site. Discarded 50-caliber ammunition belts from aircraft have also been reported at the FUDS.

Two air-to-ground target areas are located on the eastern border of the FUDS near Alkali Lake (Figure 2). Rounds of 50-caliber and 20-mm ammunition have been found in both target areas. The southern target area is a circular mound, approximately 15 feet high, and covering an area of approximately 10 acres. The remnants of seven wood structures, presumably targets, are located on the mound, in an east-west line. The layout seems to represent a convoy. The northern target area is triangular in appearance, and situated on a naturally occurring rise.

There is also some evidence that COGR was used for practice bombing purposes. Scattered occurrences of AN-MK 5, AN-MK 23, and AN-MK 43 practice bombs have been reported from throughout the FUDS. No bombing target locations have been identified and the bombing practice likely was unregulated.

It was reported that a portion of the FUDS near Alkali Lake was used for 50-caliber machine gun training. In addition, it was reported that rockets were fired from the same location (Lake County Examiner, 1943). These activities likely were associated with the Northwest Maneuvers conducted in 1943. The Northwest Maneuvers Area is a separate, and significantly larger (8 million acres), FUDS project, that fully encompasses the COGR.

The COGR was declared excess in June 1947 and transferred to the Department of the Interior.

## **2.2 Physical Setting**

### **2.2.1 Access and Land Use**

The former COGR is located in the south central portion of the state. Lakeview, OR is the nearest incorporated community (approximately 50 miles south) with a population of 2,420 (2004 estimated census).

The former range is situated on 795,056 acres, and is currently used for agricultural purposes and grazing on open range land. Current landowners include private citizens, the BLM, and the State of Oregon. Access to the FUDS is uncontrolled.

The Alkali Lake Disposal Site is located adjacent to and south of the southern target site. The site is a hazardous waste disposal site consisting of a series of 12 shallow unlined disposal trenches each approximately 400 feet (ft) long. Wastes disposed include herbicide residue, metallic chloride waste, paint and paint solvent, and dioxins/furans. There is an approximately 2,000-ft-long groundwater plume extending to the west-northwest. The site is currently monitored by the ODEQ.

### **2.2.2 Topography, Geology, and Climate**

The COGR lies within the Walla Walla Plateaus section of the Columbia Intermontane Physiographic Province. The elevation of the area ranges from approximately 4,100 ft near Alkali Lake on the east boundary to nearly 6,000 ft at St. Patrick Mountain to the west. The area is a relatively flat region characterized by sand dunes and alkali lakes. Elevated features are predominantly volcanic in origin.

The area of the FUDS is heavily faulted, with northwest trending faults that have been softened by erosion and are visible from the air. The faults are collectively named the Brothers Fault Zone. South of the fault line the lava plateau is broken into large fault block mountains and a valley, and north of the fault line, the lava plateau is mostly unbroken by faulting. The surface, in the area of the FUDS, consists primarily of various rock outcroppings, most of which are composed of basalt. Where present, the soils in the area are thin.

The climate in the area of the FUDS area is semi-arid. It is warm and dry in the summer and cool and dry in the winter. The wettest months are generally January and December with the driest months being July and August. The highest monthly average temperature is 84.2 degrees Fahrenheit (°F) in July and the lowest monthly average temperature is 19.0 °F in January. Lakeview's average annual precipitation is 14.93 inches per year, with an average annual snowfall of 57 inches.

### **2.2.3 Groundwater**

Depth to shallow groundwater near the target areas is approximately 6 ft, based on groundwater monitoring studies at the Alkali Lake Disposal Site. The shallow groundwater is saline and alkaline in chemistry. Depth to fresh water is much deeper (250 ft below ground surface), as this area is overlain by basalt. Groundwater from the deeper fresh water artesian water-bearing zone is thought to feed portions of the Hutton Springs located approximately 3,500 ft north of the two target areas.

There are numerous private groundwater wells within the 795,056-acre COGR. Most of the wells are used for irrigation purposes and are completed in deep aquifers. There are a number of shallow water-bearing zone groundwater monitoring wells located near the target areas at Alkali Lake Disposal Site.

### **2.2.4 Surface Water**

The COGR is located within the Summer Lake and Lake Abert Watersheds. Because of the flat topography, there is little developed stream drainage and most precipitation collects in shallow ponds and lakes that evaporate in the summer. Much of the water in the area lakes is alkaline in chemistry, as a result of the high evaporative rates in the summer and low stream inflows/outflows.

There is thought to be some surface water to shallow groundwater communication. However, an upward groundwater flow gradient from the deep aquifer to the shallow water bearing zone would prevent the downward migration of any impacted surface water or shallow groundwater into deeper water-bearing units with higher groundwater quality.

## **2.3 Previous Investigations**

### **2.3.1 Historical Records Searches**

Historical documents have been reviewed to collect information about the former COGR. A summary of these documents is provided below.

- A letter sent from USACE to DOI in 1947 stated that “The lands had been examined and have been cleared of all explosives or explosive objects reasonably possible to detect by visual inspection.”

- In 1988, the 34<sup>th</sup> Ordnance Detachment at the Sierra Army Depot, in Herlong, CA disposed by detonation an AN-MK 43 practice bomb, near the town of Millican, OR. This location is outside but near the COGR FUDS northwest boundary (approximately 2 miles). It is likely related to the Northwest Maneuvers of 1943 as it was found outside of the COGR FUDS boundary.
- A 50-caliber ammunition belt was found in the northern portion of the FUDS in 1990.
- In 1993 a DERP FUDS Inventory Project Report (INPR) was conducted for the COGR. The findings determined that the site had been formerly used by the DoD and was therefore eligible under the DERP program (USACE, 1993). A Risk Assessment Code (RAC) of 5 was assigned to the COGR.
- The Archives Search Report (ASR) (USACE, 1995) which compiled available information on the COGR. The emphasis of the ASR was the types and areas of ordnance use and disposal at site. The ASR included a visit to the site in August of 1995. The primary purpose of the site visit was to assess the presence of MEC through non-intrusive means. Interviews, historical research, and site reconnaissance confirmed that nothing other than small and medium arms (50-caliber and 20-mm) were used at the FUDS.
- In 2004, an ASR Supplement (USACE, 2004b) was completed that identified the entire range as one AOC. A RAC score of 4 was assigned to the AOC.

## **2.4 Munitions and Explosives of Concern and Munitions Constituents**

According to the ASR and ASR Supplement MEC at the COGR was limited to small arms ranging from 50-caliber to 20-mm ball. However, AN-MK 5, AN-MK 23, and AN-MK 43 practice bombs have been found scattered throughout the FUDS. These practice bombs contained a spotting charge consisting of a 10 gauge shotgun shell with a red or white phosphorus pyrotechnic charge. It is thought that the COGR was used for unregulated bombing practice. No chemical warfare materiel has been used at the site.

A discussion of MEC and associated MC for the COGR is provided in the CSM included as Appendix A. The MC associated with the type of munitions used at the FUDS is summarized in Table 1.

## **3.0 PRE-FIELD ACTIVITIES**

### **3.1 Coordination with State Historic Preservation Office**

The State Historic Preservation Office (SHPO) was contacted in order to determine if any areas of cultural or archaeological significance have been identified in or in proximity to the AOCs at this FUDS. According to the SHPO, no previous cultural resource surveys have been completed near the project area. However, the SHPO recommended “extreme caution” during ground disturbing activities because the project area is located in an area perceived to have a high probability for possessing archaeological sites and/or buried human remains (OR SHPO, 2006).

### **3.2 Coordination Regarding Natural Resources**

The Oregon Department of Fish and Wildlife (DFW) was contacted to determine if there are threatened or endangered species in the area that might be potentially impacted by field inspection activities. According to the DFW, the Hutton Springs Tui Chub and Western Snowy Plover are state listed species that occur at Alkali Lake. However, based on Shaw's description of the work and time of year it will be conducted, the DFW does not anticipate any impact to these species (OR DFW, 2006).

### **3.3 Review of Historical Aerial Photographs**

Limited historical photography is available for the COGR. None of the historical photographs provide a view of the two air-to-ground gunnery targets. The two target areas are visible in recent (1994 and 2005) aerial photographs.

### **3.4 Coordination of Rights of Entry**

Per section 2.5.2 of the *Final Type I Work Plan* (Shaw, 2006a) and as the geographic USACE District office for the former COGR, the Project Manager from the USACE, Seattle District is responsible for obtaining the Right of Entry (ROE) 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 ROE.

## **4.0 SITE INSPECTION ACTIVITIES**

Site inspection activities to be conducted include the following:

- Site reconnaissance,
- Soil sampling,
- Surface water sampling ,
- Sediment sampling,
- Groundwater sampling
- Recording sampling and site information using a hand-held global position system (GPS) unit, and
- Photo documentation.

All SI field activities will be conducted in accordance with the *Final Type I Work Plan* (Shaw, 2006a) and SSHP Addendum (Appendix C). The SSHP Addendum is a supplement to the program-wide Accident Prevention Plan and Site Safety and Health Plan contained in the *Final Type I Work Plan* (Shaw, 2006a). All SI field activities will be documented in the field log book.

## 4.1 Equipment

A four-wheel drive vehicle will be necessary for access because the ingress and egress to the site is via an unpaved dirt road. An electromagnetic - all metal detector will be used during the field reconnaissance surveys to identify subsurface metallic anomalies that need to be avoided during sampling activities. This instrument was selected over the Schoenstedt ferrous metal detector due to the basaltic bedrock that contains high concentrations of iron. A hand-held GPS receiver unit will be used to document reconnaissance surveys, document any surface munitions debris or subsurface magnetic anomalies, and sampling locations. Digital photographs will be obtained of important features (including MEC, munitions debris, targets, and sampling points).

## 4.2 Communications

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

## 4.3 Training and Briefing

Any additional training will be conducted onsite 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.

## 4.4 Key Personnel

This section identifies key project personnel and their specific roles and responsibilities for each SI activity conducted at the COGR. 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 non-conformance,
- Identify and record and quality problems,
- Initiate, recommend, or provide solutions through designated channels,
- Verify the implementation of solutions, and
- Control further processing, delivery, or installation of non-conforming items until the deficiency or unsatisfactory condition has been corrected.

**Project Manager** – The Shaw Project Manager will have overall responsibility, authority, and accountability for the project. Mr. Peter Kelsall, Shaw, 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 data quality objective 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 for this SI. Ms. Pamela Moore will serve as the Health and Safety Manager for this project.

**Technical Lead** – The Shaw Technical Lead will oversee the technical aspects of the inspection activities. Mr. Dale Landon will serve as the Technical Lead for this site.

**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, and federal, state, and local laws and regulations. Mr. Tony Searls will serve as Field Team Leader for this site. Mr. Searls will function as the primary point of contact for the property owners and field personnel. He will advise the Technical Lead of 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. Mr. Rob Irons will serve as the UXO Technician for this site.

#### **4.5 Field Reconnaissance**

A visual reconnaissance survey of the vicinity of the two target areas shown on Figure 2 will be conducted to identify evidence of MEC and/or range activities (presence of MEC or munitions debris, targets, etc). The reconnaissance team will locate, identify, and stake sampling locations within the AOC. The amount and type of munitions debris observed on the ground will be noted.

The following conditions at each planned sampling location will be documented in the field log book and recorded by digital photographs as necessary:

- Presence or absence of MEC and munitions debris,
- Coordinates of staked sampling locations (using a hand-held 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 a visual and geophysical inspection of the target areas. The visual inspection will be supplemented using an electromagnetic – all metal detector. The path walked during the visual reconnaissance will be recorded using a hand-held GPS unit. Reconnaissance will not include detailed mapping.

Shaw will document any MEC or munitions debris found, and proceed with MC sampling as described in the following sections.

## 4.6 Sampling

This SSWP details sampling by media planned at the former COGR, as discussed at July 17, 2006 TPP Meeting as documented in the *Final Technical Project Planning Memorandum* (Shaw 2006c). Soil, sediment, surface water, and groundwater samples will be collected based upon the rationale in Table 3. The proposed sampling for the COGR is summarized in Table 4. Sample designations and quality assurance/quality control (QA/QC) sample requirements are summarized in Table 5.

In all instances, samples will be collected using clean, new, disposable sampling equipment, i.e., a spoon or scoop and bowl. Non-disposable tools, such as a spade, shovel, or trowel, may be used to remove vegetation and roots prior to collection of the soil or sediment sample.

All soil, sediment, surface water, and groundwater samples will be collected in accordance with Sections 6.1, 6.4, and Shaw Standard Operating Procedures (SOPs) T-FS-101, T-FS-113, and T-FS-124, of Appendix E of the *Final Type I Work Plan* (Shaw, 2006a).

### 4.6.1 Soil

Six surface soil samples will be collected, three from the southern target area and three from the northern target area. Surface soil samples will be collected from locations near the targets but distributed sufficiently to evaluate distribution of MC in soil. Surface soil samples will be composite samples (7-point, wheel pattern with 2-ft radius). All surface soil samples will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel). Select metals are those metals that would have been present in the steel and lead munitions used at COGR. Chromium, copper, iron, molybdenum, and nickel are common metals contained in steel. Aluminum and manganese are used during comparison to background concentrations using geochemical methods. One surface soil sample from each target area will also be analyzed for explosives including nitroglycerine. Surface soil samples will be analyzed according to the methods specified in Section 4.6.5 below.

### 4.6.2 Sediment and Surface Water

Two sediment samples will be collected, one from the southern target area and one from the northern target area. Sediment samples will be collected from ponds or lakes located near the targets. Sediment samples will be discrete grab samples. If water is present, one surface water grab sample will be collected from the ponds or lakes sampled for sediment near each of the target areas. The sediment samples will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives including nitroglycerine. The surface water samples will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel), explosives including nitroglycerine, and perchlorate. Sediment and surface water samples will be analyzed according to the methods specified in Section 4.6.5 below.

During the TPP meeting it was agreed that a surface water sample would be collected from Hutton Springs to evaluate the potential groundwater to surface water pathway. This sample was to be analyzed for perchlorate only. Efforts by the USACE Seattle District to obtain an ROE for the property were not successful because the property owner denied access. An alternative surface water location was investigated with the BLM and the Oregon DFW.. However, no other

suitable location was identified. Therefore, no surface water sample from Hutton Springs will be collected.

#### **4.6.3 Groundwater**

One groundwater sample will be collected from a monitoring well located near the southern target. The well is part of the Alkali Lake Disposal Site groundwater monitoring network. The sample will be analyzed for perchlorate by the method specified in Section 4.6.5 below.

#### **4.6.4 Background**

ODEQ has provided a data set of background surface soil metals concentrations for use at COGR. The data set contains 211 individual samples from Lake and Harney counties. These data will be evaluated during the preparation of the SI Report to determine which samples will be used to determine background concentrations for COGR. The soil background concentrations will be determined using published USEPA guidance. It is anticipated that a 95<sup>th</sup> upper tolerance limit will be used for normally or lognormally distributed analytes and the 95<sup>th</sup> percentile for nonparametrically distributed analytes. The methods used will be documented in the SI Report.

One background sediment sample will be collected from Alkali Lake south of the target areas. The sample will be analyzed for TAL metals and molybdenum. One ambient surface water sample will be collected from Alkali Lake and analyzed for TAL metals and molybdenum, and perchlorate. One background groundwater sample will be collected from an upgradient groundwater monitoring well located at the Alkali Lake Disposal Area, and will be analyzed for perchlorate. The ambient and background values will be used as comparison values to determine whether the site sample is representative of background concentrations at the COGR area of investigation.

#### **4.6.5 Analytical Program**

Definitive target analyses for samples collected from COGR consist of the following:

- Metals by USEPA SW-846 Method 6020A,
- Explosives by EPA SW846 Method 8330A,
- Nitroglycerin by USEPA SW-846 Method 8330A (Modified), and
- Perchlorate by the method specified below.

Soil, sediment, surface water, and groundwater samples will be analyzed using USEPA SW-846 methodology as presented in Section 5.0 of the USACE QAPP. All soil, sediment and surface water samples will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) using USEPA SW-846 Method 6020A. Surface water samples will be analyzed for total and dissolved metals. Soil and sediment samples that are analyzed for explosives will be analyzed for explosives using USEPA SW-846 Method 8330, and for nitroglycerin using USEPA SW-846 Method 8330A (Modified). Surface water and groundwater samples will be analyzed for perchlorate, using liquid chromatography/mass spectrometry (LC/MS) applying DataChem Standard Operating Procedure Document Control # LCMS-CL04-Rev 2, *The Determination of Perchlorate in Water, Soil and Biota by LC/MS*, dated July 19, 2006.

Soil and sediment samples may have been impacted by small arms fire will be passed through an ASTM No. 10 (2-mm) wire mesh sieve at the laboratory prior to analysis for metals in order to

remove coarser particles and foreign objects, including large metallic fragments from bullets, which have a low degree of bio-availability (Interstate Technical and Regulatory Council, 2003, Characterization and Remediation of Soils at Closed Small Arms Firing Ranges).

Tables 6 through 11 present human health and ecological risk based screening concentrations. If the Practical Quantitation Limit (PQL) exceeds a screening value, the compound will be carried forward in the evaluation process. Chemical data will be reported via a hard-copy data package and electronic format following the requirements referenced in Section 7.1 and 7.2 of the USCAE QAPP. These data deliverables will be validated in accordance to the requirements referenced in Section 8.2 of the USACE QAPP.

#### **4.6.6 Quality Assurance/Quality Control Samples**

In accordance with the USACE Programmatic SAP, quality control (QC) samples will be collected. The locations planned for the collection of QC samples are noted on Table 5. The QC samples to be collected include field duplicates matrix spike/matrix spike duplicate (MS/MSD) samples. The Omaha Design Center has directed that no QA field split samples will be collected for this site.

#### **4.6.7 Sample Preservation, Packaging, and Shipping**

Sample preservation and packaging are provided in Table 4-1 and Table 4-2 of the USACE QAPP. Sample shipment will follow the procedures specified in Section 4.0 of the USACE QAPP. Completed analysis request/chain of custody records per Section 7.1.3 of the USACE SAP will be secured and included with each shipment of coolers to GPL Laboratories, LLC.

All samples will be shipped to the following:

#### **GPL Laboratories, LLC**

7210A Corporate Court  
Frederick, MD 21703  
Phone: 301.694.5310  
Fax: 301.620.0731  
Attention: Sample Receiving/Virginia Zusman

### **5.0 INVESTIGATION DERIVED WASTE**

Investigation-derived waste (IDW) will be managed in accordance with the *Final Type I Work Plan* (Shaw, 2006a) (Section 3.7, and Appendix E, Shaw's SAP Section 9.0). All IDW is presumed non-hazardous unless field observations indicate otherwise. The following types of IDW will be managed as specified in the *Final Type I Work Plan* (Shaw, 2006a), Appendix E, and the USACE FSP:

- Personal protective equipment and disposable equipment (i.e., disposable sampling scoop): bagged and routed to a municipal landfill;
- Excess surface soil, surface water, and sediment material: returned to source (i.e., 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 or ROE issues.

December 2006 – Submit Final SSWP;

January 2007 – Conduct Si field activities;

March 2007 – Submit Draft SI Report;

April 2007 – Review Draft SI Report;

May 2007 – Submit Draft Final SI Report;

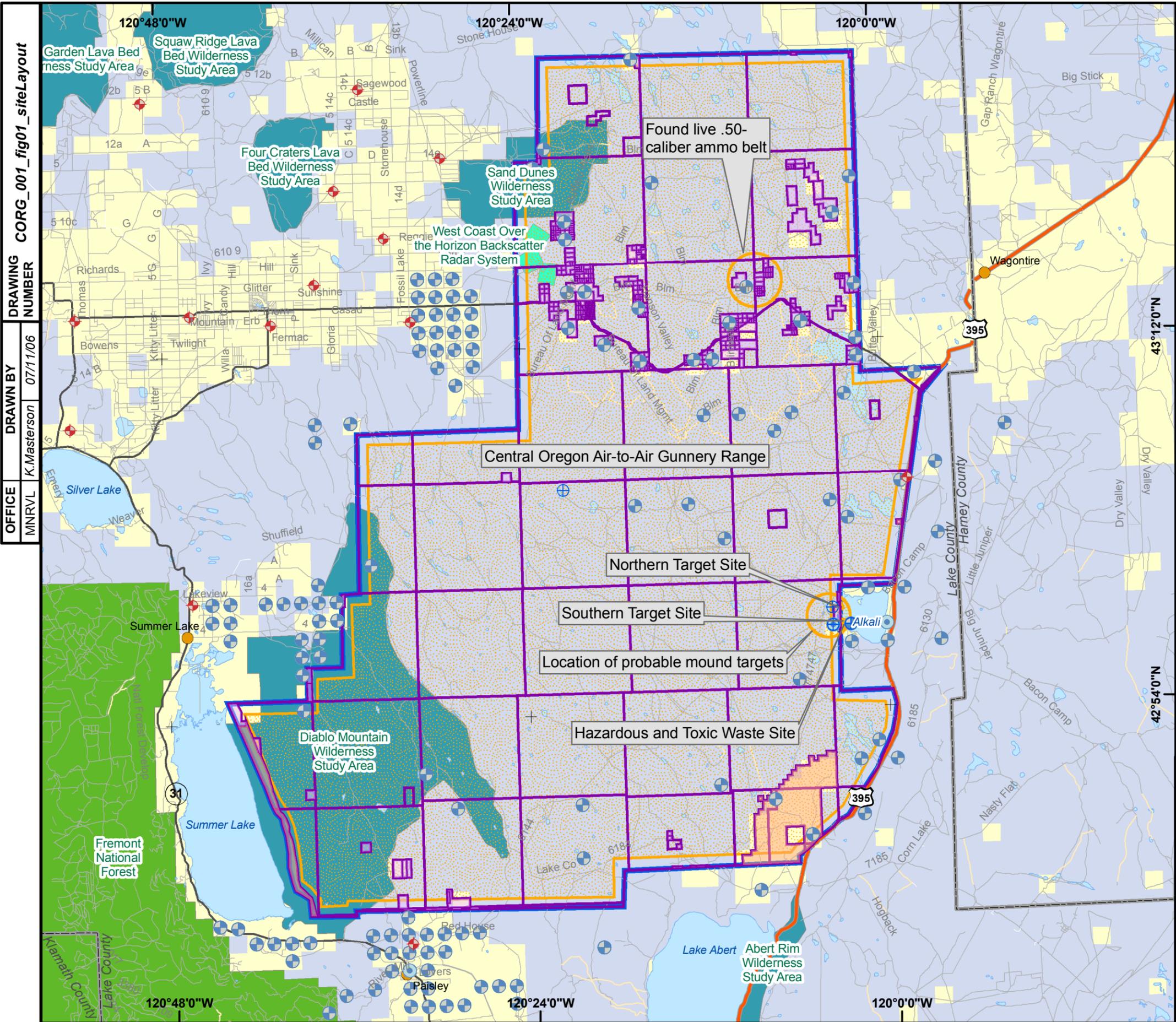
May 2007 – Review Draft Final SI Report; and

June 2007 – Submit Final SI Report.

## 7.0 REFERENCES

- U.S. Department of Defense (DoD). 2001. *Management Guidance for the Defense Environmental Program*. September 2001.
- DoD. 2003. *Definitions Related to Munitions Response Actions*. Memorandum, Philip W. Grone. December 2003.
- DoD. 2005. *Munitions Response Site Prioritization Protocol, Final Rule*, 32 CFR Part 179, 70 FR 192. 5 October 2005.
- Oregon Department of Fish and Wildlife (OR DFW). 2006. Letter from Christopher Carey (OR DFW) to Dale Langdon (Shaw). RE: Endangered and Threatened Species at Alkali Lake FUDS. November 2, 2006.
- Oregon State Historic Preservation Office (OR SHPO). 2006. Letter from Dennis Griffin (OR SHPO) to Lisa Stahl (Shaw). RE: SHPO Case No.06-2596, Boardman/Central OR Gunnery Range. November 1, 2006.
- Shaw Environmental, Inc. (Shaw). 2006a. *Final Type I Work Plan, Site Inspections at Multiple Sites, NWO Region, Formerly Used Defense Sites, Military Munitions Response Program*. Prepared for the Army Corps of Engineers. February 2006.
- Shaw. 2006b. *Draft Technical Project Planning Memorandum, Central Oregon Gunnery Range*. Prepared for the Army Corps of Engineers. September 2006.
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- USACE. 1995. *Archives Search Report, Central Oregon Gunnery Range*. August 1995.
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- USACE. 2004b. *Archives Search Report Supplement, Central Oregon Gunnery Range*. November 2004.
- USACE. 2005. *Formerly Used Defense Sites (FUDS) Military Munitions Response Program (MMRP) Site Inspections, Program Management Plan*. February 2005
- U.S. Department of Army. 2005. *Munitions Response Terminology*, Memorandum, Raymond J. Fatz. 21 April 2005.
- U.S. Environmental Protection Agency (USEPA), 1990. *Appendix A to Part 300 – The Hazard Ranking System*, Title 40 CFR Part 300, 55 FR 51583. 14 December 1990.
- USEPA. 2005a. *Federal Facilities Remedial Preliminary Assessment Summary Guide*. July 2005.
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## **FIGURES**



DRAWING NUMBER: CORG\_001\_fig01\_siteLayout  
 DRAWN BY: K.Masterson  
 DATE: 07/11/06  
 OFFICE: MNRVL

**Legend**

- Central Oregon Gunnery Range Property Boundary
- Central Oregon Air-to-Air Gunnery Range - Area of Concern
- Taxlot Parcel
- Private Land
- STATE OF OREGON
- Air Force DOD
- National Forest FS
- Public Domain Land BLM
- Wilderness Study Area BLM
- ⊕ Geotechnical Well
- ⊗ Monitoring Well
- ⊙ Water Supply Well
- ◆ Well (Water Resources Dept)

- NOTES:**
- 1) MRA/MRS boundary was derived from the Central Oregon Gunnery Range ASR Supplement.
  - 2) Groundwater well data were obtained from Oregon State Water Resources Dept and approximated to the nearest 1200 meters.
  - 3) These ranges are located within the Summer Lake and Lake Abert watersheds.

N

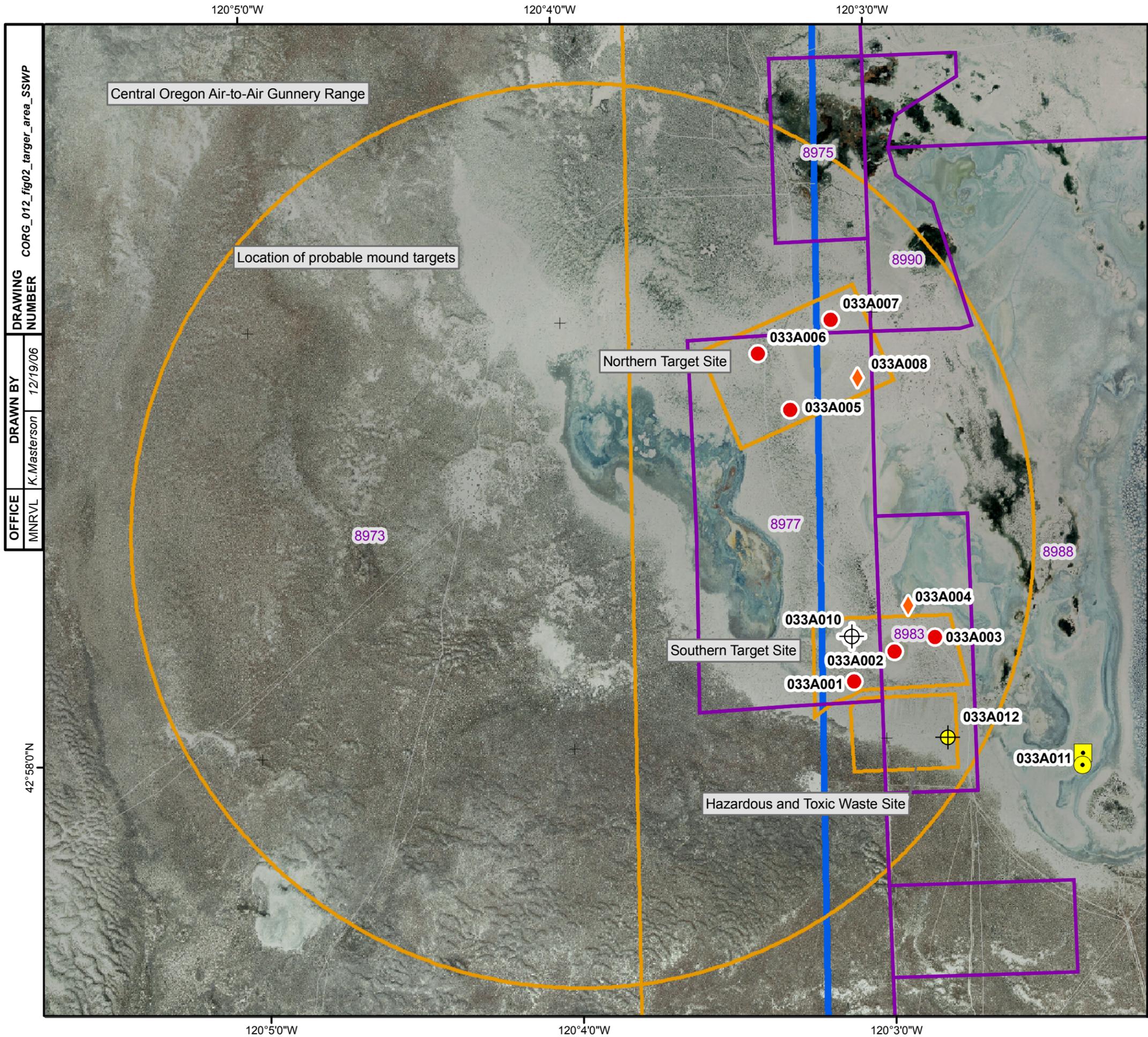
0 2.5 5

Miles

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS  
OMAHA DESIGN CENTER

FIGURE 1  
 SITE LAYOUT  
 CENTRAL OREGON GUNNERY RANGE



OFFICE: MNRVL  
 DRAWN BY: K. Masterson  
 DRAWING NUMBER: CORG\_012\_fig02\_target\_area\_SSWP  
 DATE: 12/19/06

**Legend**

- Central Oregon Gunnery Range Property Boundary
- Central Oregon Air-to-Air Gunnery Range - AOC
- Taxlot Parcel
- + Well (Water Resources Dept)
- Proposed Background Surface Water
- ◆ Proposed Sediment Sample
- Proposed Background Sediment
- Proposed Soil Sample
- ⊕ Prop bkgr GW Sample
- ⊕ Prop GW Sample

**NOTES:**

- 1) AOC boundaries were derived from the Central Oregon Gunnery Range ASR Supplement.
- 2) Groundwater well data were obtained from Oregon State Water Resources Dept and approximated to the nearest 1200 meters.
- 3) These ranges are located within the Summer Lake and Lake Albert watersheds.
- 4) 2005 Aerial photo was obtained from the Oregon Department of Environmental Quality.

N

0 700 1,400 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS  
OMAHA DESIGN CENTER

**FIGURE 2**  
**AIR-TO-GROUND TARGET AREAS**  
**SAMPLING LOCATIONS AND**  
**TAXLOT BOUNDARIES**  
 CENTRAL OREGON GUNNERY RANGE

# **TABLES**

**Table 1  
Munitions Information**

Area of Concern	Munitions	Munitions Constituents
Air-to-Air Gunnery Range	50-caliber machine gun	Lead, single- (nitrocellulose) or double-base (nitrocellulose and nitroglycerin) propellant, perchlorate
	20-mm ball M55A1, MK1	Steel, double-base (nitrocellulose and nitroglycerin) propellant
	AN-MK 5, AN-MK 23, and AN-MK 43 practice bombs	Cast iron, sheet metal, 10 gauge shotgun shell with single- (nitrocellulose) or double-base (nitrocellulose and nitroglycerin) propellant, red and white phosphorus

**Table 2  
Rights of Entry Status**

<b>Land Owner</b>	<b>Date Signed by Land Owner</b>	<b>Land Owner Concerns</b>	<b>Estimated Date to Contact Prior to Field Work</b>
BLM	Approximately November 15, 2006		2 weeks
State of Oregon	Approximately November 15, 2006		2 weeks
Private citizen		Access Denied to Hutton Springs	

**Table 3  
Sample Location Rationale**

AOC	Sample Location	Sample Media	Sample Location Rationale
Air-To-Air Gunnery Range – Southern Target	033A001	Surface Soil	Surface soil samples from the southern target area to assess possible impacts in surface soil. All samples will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and one of the three soil samples will also be analyzed for explosives including nitroglycerin. Sampling locations to be determined in the field based on the presence of MEC, munitions debris, stained soils, stressed vegetation, craters, or other indicators of potentially impacted soils.
	033A002	Surface Soil	
	033A003	Surface Soil	
	033A004	Sediment	Sediment sample collected from the bottom of a small lake or pond near the southern target to assess possible impacts to sediment. Sampling location to be determined in the field based on location of water body. Sample to be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives including nitroglycerin.
		Surface Water	Provisional surface water sample collocated with location 033A004 to assess possible impacts to surface water. Sample will be collected only if water is present. Sample location to be determined in the field based on location of water body. Sample will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel), explosives including nitroglycerin, and perchlorate.
Air-To-Air Gunnery Range – Northern Target	033A005	Surface Soil	Surface soil samples from the northern target area to assess possible impacts in surface soil. All samples will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and one of the three soil samples will also be analyzed for explosives including nitroglycerin. Sampling locations to be determined in the field based on the presence of MEC, munitions debris, stained soils, stressed vegetation, craters, or other indicators of potentially impacted soils.
	033A006	Surface Soil	
	033A007	Surface Soil	

**Table 3  
Sample Location Rationale (Continued)**

AOC	Sample Location	Sample Media	Sample Location Rationale
Air-To-Air Gunnery Range – Northern Target	033A008	Sediment	Sediment sample collected from the bottom of a small lake or pond near the northern target to assess possible impacts to sediment. Sampling location to be determined in the field based on location of water body. Sample to be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives including nitroglycerin.
		Surface Water	Provisional surface water sample collocated with location 033A009 to assess possible impacts to surface water. Sample will be collected only if water is present. Sample location to be determined in the field based on location of water body. Sample will be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel), explosives including nitroglycerin, and perchlorate.
	033A010	Groundwater	Groundwater sample to be collected from one of the Alkali Lake Disposal Area groundwater monitoring wells to assess impacts to shallow groundwater. Groundwater sample will be analyzed for perchlorate only.
Background Samples	033A011	Sediment	Background sediment sample to be collected from sediments in Alkali Lake or other water body located upwind from the southern target area. Sample will be analyzed for TAL metals list plus molybdenum.
		Surface Water	Background surface water sample to be collected from Alkali Lake or other water body located upwind of the southern target area. Sample will be analyzed for TAL metals list plus molybdenum and perchlorate.
	033A012	Groundwater	Background groundwater sample to be collected from a shallow groundwater well located within the Alkali Lake Disposal Area and upgradient from the target areas. Sample will be used to establish whether perchlorate is present in native groundwater that feeds Hutton Springs. Sample will be analyzed for perchlorate only

**Table 4  
Proposed Sampling Approach**

Area of Concern	Media	Samples	Contaminants of Concern								
			Lead	Metals	Mercury	PAHs	Explosives	PETN	Nitroglycerin	Perchlorate	Sieving (No. 10)
Air-to-Air Gunnery Range	Soil	6	0	6	0	0	2	0	2	0	6
	Sediment	2	0	2	0	0	2	0	2	0	0
	Surface Water	3	0	2	0	0	2	0	2	3	0
	Groundwater	1	0	0	0	0	0	0	0	1	0
Background	Soil	0	0	0	0	0	0	0	0	0	0
	Sediment	1	0	1	0	0	0	0	0	0	0
	Surface Water	1	0	1	0	0	0	0	0	1	0
	Groundwater	2	0	0	0	0	0	0	0	2	0
		Totals	0	12	0	0	6	0	6	7	6

QC Required Samples	Media	Samples	Lead	Metals	Mercury	PAHs	Explosives	PETN	Nitroglycerin	Perchlorate	Sieving (No. 10)
Duplicate	Soil	1	0	1	0	0	1	0	1	0	1
	Sediment	0	0	0	0	0	0	0	0	0	0
	Surface Water	1	0	1	0	0	1	0	1	1	0
	Groundwater	0	0	0	0	0	0	0	0	0	0
		Totals	0	2	0	0	2	0	2	1	1

MS/MSD	Soil	1	0	1	0	0	1	0	1	0	2
	Sediment	0	0	0	0	0	0	0	0	0	0
	Surface Water	1	0	1	0	0	1	0	1	1	0
	Groundwater	0	0	0	0	0	0	0	0	0	0
		Totals	0	2	0	0	2	0	2	1	2

Notes:

- 1) In addition to the QC samples shown above, temperature blanks will be submitted with samples, one blank per cooler.
- 2) Lead and metals by SW-846 6020A. Mercury by SW-846 7470A/7471A. PAHs by SW-846 8270 Low Level. Explosives by SW-846 8330A. PETN and Nitroglycerin by SW-845 8330A (Modified). Perchlorate by LC/MS (DataChem SOP Document Control # LCMS-CL04-Rev 2 titled "The Determination of Perchlorate in Water, Soil and Biota by LC/MS" dated July 19, 2006).
- 3) Select metals for range samples. Select metals are aluminum, chromium, copper, lead, iron, manganese, molybdenum, and nickel.
- 4) Metals background are Target Analyte List plus molybdenum.

MS/MSD - matrix spike/matrix spike duplicate

PAHs - polycyclic aromatic hydrocarbons

PETN - pentaerythritol tetranitrate

QC - quality control

**Table 5**  
**Sample Designations, QA/QC, and Analyses**

Area of Concern	Sample Location	Sample Type	Sample Number	Sample Media	QA/QC Sample		EPA Method
					Field Duplicate	MS/MSD	
Air to Air Gunnery Range – Southern Target Area	033A001	Composite	NWO-033-0001	Soil		NWO-033-0001- MS/MSD	Aluminum, chromium, copper, lead, iron, manganese, molybdenum and nickel by SW-846 6020A Explosives by SW-846 8330A Nitroglycerin by SW-846 8330A (Modified)
	033A002	Composite	NWO-033-0002	Soil			Aluminum, chromium, copper, lead, iron, manganese, molybdenum and nickel by SW-846 6020A
	033A003	Composite	NWO-033-0003	Soil			Aluminum, chromium, copper, lead, iron, manganese, molybdenum and nickel by SW-846 6020A
	033A004	Grab	NWO-033-1001	Sediment			Aluminum, chromium, copper, lead, iron, manganese, molybdenum and nickel by SW-846 6020A Explosives by SW-846 8330A Nitroglycerin by SW-846 8330A (Modified)
Grab		NWO-033-2001	Surface water		NWO-033-2001- MS/MSD	Aluminum, chromium, copper, lead, iron, manganese, molybdenum and nickel by SW-846 6020A Explosives by SW-846 8330A Nitroglycerin by SW-846 8330A (Modified) Perchlorate by LC/MS (DataChem SOP No. LC/MS-CLO4-Rev2)	
Air to Air Gunnery Range – Northern Target Area	033A005	Composite	NWO-033-0004	Soil	NWO-033-0007		Aluminum, chromium, copper, lead, iron, manganese, molybdenum and nickel by SW-846 6020A Explosives by SW-846 8330A Nitroglycerin by SW-846 8330A (Modified)
	033A006	Composite	NWO-033-0005	Soil			Aluminum, chromium, copper, lead, iron, manganese, molybdenum and nickel by SW-846 6020A
	033A007	Composite	NWO-033-0006	Soil			Aluminum, chromium, copper, lead, iron, manganese, molybdenum and nickel by SW-846 6020A
	033A008	Grab	NWO-033-1002	Sediment			Aluminum, chromium, copper, lead, iron, manganese, molybdenum and nickel by SW-846 6020A Explosives by SW-846 8330A Nitroglycerin by SW-846 8330A (Modified)
		Grab	NWO-033-2002	Surface water	NWO-033-2004		Aluminum, chromium, copper, lead, iron, manganese, molybdenum and nickel by SW-846 6020A Explosives by SW-846 8330A Nitroglycerin by SW-846 8330A (Modified) Perchlorate by LC/MS (DataChem SOP No. LC/MS-CLO4-Rev2)
033A010	Grab	NWO-033-3001	Groundwater			Perchlorate by LC/MS (DataChem SOP No. LC/MS-CLO4-Rev2)	

**Table 5 (Continued)**  
**Sample Designations and Analyses**

Area of Concern	Sample Location	Sample Type	Sample Number	Sample Media	QA/QC Sample		EPA Method
					Field Duplicate	MS/MSD	
Background	033A011	Grab	NWO-033-5001	Sediment			Aluminum, chromium, copper, lead, iron, manganese, molybdenum and nickel by SW-846 6020A
		Grab	NWO-033-6001	Surface water			Aluminum, chromium, copper, lead, iron, manganese, molybdenum and nickel by SW-846 6020A Perchlorate by LC/MS (DataChem SOP No. LC/MS-CLO4-Rev2)
	033A012	Grab	NWO-033-6002	Groundwater			Perchlorate by LC/MS (DataChem SOP No. LC/MS-CLO4-Rev2)

**Table 6**  
**Human Health Soil/Sediment Screening Values at Oregon Sites <sup>a</sup>**

Potential Contaminant of Concern	Laboratory Method Detection Limit (mg/kg)	USEPA Region 9 Human Health Screening Values		
		Residential PRG <sup>b</sup> (mg/kg)	SSLs <sup>c</sup> DAF=1 (mg/kg)	SSLs <sup>c</sup> DAF=20 (mg/kg)
<b>Explosives</b>				
1,3,5-Trinitrobenzene	0.02	1,800		
1,3-Dinitrobenzene	0.02	6.1		
2,4,6-Trinitrotoluene	0.04	16		
2,4-Dinitrotoluene <sup>d</sup>	0.04	0.72	0.00004	0.0008
2,6-Dinitrotoluene <sup>d</sup>	0.04	0.72	0.00004	0.0008
2-Amino-4,6-dinitrotoluene	0.04	12		
2-Nitrotoluene	0.075	0.88		
3-Nitrotoluene	0.05	730		
4-Amino-2,6-dinitrotoluene	0.04	12		
4-Nitrotoluene	0.04	12		
HMX	0.05	3,100		
Nitrobenzene	0.02	20	0.007	0.1
Nitroglycerin	10	35		
RDX	0.075	4.4		
Tetryl	0.065	610		
<b>Metals</b>				
Chromium <sup>e</sup>	1.0	210	2	38
Copper	1.0	3,100		
Iron	15.0	23,000		
Lead	1.0	400		
Molybdenum	0.5	390		
Nickel	1.0	1,600	7	130

DAF = Dilution Attenuation Factor

**Table 7**  
**Human Health Surface Water Screening Values at Oregon Sites <sup>a</sup>**

Potential Contaminant of Concern	Laboratory Method Detection Limit (µg/L)	USEPA Region 9 Tap Water PRG <sup>b</sup> (µg/L)	Oregon DEQ Water Quality Criteria <sup>c</sup>	
			Water and Fish Ingestion <sup>d</sup> (µg/L)	Fish Consumption Only <sup>e</sup> (µg/L)
<b>Explosives</b>				
1,3,5-Trinitrobenzene	0.2	1,100		
1,3-Dinitrobenzene	0.2	3.6		
2,4,6-Trinitrotoluene	0.3	2.2		
2,4-Dinitrotoluene <sup>f</sup>	0.3	<b>0.099</b>	0.11 <sup>g</sup>	9.1 <sup>g</sup>
2,6-Dinitrotoluene <sup>f</sup>	0.3	<b>0.099</b>		
2-Amino-4,6-dinitrotoluene	0.2	7.3		
2-Nitrotoluene	0.4	<b>0.049</b>		
3-Nitrotoluene	0.8	120		
4-Amino-2,6-dinitrotoluene	0.2	7.3		
4-Nitrotoluene	0.4	0.66		
HMX	0.4	1,800		
Nitrobenzene	0.2	3.4	19,800	
Nitroglycerin	0.75	4.8		
RDX	0.8	<b>0.61</b>		
Tetryl	1.3	360		
<b>Metals/Inorganics</b>				
Chromium <sup>h</sup>	2.0E-03	110	50	
Copper	3.0E-03	1,500		
Iron	5.0E-02	11,000	300	
Lead	1.0E-03		50	
Molybdenum	5.0E-03	180		
Nickel	1.0E-03	730	13.4	100
Perchlorate	3.0	24 <sup>i</sup>		

**Table 7 (Continued)**  
**Human Health Surface Water Screening Values at Oregon Sites <sup>a</sup>**

MCL = Maximum Contaminant Level

MDL = Method Detection Limit

PQL = Practical Quantitation Limit

PRG = Preliminary Remediation Goal

QA/QC = Quality Assurance/Quality Control

µg/L = micrograms per liter

<sup>a</sup> Screening value is shown in bold face if it is less than the PQL. If the laboratory cannot achieve PQL at or below the screening values with routine methodology, as supported by MDLs that are no greater than 1/3 PQL, the laboratory's PQL must be identified in the Analytical Data QA/QC Report as failing to meet the applicable screening value. Some screening values cannot be obtained with routine methodology. In those cases, the PQL achievable by routine methodology is acceptable.

<sup>b</sup> EPA Region 9 PRG Table dated October 2004 and revision note dated 28 December 2004, based on single chemical.

<sup>c</sup> Values from Oregon DEQ Water Quality Criteria (OAR 340 Division 41, Table 20).

<sup>d</sup> Values represent the maximum ambient water concentration for consumption of both contaminated water and fish or other aquatic organisms.

<sup>e</sup> Values represent the maximum ambient water concentration for consumption of fish or other aquatic organisms.

<sup>f</sup> Carcinogenic DNT mixture values used if more conservative than noncarcinogenic isomer-specific values.

<sup>g</sup> Value is based on a cancer risk of  $1.0 \times 10^{-6}$ .

<sup>h</sup> Because the form of chromium has not yet been determined, the values for Chromium VI are used as a conservative measure.

<sup>i</sup> Value based on memorandum from Department of Defense entitled "Policy on DoD Required Actions - Related to Perchlorate", dated 26 January 2006.

**Table 8**  
**Human Health Groundwater Screening Values at Oregon Sites <sup>a</sup>**

Potential Contaminant of Concern	Laboratory Method Detection Limit (µg/L)	USEPA Region 9 Tap Water PRG <sup>b</sup> (µg/L)	Federal Drinking Water Criteria MCLs <sup>c</sup> (µg/L)
<b>Explosives</b>			
1,3,5-Trinitrobenzene	0.2	1,100	
1,3-Dinitrobenzene	0.2	3.6	
2,4,6-Trinitrotoluene	0.3	2.2	
2,4-Dinitrotoluene <sup>d</sup>	0.3	<b>0.099</b>	
2,6-Dinitrotoluene <sup>d</sup>	0.3	<b>0.099</b>	
2-Amino-4,6-dinitrotoluene	0.2	7.3	
2-Nitrotoluene	0.4	<b>0.049</b>	
3-Nitrotoluene	0.8	120	
4-Amino-2,6-dinitrotoluene	0.2	7.3	
4-Nitrotoluene	0.4	0.66	
HMX	0.4	1,800	
Nitrobenzene	0.2	3.4	
Nitroglycerin	0.5	4.8	
RDX	0.8	<b>0.61</b>	
Tetryl	0.75	360	
<b>Metals/Inorganics</b>			
Chromium <sup>f</sup>	2.0E-03	110	100
Copper	3.0E-03	1,500	1,000 <sup>e</sup> 1,300 <sup>g</sup>
Iron	5.0E-02	11,000	300 <sup>e</sup>
Lead	1.0E-03		15 <sup>g</sup>
Molybdenum	5.0E-03	180	
Nickel	1.0E-03	730	
Perchlorate	3.0	24 <sup>h</sup>	

**Table 8 (Continued)**  
**Human Health Groundwater Screening Values at Oregon Sites <sup>a</sup>**

<sup>a</sup> Screening value is shown in bold face if it is less than the PQL. If the laboratory cannot achieve PQL at or below the screening values with routine methodology, as supported by MDLs that are no greater than 1/3 PQL, the laboratory's PQL must be identified in the Analytical Data QA/QC Report as failing to meet the applicable screening value. Some screening values cannot be obtained with routine methodology. In those cases, the PQL achievable by routine methodology is acceptable.

<sup>b</sup> EPA Region 9 PRG Table dated October 2004 and revision note dated 28 December 2004, based on single chemical.

<sup>c</sup> Primary MCL from the 2004 Edition of the Drinking Water Standards and Health Advisories, dated Winter 2004, unless otherwise indicated.

<sup>d</sup> Carcinogenic DNT mixture values used if more conservative than noncarcinogenic isomer-specific values.

<sup>e</sup> Secondary MCL from the 2004 Edition of the Drinking Water Standards and Health Advisories, dated Winter 2004.

<sup>f</sup> Total chromium values used if available.

<sup>g</sup> Action level from the 2004 Edition of the Drinking Water Standards and Health Advisories, dated Winter 2004.

<sup>h</sup> Value based on memorandum from Department of Defense entitled "Policy on DoD Required Actions Related to Perchlorate", dated 26 January 2006.

**Table 9**  
**Selection of Ecological Soil Screening Toxicity Values for Constituents of Potential Ecological Concern (Oregon Sites)**

Potential Contaminant of Concern	ODEQ Level II Screening Level <sup>a</sup>	Proposed Benchmarks											Potential Bioaccumulative Constituent? <sup>h</sup>	Final Ecological Screening Value Soil <sup>i</sup> (mg/kg)	Practical Quantitation Limit (mg/kg)	
	Lowest Value for Plants/Inverts./ Birds/Mammals (mg/kg)	Region 5 ESLs <sup>b</sup> (2003) (mg/kg)	Dutch Intervention Value (2000) (mg/kg)	Adjusted Dutch Intervention (mg/kg)	Region 7 <sup>c</sup> (mg/kg)	Region 8 <sup>d</sup> (mg/kg)	Region 10 <sup>e</sup> (mg/kg)	Other Values: Talmage et al. (1999) <sup>f</sup> or LANL (2005) <sup>g</sup> (mg/kg)								
<b>Explosives</b>																
1,3,5-Trinitrobenzene	NVA	0.376			0.376	EPA-R4	NVA		0.376		EPA-R4	6.6	LANL		0.376	0.020
1,3-Dinitrobenzene	NVA	0.655			0.655	EPA-R4	NVA		0.655		EPA-R4	0.073	LANL		0.655	0.020
2,4,6-Trinitrotoluene	NVA	NVA			NVA		NVA		NVA	NVA		6.4	LANL		6.4	0.040
2,4-Dinitrotoluene	NVA	1.28			1.28	EPA-R4	NVA		1.28		EPA-R4	0.52	LANL		1.28	0.040
2,6-Dinitrotoluene	NVA	0.0328			0.0328	EPA-R4	NVA		0.0328		EPA-R4	0.37	LANL		0.0328	0.040
2-Amino-4,6-Dinitrotoluene	NVA	NVA			NVA		NVA		NVA	NVA		2.1	LANL		2.1	0.040
2-Nitrotoluene	NVA	NVA			NVA		NVA		NVA			2.0	LANL		2.0	0.075
3-Nitrotoluene	NVA	NVA			NVA		NVA		NVA			2.4	LANL		2.4	0.050
4-Amino-2,6-Dinitrotoluene	NVA	NVA			NVA		NVA		NVA	NVA		0.73	LANL		0.73	0.040
4-Nitrotoluene	NVA	NVA			NVA		NVA		NVA			4.4	LANL		4.4	0.040
HMX	NVA	NVA			NVA		NVA		NVA	NVA		27	LANL		27	0.050
Nitrobenzene	8	1.31			1.31	EPA-R4	NVA		1.31		EPA-R4	2.2	LANL		8	0.020
Nitroglycerin	NVA	NVA			NVA		NVA		NVA			71	LANL		71	10
RDX	NVA	NVA			NVA		NVA		NVA			7.5	LANL		7.5	0.075
Tetryl	NVA	NVA			NVA		NVA		NVA			0.99	LANL		0.99	0.065
<b>Metals</b>																
Chromium (total)	0.4	0.4			26	SSL	26	SSL	26		SSL	2.3	LANL	Yes	0.4	1.0
Copper	50	5.4	190	19	60	ORNL	190	Dutch	60		ORNL	10	LANL	Yes	50	1.0
Iron	10	NVA			200	EPA-R4	NVA		200	<b>200</b>	EPA-R4	NVA			10	15.0
Lead	16	0.0537	530	53	11	SSL	11	SSL	11		SSL	14	LANL	Yes	16	1.0
Molybdenum	2	NVA			2	ORNL	2	ORNL	2	2	ORNL	NVA			2	0.5
Nickel	30	13.6	210	21	30	ORNL	30	ORNL	30		ORNL	20	LANL	Yes	30	1.0

NVA: No value available

<sup>a</sup> Oregon Department of Environmental Quality Screening Level Values (December 2001).

<sup>b</sup> Ecological Screening Levels (ESLs), US EPA Region V, August 2003.

<sup>c</sup> USEPA Region 7: Catherine Wooster-Brown (Eco Risk Assessor) recommends the following hierarchy: USEPA EcoSSLs; ORNL Efromson values; USEPA Region 4 values; other published values.

<sup>d</sup> USEPA Region 8: Dale Hoff (Eco Risk Assessor) recommends the following hierarchy: USEPA SSLs; Dutch Intervention Values or ORNL Efromson values.

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

<sup>f</sup> 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.*

<sup>g</sup> Los Alamos National Laboratory (LANL), Eco Risk Database, Release 2.2, September 2005.

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

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

<sup>i</sup> Final Screening Value selected using the following hierarchy:

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

EPA-R4=USEPA Region 4

LANL= Los Alamos National Laboratory

SSL=USEPA Eco Soil Screening Levels

Dutch=Dutch Intervention Values

ORNL= Oak Ridge National Laboratory Ecological PRGs (Efromson et al)

**Other References:**

U.S. Environmental Protection Agency, 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, 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>.

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

Dutch Intervention Values:

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

The Netherlands Ministry of Housing, Spatial Planning and Environment's Circular on target values and intervention values for soil remediation: [http://www2.minvrom.nl/Docs/internationaal/S\\_I2000.pdf](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](http://www2.minvrom.nl/Docs/internationaal/annexS_I2000.pdf) were also consulted.

**Table 10**  
**Selection of Ecological Sediment Screening Toxicity Values for Constituents of Potential Ecological Concern (Oregon Sites)**

Potential Contaminant of Concern	ODEQ Screening Level Values <sup>a</sup> (mg/kg) Freshwater	Region 5 Ecological Screening Levels <sup>b</sup> (mg/kg)	EPA Region 7 <sup>c</sup> (mg/kg)	EPA Region 8 <sup>d</sup> (mg/kg)	EPA Region 10 <sup>e</sup> (mg/kg)	Other Ecological Screening Levels <sup>f</sup> (mg/kg)	Potential Bioaccumulative Constituent? <sup>g</sup>	Final Ecological Screening Value Sediment <sup>h</sup> (mg/kg)	Practical Quantitation Limit (mg/kg)				
<b>Explosives</b>													
1,3,5-Trinitrobenzene	NVA	NVA	NVA	NVA	NVA	2.40E-02 TAL		2.40E-02	0.020				
1,3-Dinitrobenzene	NVA	8.61E-03	NVA	NVA	NVA	6.70E-02 TAL		6.70E-02	0.020				
2,4,6-Trinitrotoluene	NVA	NVA	NVA	NVA	NVA	9.20E-01 TAL		9.20E-01	0.040				
2,4-Dinitrotoluene	NVA	1.44E-03	NVA	NVA	NVA	2.90E-01 LANL		2.90E-01	0.040				
2,6-Dinitrotoluene	NVA	3.98E-03	NVA	NVA	NVA	1.90E+00 LANL		1.90E+00	0.040				
2-Amino-4,6,-Dintrotoluene	NVA	NVA	NVA	NVA	NVA	7.00E+00 LANL		7.00E+00	0.040				
2-Nitrotoluene	NVA	NVA	NVA	NVA	NVA	5.60E+00 LANL		5.60E+00	0.075				
3-Nitrotoluene	NVA	NVA	NVA	NVA	NVA	4.90E+00 LANL		4.90E+00	0.050				
4-Amino-2,6,-Dintrotoluene	NVA	NVA	NVA	NVA	NVA	1.90E+00 LANL		1.90E+00	0.040				
4-Nitrotoluene	NVA	NVA	NVA	NVA	NVA	1.00E+01 LANL		1.00E+01	0.040				
HMX	NVA	NVA	NVA	NVA	NVA	4.70E-02 TAL		4.70E-02	0.050				
Nitrobenzene	NVA	1.45E-01	NVA	NVA	NVA	3.20E+01 LANL		3.20E+01	0.020				
Nitroglycerin	NVA	NVA	NVA	NVA	NVA	1.70E+03 LANL		1.70E+03	10				
RDX	NVA	NVA	NVA	NVA	NVA	1.30E-01 TAL		1.30E-01	0.075				
Tetryl	NVA	NVA	NVA	NVA	NVA	1.00E+02 LANL		1.00E+02	0.065				
<b>Metals</b>													
Chromium	3.70E+01	4.34E+01	4.34E+01	MAC	4.34E+01	MAC	4.34E+01	MAC	5.60E+01	LANL	Yes	3.70E+01	1.0
Copper	1.00E+01	3.16E+01	3.16E+01	MAC	3.16E+01	MAC	3.16E+01	MAC	1.70E+01	LANL	Yes	1.00E+01	1.0
Iron	NVA	NVA	NVA		NVA		NVA		2.00E+01	LANL		2.00E+01	15.0
Lead	3.50E+01	3.58E+01	3.58E+01	MAC	3.58E+01	MAC	3.58E+01	MAC	2.70E+01	LANL	Yes	3.50E+01	1.0
Molybdenum	NVA	NVA	NVA		NVA		NVA		NVA			NVA	0.5
Nickel	1.80E+01	2.27E+01	2.27E+01	MAC	2.27E+01	MAC	2.27E+01	MAC	3.90E+01	LANL	Yes	1.80E+01	1.0

NVA = No Value Available

<sup>a</sup> Oregon Department of Environmental Quality Screening Level Values (December 2001).

<sup>b</sup> Ecological Screening Levels (ESLs), USEPA Region V, August 2003.

<sup>c</sup> USEPA Region 7: Catherine Wooster-Brown (Eco Risk Assessor) recommends the following hierarchy: MacDonald Consensus Values (MacDonald, 2000); ORNL Efrogmson values (ORNL, 1977).

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

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

<sup>f</sup> Talmage, S.S., D.M. Opreško, C.J. Maxwell, C.J.E. Welsh, F.M. Cretella, P.H. Reno, and F.B. Daniel (TAL), 1999, *Nitroaromatic Munition Compounds: Environmental Effects and Screening Values*, **Rev. Environ. Contam. Toxicol.** or Los Alamos National Laboratory (LANL), Eco Risk Database, Release 2.2, September 2005.

<sup>g</sup> Potential bioaccumulative constituents will be evaluated in more detail, as some screening values do not take into account bioaccumulation.

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

<sup>h</sup> Final Screening Value selected using the following hierarchy:

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

**Note:** The Talmage [TAL] screening values assume 10% organic carbon in the sediment.

MAC=MacDonald Consensus Values

EPRGs=Oak Ridge National Laboratory Ecological PRGs

ISQGs=Canadian Interim Sediment Quality Guideline:

LANL=Los Alamos National Laboratory

TAL=Talmage et al (1999)

**Other References:**

Efrogmson, 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

**Table 11**  
**Selection of Ecological Surface Water Screening Toxicity Values for Constituents of Potential Ecological Concern at Oregon Sites**

Potential Contaminant of Concern	ODEQ Screening Level Values <sup>a</sup> (mg/L) Freshwater	Region 5 Ecological Screening Levels <sup>b</sup> (mg/L)	EPA Region 7 <sup>c</sup> (mg/L)		EPA Region 8 <sup>d</sup> (mg/L)		EPA Region 10 <sup>e</sup> (mg/L)		Other Ecological Screening Values <sup>f</sup> (mg/L)		Potential Bioaccumulative Constituent? <sup>g</sup>	Final Ecological Value Surface Water <sup>h</sup> (mg/L)	Practical Quantitation Limit (mg/L)
<b>Explosives</b>													
1,3,5-Trinitrobenzene	NVA	NVA	NVA		NVA		NVA		1.00E-02	TAL		1.00E-02	2.0E-04
1,3-Dinitrobenzene	NVA	2.20E-02	NVA		NVA		NVA		2.00E-02	TAL		2.00E-02	2.0E-04
2,4,6-Trinitrotoluene	NVA	NVA	NVA		NVA		NVA		9.00E-02	TAL		9.00E-02	3.0E-04
2,4-Dinitrotoluene	2.30E-01	4.40E-02	NVA		NVA		NVA		3.10E-01	LANL		2.30E-01	3.0E-04
2,6-Dinitrotoluene	2.30E-01	8.10E-02	NVA		NVA		NVA		6.00E-02	LANL		2.30E-01	3.0E-04
2-Amino,4,6-Dinitrotoluene	NVA	NVA	NVA		NVA		NVA		2.00E-02	TAL		2.00E-02	2.0E-04
2-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		8.00E+00	LANL		8.00E+00	4.0E-04
3-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		9.60E+00	LANL		9.60E+00	8.0E-04
4-Amino-2,6-Dinitrotoluene	NVA	NVA	NVA		NVA		NVA		8.60E+00	LANL		8.60E+00	2.0E-04
4-Nitrotoluene	NVA	NVA	NVA		NVA		NVA		1.70E+01	LANL		1.70E+01	4.0E-04
HMX	NVA	NVA	NVA		NVA		NVA		3.30E-01	TAL		3.30E-01	4.0E-04
Nitrobenzene	5.40E-01	2.20E-01	NVA		NVA		NVA		2.70E-01	LANL		5.40E-01	2.0E-04
Nitroglycerin	NVA	NVA	NVA		NVA		NVA		4.30E+02	LANL		4.30E+02	5.0E-02
RDX	NVA	NVA	NVA		NVA		NVA		1.90E-01	TAL		1.90E-01	8.0E-04
Tetryl	NVA	NVA	NVA		NVA		NVA		5.80E+00	LANL		5.80E+00	7.5E-04
<b>Metals/Inorganics</b>													
Chromium (Cr-III)	7.40E-02	4.20E-02	7.40E-02	AWQC	7.40E-02	AWQC	7.40E-02	AWQC	7.70E-02	LANL	Yes	7.40E-02	2.0E-03
Copper	9.00E-03	1.58E-03	9.00E-03	AWQC	9.00E-03	AWQC	9.00E-03	AWQC	5.00E-03	LANL	Yes	9.00E-03	3.0E-03
Iron	1.00E+00	NVA	1.00E+00	AWQC	1.00E+00	AWQC	1.00E+00	AWQC	1.00E+00	LANL		1.00E+00	5.0E-02
Lead	2.50E-03	1.17E-03	2.50E-03	AWQC	2.50E-03	AWQC	2.50E-03	AWQC	1.20E-03	LANL	Yes	2.50E-03	1.0E-03
Molybdenum	3.70E-01	NVA	3.70E-01	EPRG	3.70E-01	Tier II	3.70E-01	EPRG	NVA			3.70E-01	5.0E-03
Nickel	5.20E-02	2.89E-02	5.20E-02	AWQC	5.20E-02	AWQC	5.20E-02	AWQC	2.80E-02	LANL	Yes	5.20E-02	1.0E-03
Perchlorate	NVA	NVA	NVA		NVA		NVA		3.50E+01	LANL		3.50E+01	

NVA = No Value Available

<sup>a</sup> Oregon Department of Environmental Quality Screening Level Values (December 2001).

<sup>b</sup> Ecological Screening Levels (ESLs), USEPA Region 5, August 2003.

<sup>c</sup> USEPA Region 7: Catherine Wooster-Brown (Eco Risk Assessor) recommends the following hierarchy: National Ambient Water Quality Criteria; ORNL Efromysson values (ORNL, 1977).

<sup>d</sup> USEPA Region 8: Dale Hoff (Eco Risk Assessor) recommends the following hierarchy: National Ambient Water Quality Criteria; Great Lakes Tier II Values; Canadian Environmental Quality Guidelines (CCME, 2003) or ORNL Efromysson values (ORNL, 1977).

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

<sup>f</sup> Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E. Welsh, F.M. Cretella, P.H. Reno, and F.B. Daniel (TAL), 1999, *Nitroaromatic Munition Compounds: Environmental Effects and Screening Values*.

**Rev. Environ. Contam. Toxicol.**

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

<sup>g</sup> Potential bioaccumulative constituents will be evaluated in more detail, as some screening values do not take into account bioaccumulation.

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

<sup>h</sup> Final Screening Value selected using the following hierarchy:

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

AWQC=National Ambient Water Quality Criteria

LANL= Los Alamos National Laboratory

Tier II=Great Lakes Tier II Water Quality Criteria

EPRGs=Oak Ridge National Laboratory Ecological PRGs

TAL=Talmage et al (1999)

CCME=Canadian Council of Ministers of the Environment, Environmental Quality Guideline

**Other References:**

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

Canadian Environmental Quality Guidelines (for Freshwater) Summary Table, CCME, December 2003

Great Lakes Tier II Values from Suter, G.W. and C.L. Tsao, 1996, *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Rev*, ES/ER/TM-96/R2.

National AWQC from USEPA Water Quality Criteria Web Site: <http://www.epa.gov/waterscience/criteria/wqcriteria.htm>

**APPENDIX A**  
**CONCEPTUAL SITE MODEL**

## Overview

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

The CSM is evaluated for completeness and further developed as needed through TPP meetings. Based on a review of documents and the discussion during the TPP meeting, the following AOC was identified within the COGR FUDS:

- Air-to-Air Gunnery Range.

The Air-to-Air Gunnery Range includes the Air-to-Ground target areas.

On agreement between stakeholders at the TPP meeting, locations within the COGR that likely were occupied solely during the 1943 Northwest Maneuvers are not included in the COGR FUDS, but will be included as part of the 1943 Northwest Maneuvers FUDS SI.

The following presents the CSM for the COGR FUDS.

## **Conceptual Site Model – Air-to-Air Gunnery Range AOC**

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 for each area to evaluate potential human health and ecological impacts. Historical photos of the ranges (if available) are carefully examined for possible disturbances or other site features of interest in order to focus the efforts on areas where MC contamination is most likely to occur.

While the AOC is termed the Air-to-Air Gunnery Range, there were two primary uses for the AOC. These were air-to-air gunnery training that occurred over much of the 795,056-acre site and the air-to-ground gunnery training that was focused on two targets located on the eastern border of the AOC adjacent to Alkali Lake. Figure 2 of the *Final Technical Project Planning Memorandum* (Shaw, 2006c) shows the location of the air-to-ground gunnery target areas. In addition, unregulated practice bombing occurred at the FUDS and practice bombs have been found at the FUDS.

There was also a reported use of the AOC for ground-to-air gunnery practice and machine gun and rocket firing in 1943, about the time of the Northwest Maneuvers. The location of the ground-to-air gunnery training and machine gun and rocket firing is not known, other than it was near Alkali Lake. These activities will be evaluated in the SI for the Northwest Maneuver Area FUDS.

### **Current and Future Land Use**

- Currently, the site is used primarily for livestock grazing.
- Use of the range for agricultural purposes (i.e., grazing and farming) will likely continue into the foreseeable future.

### **Potential Contaminant Sources – Air-to-Air Gunnery Range AOC**

- The ASR identified that the AOC was used for air-to-air and air-to-ground gunnery practice. The air-to-air portion would have used towed targets. No target remnants have been reported. The air-to-ground practice is supported by the wooden targets on the southern and northern target areas. Although not identified in the ASR or ASR Supplement AN-MK 5, AN-MK 23, and AN-MK 43 practice bombs have also been found throughout the FUDS.
- DoD records indicate that small arms and medium caliber munitions were used at the FUDS. Predominantly, 50-caliber, and 20-mm ammunition were used.
- Reported MEC includes a belt of live 50-caliber ammunition found in the northern part of the FUDS (Figure 1) and elsewhere (based on reports from the BLM archeologist) and expended AN-MK 5, AN-MK 23, and AN-MK 43 practice bombs.
- The 50-caliber rounds had tracers may have contained perchlorate.

## **MEC Evaluation**

### **Types of MEC**

- Potential MEC within the Air-to-Air Gunnery Range AOC are 50-caliber and 20-mm ammunition and practice bombs. An explosive hazard from the 50-caliber and 20-mm ammunition is not expected. However, an explosive hazard does exist for the practice bombs, primarily from the 10 gauge shotgun shell and red or white phosphorous pyrotechnic.

### **Surface Exposure Pathway**

- The potential route of human exposure to MEC or munitions debris includes direct contact by vehicles, foot traffic, or handling. This would include BLM and ranch workers, and recreationists.
- The potential route of wildlife exposure to MEC or munitions debris would be by directly walking on them.

### **Subsurface Exposure Pathway**

- The potential routes of human exposure to MEC or munitions debris would be by intrusive drilling or digging activities. This includes BLM, ranch workers, and recreationists.
- The potential route of wildlife exposure to MEC or munitions debris would be by burrowing activities.

An analysis of the exposure pathways and receptors for MEC is provided in Table 2 of the *Final Technical Project Planning Memorandum* (Shaw, 2006c).

### **MEC Evaluation/Investigation Needed**

- No visual reconnaissance surveys will be completed within the air-to-air gunnery range because of the expansive area to be surveyed (1,242 square miles). MEC in the form of ammunition belts and expended practice bombs have been found on the FUDS.
- A visual (magnetometer assisted) reconnaissance survey will be completed at two air-to-ground gunnery range target areas. This survey will be completed to clear soil and sediment sampling sites.

## **MC Evaluation**

### **Types of MC**

- The anticipated MC at the COGR is lead and steel from projectiles, brass from spent cartridges, and cast iron or sheet metal from practice bombs.
- Metal contaminants of concern from these munitions include chromium, copper, lead, and nickel.
- The propellants were either single base or double base type. However, the munitions were fired from aircraft and any residue from the firing would be distributed over a wide area because of dispersion in the air.

- Tracers were used in the 50-caliber rounds, potentially containing perchlorate.

## **Overview of Pathways**

Affected media and potential pathways for MC include:

- **Soil:** At the COGR, soil is the primary medium of concern because of possible MC in the soil from training activities. The soil also serves as a secondary source of potential sediment/surface water, groundwater, or air contamination.
- **Sediment/Surface Water:** Surface water may act as a migration pathway to humans and ecological receptors from potential sources in soils and sediments. Accumulation of metals in the sediments in pond and lake bottoms may occur. There is no developed surface water drainage between the ponds and lakes and high evaporation rates in the summer reduce the size of the ponds and lakes in the summer.
- **Groundwater:** Groundwater is considered a potentially affected media because of the near surface upper water bearing zone.
- **Air:** Air is a potential media of concern because of the possibility of inhalation of contaminated soil particles. Air is an affected media because of the potential for dust entrainment during high winds.

Exposure media at the COGR include soil, sediment/surface water, groundwater, and air. A pathway evaluation for each media is discussed below and provided in Table 2 of the *Final Technical Project Planning Memorandum* (Shaw, 2006c).

Figure 3 of the *Final Technical Project Planning Memorandum* (Shaw, 2006c) illustrates the conceptual site model for the Air-to-Air Gunnery Range and potential pathways of MC contamination.

## **Soil Exposure Pathway**

### **Exposure Routes**

- The potential routes of human exposure to contaminated soils include incidental ingestion of and dermal contact with contaminated media, as well as inhalation of soil particulates during intrusive work.
- The potential routes of wildlife exposure to contaminated soils include ingestion of and direct contact with contaminated media. Plants may uptake MC and then subsequently be eaten by wildlife. Burrowing animals may ingest MC-contaminated soil and subsequently be eaten by predators.

### **Receptors**

- Workers (BLM and ranch workers, and recreationists).
- Wildlife.

### **MC Soil Evaluation/Investigation Needed**

- No soil samples will be collected from the larger air-to-air gunnery range because of the size and inability to focus on one specific area to sample. Sampling activities will be focused on the two air-to-ground targets containing the highest density of activity. These two locations are where the highest level of training activity occurred. Air-to-air

gunnery training and unregulated practice bombing was conducted over the entire 795,056-acre FUDS and MC sampling over this larger area would not be productive.

- Three soil samples are proposed to be collected from each of the two target areas near Alkali Lake.
- All samples to be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel). One soil sample from each target area will also be analyzed for explosives including nitroglycerine. The above list of metals for analysis was developed from the expected common components of projectiles, lead and steel (chromium, copper, iron, lead, molybdenum, and nickel). In addition, aluminum and manganese will be analyzed for to aid in background comparisons using geochemical methods.
- Sampling for perchlorate in soils is not warranted. The source for perchlorate would be from incomplete ignition and burning of the perchlorate containing tracers in the 50 caliber ammunition fired from aircraft. While incomplete ignition and burning may occur, once the ammunition reached the surface 60 years of precipitation would have dissolved the perchlorate and no residual would remain in the soil.

## **Sediment/Surface Water Exposure Pathway**

### **Exposure Routes**

- The potential routes of human exposure to contaminated sediment/surface water include incidental ingestion and dermal contact with surface water.
- The potential routes of wildlife (including aquatic organisms) exposure to contaminated sediment/surface water include ingestion of and direct contact with surface water present at or near the AOC.
- A potential exposure point is at Hutton Springs located north of the target areas. The springs are a critical habitat for the Hutton Tui Chub, a threatened species.

### **Receptors**

- Workers (BLM and ranch workers).
- Wildlife.

## **MC Sediment/Surface Water Evaluation/Investigation Needed**

- One sediment sample will be collected from ponds or lakes located near each of the two target areas.
- If water is present in the ponds or lakes sampled near the target areas, water samples will be collected.
- One water sample will be collected from Hutton Springs located north of the target areas.
- Sediment samples to be analyzed for select metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel) and explosives including nitroglycerine.

- Water samples from small ponds and lakes to be analyzed for select total and dissolved metals (aluminum, chromium, copper, iron, lead, manganese, molybdenum, and nickel), explosives, and perchlorate.
- Water sample from Hutton Springs to be analyzed for perchlorate only.

## **Groundwater Exposure Pathway**

### **Exposure Routes**

- The potential routes of human exposure to contaminated groundwater include ingestion of and dermal contact with groundwater.
- Wildlife exposure to groundwater is not anticipated.
- A potential exposure point for groundwater surfacing is at Hutton Springs located north of the target areas. The springs are a critical habitat for the Tui Chub, a threatened species. Evaluation of the springs is addressed above under the Sediment/Surface Water Exposure Pathway.

### **Receptors**

- Workers (BLM and ranch workers).

### **MC Groundwater Evaluation/Investigation Needed**

- One groundwater sample will be collected from a well located adjacent to the southern target. The well is part of the monitoring well network for the adjacent Alkali Lake Disposal Site.
- The groundwater sample will be analyzed for perchlorate only.
- Analysis for metals will not be completed. Discussions at the TPP meeting indicated that metals in groundwater were not a concern due to the relatively low mobility of the metals in the semi-arid environment at the COGR. In addition, there is a contaminated groundwater plume (phenols, and 2,4-toluenediamene) from a nearby chemical waste disposal site that runs under the two target areas. The plume has degraded the groundwater quality to above accepted regulatory standards.

## **Air Exposure Pathway**

### **Exposure Routes**

- The potential route of human exposure to contaminated air includes inhalation during times of blowing dust.
- The potential route of wildlife exposure to contaminated air include inhalation of air during times of blowing dust.

### **Receptors**

- Workers (BLM and ranch workers).
- Wildlife.

### **MC Air Evaluation/Investigation Needed**

- No air samples will be collected from the COGR. Analytical results from soil samples will be used in the evaluation of the air pathway. The U.S. Environmental Protection Agency (USEPA) Region 9 Preliminary Remediation Goals (PRGs) (USEPA, 2004) incorporate dust exposure into the values and additional exposure data beyond soil data is not required.

## Data Gaps

- SI being performed for the COGR will identify MEC and MC impacts to soil and sediments/surface water at the former range.
- The presence of MEC has been established at the COGR by the discovery of scattered 50-caliber ammunition belts and practice bombs over the 1,242-square mile COGR. The likely source was from being dropped from aircraft flying over the area.
- No other MEC has been reported.

Results of the current status of data requirements with respect to MEC and MC for the AOCs located at the former COGR are summarized below:

AOC	Presence of MEC	Presence of MC	Proposed Inspection Activities
Air-to-Air Gunnery Range (includes air-to-ground training)	Established, scattered finds of 50-caliber ammo belts and practice bombs	Unknown	Collect soil, sediment/surface water, and groundwater samples at target areas to determine presence of MC

Background data for soils have been provided by ODEQ. However, no background data exist for metals in sediments, surface water, or groundwater or for perchlorate in surface water and groundwater.

**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:

CEHNC-OE-CX

MAR 16 2006

MEMORANDUM FOR SEE DISTRIBUTION

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

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

3. REQUIREMENTS AND PROCEDURES:

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

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

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

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

MAR 1 6 2006

CEHNC-OE-CX

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

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

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

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

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

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

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

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



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



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

May 23, 2006

REPLY TO  
ATTENTION OF:

OE Safety Division for Ordnance  
and Explosives Directorate

Shaw Environmental  
4171 Essen Lane  
Baton Rouge, Louisiana 70809

Dear Sir/Madam:

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

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

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

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

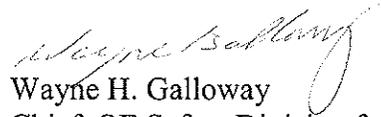
e. During these site visits all required MEC security requirements should be implemented as necessary and required. All team members are to be instructed in and made aware of any MEC security requirements.

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

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

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

Sincerely,



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

**APPENDIX C**  
**SITE SAFETY AND HEALTH PLAN ADDENDUM**

**ADDENDUM OR-2 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
<b>Authored by:</b> Pamela Moore	Dec 19	<b>Signature:</b> 
<b>Peer Review by:</b> Dale Landon	12/19	<b>Signature:</b> 
<b>Quality Control Review (QCR) by:</b> Kathy Stroppel-Holl	12/19/06	<b>Signature:</b> 
<b>Project Manager Reviewed by:</b> Peter Kelsall	12/19/06	<b>Signature:</b> 

<b>USACE Omaha District MM DC OE Safety Specialist Review:</b> Andrew G. Marks		<b>Signature:</b>
<b>USACE Omaha District MM DC Project Manager Approval:</b> Mike Watson		<b>Signature:</b>

<b>ADDENDUM OR-2 TO SITE SAFETY AND HEALTH PLAN (SSHP)</b> <b>TITLE PAGE</b> 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: FUDS SI – CENTRAL OREGON GUNNERY RANGE

**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:**

Add site-specific supplemental information.

## SITE SAFETY AND HEALTH PLAN ADDENDUM

FOR

Site Name:	Central Oregon Gunnery Range
Site Location:	Central Oregon Gunnery Range is located approximately 50 miles north of Lakeview, Oregon and 45 miles southwest of Burns Oregon in Lake County.
Purpose of Visit:	Site Inspection of the FUDS for MEC reconnaissance and MC sampling.
Date(s) of Site Visit:	Approximately December 2006
Office:	Shaw Environmental, Inc. Richland, Washington office
Address:	1045 Jadwin Ave, Suite C Richland, Washington 99352
Telephone:	(509) 943-6728

Date Prepared: 20 October 2006

Site inspection work at this FUDS will be conducted in accordance with the approved Accident Prevention Plan and Site Safety and Health Plan (SSHP) included in Appendix D of the "Final Type I Work Plan, Site Inspections at Multiple Sites, NWO Region" (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**

(For complete background, see text and figures of Site-Specific Work Plan included with this document. A brief summary follows.)

**A. SITE DESCRIPTION:**

- o Size: One AOC covering approximately 795,000 acres.
- o Present Usage (Check all that apply)

<input type="checkbox"/> Military	<input checked="" type="checkbox"/> Recreational	<input checked="" type="checkbox"/> Agricultural
<input checked="" type="checkbox"/> Residential	<input type="checkbox"/> Commercial	<input checked="" type="checkbox"/> Landfill
<input checked="" type="checkbox"/> Natural Area	<input type="checkbox"/> Industrial	
<input type="checkbox"/> Other Specify		

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

**B. PAST USES:**

Central Oregon Gunnery Range was operated between approximately 1942 and 1947 as an air-to-air and air-to-ground gunnery range. Non-regulated practice bombing also occurred within the range. The Range was declared surplus in 1947.

**C. SURROUNDING POPULATION:**

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

**D. PREVIOUS SAMPLING/INVESTIGATION RESULTS:**

Several finds of 50 caliber ammunition belts and scattered reports of AN-MK 23 and AN-MK 43 practice bombs have been reported (ASR, ASR Supplement, BLM archeologist) throughout the FUDS. No other known previous investigations have been completed.

(1) MEC ENCOUNTERED: See SSWP figure for specific locations of MEC finds.

Location:	Description:
Air-to-Air Gunnery Range – no specific locations	50 caliber ammunition belts. AN-MK 43 practice bombs

(2) SAMPLES: Air, Water, Soil, and Vegetation: None

**II. DESCRIPTION OF ON-SITE ACTIVITIES:**

<input checked="" type="checkbox"/> Walk Through	<input checked="" type="checkbox"/> Drive Through	<input type="checkbox"/> Fly Over
<input checked="" type="checkbox"/> On-Road	<input type="checkbox"/> Off-Road	<input checked="" type="checkbox"/> On-Path
<input checked="" type="checkbox"/> Off-Path		
<input checked="" type="checkbox"/> Other Specify: Soil, sediment and water sampling		

Activities/Tasks to be Performed (Summarize)

A visual reconnaissance of the Southern and Northern Target areas within the AOC will be performed. The inspection will be conducted by a qualified unexploded ordnance (UXO) technician, with the aid of a hand-held magnetometer, to look for evidence of munitions activity and to assure that personnel avoid any potential MEC. Reconnaissance will follow a meandering survey path within the AOC. Special attention will be given to physical features such as depressions, craters, or pits that could be present at impact locations of munitions. A global positioning system (GPS) unit will be used to record the survey path and the location of any MEC, munitions debris, or other significant features (such as remnant evidence of targets or other range-related structures) observed.

Soil, sediment, surface water, and groundwater sampling will be performed at locations that have been cleared by the UXO technician. Groundwater samples will be collected from monitoring wells located within the groundwater plume from the Alkali Lake Disposal Site. The site is a hazardous waste site. Waste products disposed of at the site were primarily distillation residues from the production of the herbicides 2,4-dichlorophenoxyacetic acid, 2,4-dichlorophenol, and 2-methyl-4-chlorophenoxyacetic acid. Wastes also included chlorinated dibenzodioxins and chlorinated dibenzofurans. Reported concentrations of phenols in groundwater at the site are up to 340 ppm. Dioxins have been detected in groundwater sampled downgradient of the site at 0.4 ppt. The site is currently monitored by the ODEQ.

Samples will be collected to determine MC impacts. Sampling locations will be recorded using GPS. Sampling protocols will be as specified in the SSWP and the Type 1 Work Plan.

**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
Tony Searls Field Team Leader/SSHO	X	X	X	X	X	
Rob Irons (1137) UXO Technician	X	X		X	X	X

**IV. HAZARD ANALYSIS:**

**A. SAFETY AND HEALTH HAZARDS ANTICIPATED:**

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

**B. OVERALL HAZARD EVALUATION:**

<input type="checkbox"/> High	<input type="checkbox"/> Moderate	<input checked="" type="checkbox"/> Low	<input type="checkbox"/> Unknown
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**JUSTIFICATION:** (Provide a brief justification supporting the overall evaluation.)

Munitions debris that has been documented or observed near the AOC are of low explosive hazard (small and medium arms, practice bombs). Anomaly avoidance will be conducted to minimize contact with MEC.

All soil, sediment, surface water, and groundwater samples will be collected in accordance with Sections 6.1, 6.3, 6.4, and Shaw Standard Operating Procedures (SOPs) T-FS-101, T-FS-110, and T-FS-113, of Appendix E of the *Final Type I Work Plan* (Shaw, 2006a).

## **V. SITE INSTRUCTIONS FOR MEC AVOIDANCE:**

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

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

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

## **VI. SITE CONTROL AND COMMUNICATIONS:**

### **A. SITE WORK ZONES:**

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 be include an on-site cellular phone or the nearest public phone or private phone that may be readily accessed.

Cellular Phone: TBD

Public/Private phone

**TELEPHONE NUMBERS:**

1. MEDICAL FACILITY (Emergency Care): Lakeview District Hospital – Lakeview, OR	(541) 947-2114
2. MEDICAL FACILITY (Non-Emergency Care-Shaw-Approved Occupational Health Clinic): Immediate Care Center, Mt. Bachelor Clinic	(541) 388-7799
3. FIRE DEPARTMENT:	No local Fire Department call 911
4. Oregon State Police Dispatch Center for MEC Notification:	1-800-452-7888 (503) 375-3555
5. POLICE DEPARTMENT: Lake County Sheriff	(541) 576-2781 or 911
6. POISON CONTROL CENTER	(800) 222-1222
7. USACE MM DC PROJECT MANAGER: Mike Watson	(402) 221-7703
8. USACE PROJECT MANAGER: Mike Nelson	(206) 764-3458
9. USACE OE Safety: Glenn Marks	(402) 221-7683 (Office) (402) 740-4954 (Cell)
10. SHAW PROJECT MANAGER: Peter Kelsall	(303) 793-5252 (Office) (303) 981-8435 (Cell)
11. SHAW TECHNICAL LEAD: Dale Landon	(509) 946-2069 (Office) (509) 521-1437 (Cell)
12. SHAW FIELD TEAM LEADER: Tony Searls	(509) 946-2062 (Office) (509) 531-9028 (Cell)
13. SHAW OE SAFETY: Brian Hamilton	(303) 690-3117 (Office) (303) 809-0416 (cell)
14. SHAW UXO TECHNICIANS: Rob Irons	(530) 713-2245

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

Verbal

Nonverbal (Specify)

**VII. EMERGENCY RESPONSE:**

(1) ACCIDENTS: Safety-related incidents and accidents will be immediately reported to the Shaw Project Manager and the USACE MM DC Project Manager. Additional notifications within the USACE organization will be coordinated by the USACE MM DC Project Manager.

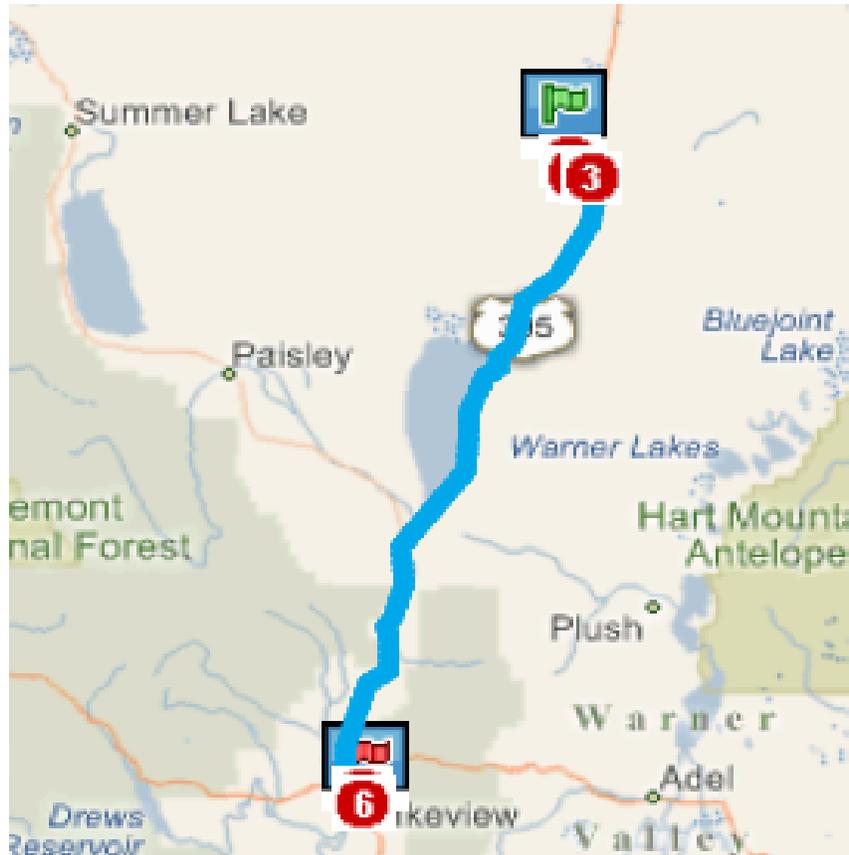
Additional accident reporting responsibilities of Shaw personnel are described in Section 1.9 of the Accident Prevention Plan.

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

<p><b>Lake District Hospital - Lakeview</b>          700 South J Street          Lakeview, Oregon 97630  <b>(541) 947-2114</b>          Hours of Operation  <b>Open 24 hours</b></p>	<p><b>Services Provided</b></p>	<ul style="list-style-type: none"> <li>- Hospitals</li> <li>- Emergency Care</li> <li>- Rehabilitation</li> <li>- Outpatient Care</li> </ul>	<ul style="list-style-type: none"> <li>- Referrals</li> <li>- Surgery</li> <li>- X-rays</li> <li>- Inpatient Care</li> <li>- CAT Scans</li> </ul>
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<b>Direction</b>	<b>Distance</b>
<b>Start: Highway 395 at Alkali Lake</b>	0. miles
<b>1. Right (south) on Hwy 395</b>	Approx, 60 miles
<b>2. Right on S. 9 th street At roundabout, take the First exit onto Local road(s)</b>	0.3 miles
<b>3. Left on S. J Street</b>	0.1 miles
<b>End: Arrive 700 S J St, Lakeview, OR 97630</b>	

**Figure 1: Map of Route to Lake District Hospital, Lakeview, Oregon**



(3) DIRECTIONS TO THE NON-EMERGENCY FACILITY:

The following occupational health clinic is approved by Health Resources for non-life-threatening medical treatment of Shaw employees:

Location	City	Clinic	Address	Zip	Telephone	Contact
Bend, OR	Bend	Immediate Care Center, Mt. Bachelor Clinic, Occ. H	1302 North East 3rd Street	97701	541-388-7799	Gutierrez, Claudia

**Directions**

**Distance**

- Start:** Depart on Local road(s) (South-West) 0.7 mi
- 1:** Turn LEFT (South) onto Local road(s) 1 mi
- 2:** Bear LEFT (East) onto Halfway Buttes Rd 1.5 mi

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- 3:** Turn LEFT (North) onto US-395 [Lakeview-Burns Hwy] 15.1 mi
- 4:** Turn LEFT (North-West) onto Christmas Valley-Wagontire Rd [County Road 5-14] 2.8 mi
- 5:** Keep RIGHT onto Wagontire Rd 10.8 mi

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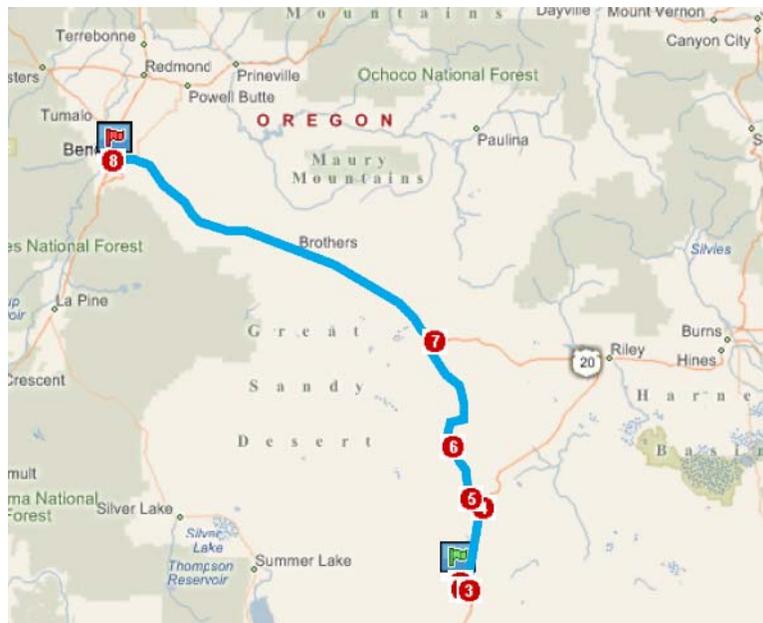
- 6:** Turn RIGHT to stay on Wagontire Rd 23.9 mi
- 7:** Turn LEFT (West) onto US-20 [Central Oregon Hwy] 69.7 mi

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- 8:** Turn RIGHT (North) onto US-20 [US-97 Bus] 0.2 mi

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- End:** Arrive at 1302 Northeast 3rd Street, Bend, Or



## **VIII. PERSONAL PROTECTIVE EQUIPMENT:**

For field work to be performed at this site, Level D is required. Level D Protection requirements are defined in section 5.1.5 of the SSHP. In general, the use of hard hats is required on all USACE work sites, except on MEC-contaminated sites. 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.

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 of 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:**

Training specific to this site includes Hazard Communications and MEC safety procedures as determined by the UXO Technician.

## **XI. GENERAL:**

### **Site Visitors**

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.

### **Modifications to SSHP Addendum**

The Field Team Leader may modify this SSHP Addendum if site conditions warrant. All changes to the SSHP Addendum require USACE review and concurrence before new procedures can be applied in the field.

### **Severe Weather Contingency Plan**

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

Weather conditions will be monitored throughout the day by all field team members. Additionally, field personnel should be aware of/informed of daily weather forecasts. Local weather broadcasts and information from a severe weather alert radio will be monitored by the

Field Team Leader, SSHO, or designee when the likelihood for severe weather exists. The location of Tornado Shelters that may be located in the general area where field work is being performed will be identified. Severe weather may include:

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

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

- Drilling and 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.

## SAFETY BRIEFING CHECKLIST

(Check subjects discussed)

SITE NAME: Central Oregon Gunnery Range	DATE/TIME:        /        /
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### GENERAL INFORMATION

- 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 & LOCATION
  - LOCATION OF 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 AND ADDENDUM**

**FOR**

**Site Name: Central Oregon Gunnery Range**  
**Location: Lake County, Oregon**

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

<b>NAME (PRINTED)</b>	<b>OFFICE</b>	<b>SIGNATURE</b>	<b>DATE</b>

Person presenting the safety briefing:

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
DATE