U.S. Army
Corps of Engineers
Omaha District

DRAFT FINAL SITE INSPECTION REPORT

Camp Adair/Adair Air Force Station

Benton, Polk and Linn Counties, OR
FUDS PROPERTY No. 10OR0029

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

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

March 23, 2007

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The views, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as official department of the Army position, policy, or decision, unless so designated by other documentation.

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March 23, 2007

Submitted to:

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

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List of Acronyms

°F	degrees Fahrenheit
AOC	area of concern
ASR	Archives Search Report
bgs	below ground surface
CAIS	Chemical Agent Identification Sets
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
CSM	conceptual site model
CWM	Chemical Warfare Materiel
DERP	Defense Environmental Response Program
DMM	discarded military munitions
DoD	Department of Defense
DQO	data quality objective
EDR	Environmental Data Resources, Inc.
EPA	Environmental Protection Agency
ER	Engineering Regulation
FR	Federal Register
ft	foot or feet
FUDS	Formerly Used Defense Sites
GPS	Global Positioning System
HRS	Hazard Ranking System
HTRW	hazardous, toxic, or radioactive wastes
IEP	Important Ecological Places
INPR	Inventory Project Report
lb(s)	pound(s)
MC	munitions constituents
MCL	maximum contaminant level
MDL	maximum detection limit
MEC	munitions and explosives of concern
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
MMRP	Military Munitions Response Program
MRA	Munitions Response Area
MRS	Munitions Response Site
MRSPP	Munitions Response Site Prioritization Protocol
NCP	National Contingency Plan
NDAI	No Department of Defense Action Indicated
NWO	Northwest Region (Omaha District Military Munitions Design Center)
OB/OD	ordnance burial/ordnance disposal
ODFW	Oregon Department of Fish and Wildlife
OE	Ordnance and Explosives
OR	Oregon

List of Acronyms (Cont.)

PAH	polycyclic aromatic hydrocarbon
PETN	pentaerythritol tetranitrate
PQL	practical quantitation limit
PRG	preliminary remediation goal
RAC	Risk Assessment Code
ROE(s)	Right(s) of Entry
RI/FS	remedial investigation/feasibility study
Shaw	Shaw Environmental, Inc.
SHPO	State Historic Preservation Office
SI	Site Inspection
SLERA	Screening Level Risk Assessment
SSI	Screening Site Inspection
SSWP	Site-Specific Work Plan
TCRA	time-critical removal action
TNT	trinitrotoluene
TPP	Technical Project Planning
USACE	U.S. Army Corps of Engineers
USC	United States Code
UTL	Upper Tolerance Limit
UXO	unexploded ordnance
VSP	Visual Sampling Plan

Glossary of Terms

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) – Also known as "Superfund," this congressionally enacted legislation provides the methodology for the removal of hazardous substances resultant from past / former operations. Response actions must be performed in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (USACE, 2003). CERCLA was codified as 42 USC 9601 et seq., on December 11, 1980, and amended by the Superfund Amendments and Reauthorization Act (SARA) on October 17, 1986.

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

Discarded Military Munitions (DMM) – Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed consistent with applicable environmental laws and regulations (10 USC 2710(e)(2)).

Explosive Ordnance Disposal (EOD) – The detection, identification, on-site evaluation, rendering safe, recovery, and final disposal of unexploded ordnance and of other munitions that have become an imposing danger, for example, by damage or deterioration (10 USC 2710(e)(2)).

Formerly Used Defense Site (FUDS) – Real property that was formerly owned by, leased by, possessed by, or otherwise under the jurisdiction of the Secretary of Defense or the components, including organizations that predate DoD. Some FUDS properties include areas formerly used as military ranges (10 USC 2710(e)(2)).

Military Munitions – Ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the DoD, the U.S. Coast Guard, the U.S. Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants, explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives, and chemical warfare agents, chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunitions, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges, and devices and components of the above.

The term does not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components, other than non-nuclear components of

nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 USC 2011 et seq.) have been completed (10 USC 101(e)(4)(A) through (C)).

Munitions Constituents (MC) – Any materials originating from unexploded ordnance (UXO), discarded military munitions (DMM), or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions (10 USC 2710(e)(3)).

Munitions Debris (MD) – Remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal (10 USC 2710(e)(2)).

Munitions and Explosives of Concern (MEC) – This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks means: (A) Unexploded ordnance (UXO), as defined in 10 USC 101(e)(5); (B) Discarded military munitions (DMM), as defined in 10 USC 2710(e)(2); or (C) Munitions constituents (e.g., TNT, RDX), as defined in 10 USC 2710(e)(3), present in high enough concentrations to pose an explosive hazard (10 USC 2710(e)(2)).

Munitions Response Area (MRA) – Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples are former ranges and munitions burial areas. An MRA comprises one or more munitions response sites (32 CFR§179.3).

Munitions Response Site (MRS) – A discrete location within a munitions response area that is known to require a munitions response (32 CFR§179.3).

Munitions Response Site Prioritization Protocol (MRSPP) – The MRSPP was published as a rule on October 5, 2005. This rule implements the requirement established in section 311(b) of the National Defense Authorization Act for Fiscal Year 2002 for the Department of Defense (DoD) to assign a relative priority for munitions responses to each location in the DoD's inventory of defense sites known or suspected of containing unexploded ordnance (UXO), discarded military munitions (DMM), or munitions constituents (MC). The DoD adopted the MRSPP under the authority of 10 USC 2710(b). Provisions of 10 USC 2710(b) require that the Department assign to each defense site in the inventory required by 10 USC 2710(a) a relative priority for response activities based on the overall conditions at each location and taking into consideration various factors related to safety and environmental hazards (70 FR 58016).

Range – A designated land or water area that is set aside, managed, and used for range activities of the Department of Defense. The term includes firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, electronic scoring sites, buffer zones with restricted access, and exclusionary areas. The term also includes airspace areas designated for

military use in accordance with regulations and procedures prescribed by the Administrator of the Federal Aviation Administration (10 USC 101(e)(1)(A) and (B)).

Range Activities – Research, development, testing, and evaluation of military munitions, other ordnance, and weapons systems; and the training of members of the armed forces in the use and handling of military munitions, other ordnance, and weapons systems (10 USC 101(e)(2)(A) and (B)).

Risk Assessment Code (RAC) – An interim risk assessment procedure developed by the U.S. Army Engineering and Support Center, Huntsville (USAESCH), Ordnance and Explosives Directorate (CEHNC-OE) to address explosives safety hazards related to munitions. The RAC score was formerly used by the USACE to prioritize response actions at FUDS. The RAC procedure, which does not address environmental hazards associated with munitions constituents, has been superseded by the MRSPP.

Unexploded Ordnance – Military munitions that (A) have been primed, fuzed, armed, or otherwise prepared for action; (B) have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and (C) remain unexploded either by malfunction, design, or any other cause (10 USC 101(e)(5)(A) through (C)).

Executive Summary

The Department of Defense (DoD) has established the Military Munitions Response Program (MMRP) under the Defense Environmental Response Program to address DoD sites suspected of containing munitions and explosives of concern (MEC) or munitions constituents (MC). Under the MMRP, the U.S. Army Corps of Engineers (USACE) is conducting environmental response activities at Formerly Used Defense Sites (FUDS) for the Army, DoD's Executive Agent for the FUDS program. Shaw Environmental, Inc. (Shaw) is responsible for conducting Site Inspections (SIs) at FUDS in the northwest region managed by the Omaha District Military Munitions Design Center.

SI Objectives and Scope

The primary objective of the MMRP SI is to determine whether a FUDS project warrants further response action under the Comprehensive Environmental Response, Compensation, and Liability Act. The SI collects the minimum amount of information necessary to make this determination, as well as it (i) determines the potential need for a removal action; (ii) collects or develops additional data, as appropriate, for Hazard Ranking System scoring by the Environmental Protection Agency; and (iii) collects data, as appropriate, to characterize the release for effective and rapid initiation of the Remedial Investigation and Feasibility Study. An additional objective of the MMRP SI is to collect the additional data necessary to complete the Munitions Response Site Prioritization Protocol (MRSPP).

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

Camp Adair

This report presents the results of an SI conducted at Camp Adair/Adair Air Force Station (Camp Adair), FUDS property number F10OR0029, located approximately 9 miles north of Corvallis, Oregon, in Polk, Benton, and Linn Counties. Camp Adair was commissioned in 1942 and was used primarily for training of triangular (three-regiment) infantry divisions until 1945. Other uses of the camp from 1944 to 1946 included bombing and gunnery practice for Navy/Marine pilots, a storage facility, a prisoner of war camp, and a Navy hospital. Camp Adair included a cantonment area east of Highway 99 and a live fire and maneuver area to the west. During the last two years of training, an estimated 265,000 rounds of high explosive ammunition (37-millimeter [mm] or larger) were fired. Camp Adair was declared surplus and assigned for disposition in April 1946. A War Department letter of August 1946 stated that Camp Adair had been "dedudded so as to make it reasonably safe for any use" (War Department, 1946). A Certificate of Clearance was issued in March 1947. Between 1958 and 1969, after several years

of inactivity, the cantonment area was used as Adair Air Force Station. Related munitions training activity was limited to use of Skeet Range No. 580 in the cantonment area (between 1955 and 1964). In 1970, the Adair Air Force Station lands were determined excess and reported to the General Services Administration for disposal.

Technical Project Planning

The approach for the SI was developed by Shaw in consultation with site stakeholders. A Technical Project Planning meeting conducted in April 2006 was attended by representatives from the USACE Omaha Design Center, USACE Hazardous, Toxic, and Radioactive Waste Center of Expertise, and USACE – Seattle District; Oregon Department of Environmental Quality (ODEQ); Oregon National Guard; U.S. Forest Service; Benton County; Oregon Department of Fish and Wildlife; Polk County; Oregon State University Forestry Department; Allied Waste; and Shaw. The stakeholders agreed to the approach and identified 21 areas of concern (AOCs), that can be divided into five types of AOCs: small arms ranges, explosive munitions ranges, live hand grenade courts, practice grenade courts, and the Chemical Identification Area (Table 1-1).

SI Field Activities

SI field activities, conducted between August 21 and September 20, 2006, included a site reconnaissance to look for evidence of MEC and to avoid MEC during sampling. Samples were collected from surface soil, sediment, and groundwater. Results of the analyses suggest that representative samples were collected and analyzed, and the results are indicative of the media analyzed. Some results were qualified as described in the report. No data were qualified “R” as unusable. Overall, the data reflect expected site conditions and they are fully usable for their intended purpose.

SI Recommendations

Results of the SI provide the basis for conclusions and/or recommendations for further actions at each of the AOCs.

Small Arms Ranges

Based on historical evidence and results from the SI field activities, there is no evidence of MEC at any of the five small arms ranges. All of the small arms ranges are recommended for No Department of Defense Action Indicated (NDAI) for MEC.

Sampling results at Range Complex No. 5 and Range Complex No. 6.show that concentrations of potential contaminants are below human health and ecological screening levels agreed by the stakeholders. These two ranges are recommended for NDAI for MC.

The Infiltration Range No. 143 has been incorporated into the Coffin Butte Landfill operations. The area of Infiltration Range No. 143 has been heavily excavated and the soil has been

disturbed, reworked, or removed. Based on these findings, the Infiltration Range No. 143 is recommended for NDAI for MC.

Soil from Range Complex No. 4 had lead concentrations that were above the background soil concentration and the ecological screening level. As agreed to during the TPP and documented in the DQOs, "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." No recommendation for either NDAI or RI/FS is made relative to MC until consultation with the stakeholders is completed.

Skeet Range No. 580 had lead concentrations above the background soil concentration and ecological screening level. Sheet Range No. 580 is currently a county park with baseball fields, tennis courts, and playgrounds. As agreed to during the TPP and documented in the DQOs, "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." No recommendation for either NDAI or RI/FS is made relative to MC until consultation with the stakeholders is completed.

Explosive Munitions Ranges

Based on historical evidence, MEC and munitions debris have been identified in five of the six explosive munitions ranges. No MEC or munitions debris have been reported at Range Complex No. 5. Field activities conducted during the SI did not find any MEC or munitions debris at the explosive munitions ranges. Based on historical findings, the explosive munitions ranges are recommended for RI/FS with regard to MEC.

SI sampling results show that the concentrations of metals and explosives in groundwater, sediment, and soil are low and below human health screening values. Exceedances of soil background and ecological screening values were identified as follows:

- Molybdenum in soil at Range Complex No. 3,
- Chromium in soil at the Mortar Range, and
- Barium in soil at the Moving Target Range No. 75.

As agreed to during the TPP and documented in the DQOs, "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." No recommendation for either NDAI or RI/FS is made relative to MC until consultation with the stakeholders is completed.

Live Hand Grenade Courts

Historical evidence indicates that MEC has been reported at the Live Hand Grenade Court No. 129 and the West Live Hand Grenade Court. No MEC has been reported at the East Live Hand Grenade Court. Field activities conducted during the SI did not identify any MEC or munitions debris. However, based on similar historical uses, there is potential for MEC at the East Live Hand Grenade Court. Based on these findings, the three live hand grenade courts are recommended for RI/FS with respect to MEC.

SI sampling results show that concentrations of metals in sediment and soil are low and below both human health and ecological screening values. There were no detections of explosives in sediment or soil. Based on these findings, the three live hand grenade courts are recommended for NDAI with respect to MC.

Practice Grenade Courts

Based on historical evidence and results from the SI field activities, training hand grenades have been found at Practice Grenade Court Nos. 125, 126, and 127. These training grenades may contain a small black powder spotting charge. The risk of injury from these training grenades is considered low. Based on the potential presence of MEC, the practice grenade courts are recommended for RI/FS with respect to MEC.

No sampling was conducted at the practice grenade courts. However, potential contaminants are limited to a few common metals (iron, and small quantities of manganese and nickel). The spotting charges were comprised of black powder, which does not contain CERCLA hazardous substances. The practice grenade courts are recommended for NDAI with respect to MC.

Chemical Identification Area

Based on historical documentation, there is no evidence of MEC at the Chemical Identification Area No. 182. The area is currently tilled farm land. No sampling was completed at this range. Based on the possibility of buried MEC and MC, the Chemical Identification Area No. 182 is therefore recommended for RI/FS with respect to MEC and MC.

Time Critical Removal Action

There is no indication from the SI that a time critical removal action is warranted at Camp Adair.

1.0 Introduction

This Site Inspection (SI) Report presents the results of an SI conducted at the Camp Adair/Adair Air Force Station (Camp Adair) Formerly Used Defense Site (FUDS) located near Corvallis, Oregon (OR). Shaw Environmental, Inc. (Shaw) has prepared this report for the U.S. Army Corps of Engineers (USACE) in accordance with Task Order 003, issued under USACE Contract No. W912DY-04-D-0010. Shaw is responsible for conducting SIs at FUDS in the northwest region managed by the Omaha District Military Munitions Design Center (NWO) as directed by the Performance Work Statement (Appendix A).

The technical approach is based on the *Type 1 Work Plan, Site Inspections at Multiple Sites, NWO Region* (Shaw, 2006a) and the *Formerly Used Defense Sites, Military Munitions Response Program, Site Inspections, Program Management Plan* (USACE, 2005).

1.1 Project Authorization

The Department of Defense (DoD) has established the Military Munitions Response Program (MMRP) to address DoD sites suspected of containing munitions and explosives of concern (MEC) or munitions constituents (MC). Under the MMRP, the USACE is conducting environmental response activities at FUDS for the Army, DoD's Executive Agent for the FUDS program.

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

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

1.2 Site Name and Location

Camp Adair, FUDS property number F10OR0029, is located approximately 9 miles north of Corvallis, OR, in Polk, Benton, and Linn Counties (Figure 1-1). U.S. Highway 99 runs north-south through the site. Camp Adair is included in the MMRP Inventory in the *Defense Environmental Programs Fiscal Year 2005 Annual Report to Congress* (DoD, 2005), and in the

Archives Search Report (ASR) *Supplement* (USACE, 2004b), with 21 identified ranges as listed in Table 1-1. The Camp Adair FUDS project number, used to identify the ranges, is F10OR002903.

1.3 Purpose, Scope, and Objectives of the Site Inspection

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

The scope of the SI reported herein is restricted to evaluation of the presence of MEC or MC related to historical use of the FUDS prior to transfer. Potential releases of hazardous, toxic, or radioactive wastes (HTRW) are not addressed within the current scope. The intent of the SI is to confirm the presence or absence of contamination from MEC and/or MC. The general approach for each SI is to conduct records review and site reconnaissance 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). The following decision rules are used to evaluate the results of the SI:

Is No DoD Action Indicated (NDAI)? An NDAI recommendation may be made if:

- There is no indication of MEC;
  and
- MC contamination does not exceed screening levels determined from Technical Project Planning (TPP).

Is an RI/FS warranted? An RI/FS may be recommended if:

- There is evidence of MEC hazard. MEC hazard may be indicated by direct observation of MEC during the SI, by indirect evidence (e.g., a false crater potentially caused by impact of unexploded ordnance [UXO]), or by a report of MEC being found in the past without record that the area was subsequently cleared;
  or
- MC contamination exceeds screening levels determined from TPP.

Is a time-critical removal action (TCRA) warranted? A TCRA may be needed if:

- High MEC hazard is identified. Shaw will immediately report any MEC findings so that USACE can determine the hazard in accordance with the Munitions Response Site Prioritization Protocol (MRSPP). An example of a high hazard would be finding sensitive MEC at the surface in a populated area with no barriers

to restrict access;
or

- Elevated MC risk is identified. Identification of a complete exposure pathway (e.g., confirming MC concentrations above health-based risk standards in a water supply well) would trigger notification of affected stakeholders. Data would be presented at a second TPP meeting regarding the possible need for a TCRA.

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

1.4 Munitions Response Site Prioritization Protocol

An additional objective of the MMRP SI is to collect the additional data necessary to complete the MRSPP. Appendix K of this report includes draft MRSPP scoring sheets for the munitions response sites identified in this SI Report. The MRSPP scoring will remain draft after this SI Report is finalized and will be updated on an annual basis to incorporate new information.

2.0 Property Description and History

The setting, history, and use of Camp Adair are described in the following sections. Unless otherwise referenced, this information is taken from the ASR (USACE, 2001).

2.1 Historical Military Use

Camp Adair (Figure 2-1) was used primarily for training of triangular (three-regiment) infantry divisions between 1942 and 1945. Training activities for four army infantry divisions included use of small arms, explosives, mortars, artillery, antiaircraft and antitank guns, and support by tanks and Army Air Forces aircraft. Other uses of the camp from 1944 to 1946 included bombing and gunnery practice for Navy/Marine pilots, a storage facility, a prisoner of war camp, and a Navy hospital. Camp Adair included a cantonment area and hospital east of Highway 99 and a live fire and maneuver area to the west. Camp Adair was declared surplus and assigned for disposition in April 1946. Figure 2-1 shows the layout of Camp Adair based on a 1945 Training Aid and General Layout Map provided in the ASR. Figure 2-2 shows the current site layout overlain on the most recent available aerial photographs taken in 2005 and 2006.

Between 1955 and 1969, after several years of military inactivity, the area of present day Adair Village served as the headquarters for Adair Air Force Station. Adair Air Force Station was headquarters for the 26th Air Division (NORAD), which provided air defense for seven Western states. Adair Air Force Station was selected in 1959 as a location for the Bomarc Missile base, but construction of the base was not completed. During the use by the Air Force, munitions training activity was limited to use of Skeet Range No. 580 in the cantonment area (between 1955 and 1964). In 1970, the Adair Air Force Station lands were determined excess and reported to the General Services Administration for transfer.

The Oregon National Guard has used a former Army range, the Known Distance Rifle Range No. 4, over the period from 1946 to the present. This is part of a 527-acre facility in which the National Guard conducts weapons qualification and field exercises. The National Guard facility is fenced as a separate property and was not included in the SI. There is only a small overlap between the National Guard property and one of the FUDS AOCs.

2.2 Munitions Information

Munitions at Camp Adair included small arms (.50 caliber or less), practice grenades, live grenades, high explosives (37-millimeter [mm] or larger), and 100-pound (lb) to 500-lb bombs. During the last two years of training, an estimated 265,000 rounds of high explosive ammunition were fired. Table 2-1 contains a list of the munitions and associated MC reportedly used at the Areas of Concern (AOCs).

Over the years (and as recently as 2001), MEC and suspected MEC have been found at the former Camp Adair, including 2.36-inch anti-tank rockets, and 60-mm, 81-mm, 105-mm, and 155-mm rounds. Reported MEC finds are discussed in Section 2.8.

2.3 Ownership History

The Army began acquiring land for Camp Adair in 1941. In 1946 the War Department declared Camp Adair surplus and the facility was assigned to the War Assets Administration for disposition under the Surplus Property Act. In 1946 the property was transferred to the Department of Agriculture for sale by the Federal Land Bank. Portions of the land were purchased by the Oregon State College for apartment buildings and for Oregon State College forestry land. Other portions of Camp Adair were sold to private owners.

Since 1946, the Oregon National Guard has occupied a portion of Camp Adair for use as a training facility.

In 1955, the Air Force acquired property in present day Adair Village and portions of the cantonment area for use as an air defense facility (Semi-Automatic Ground Environment System) and later it served as Headquarters for the 26th Air Division (NORAD), which provided air defense for seven western states. In 1969, Adair Air Force Station was closed. In 1970, the Adair Air Force Station lands were determined excess and reported to the General Services Administration for transfer.

As of 2006, over 1,000 individuals and agencies shared property ownership of the Camp Adair area. These owners include federal agencies (U.S. Forest Service), Oregon State agencies (Oregon State University, Parks and Recreation Department, Oregon National Guard, Oregon Department of Fish and Wildlife), private industry, and private citizens. There is no controlled access to the FUDS. Figures 2-3A through 2-3L show the current property ownership. On these figures the property owner is identified by an index number rather than a name. The names of the property owners are available on request from the USACE Seattle District office.

2.4 Physical Setting

2.4.1 Topography and Vegetation

Topography in the area of Camp Adair is relatively flat to mountainous, and variously vegetated with crops, grasses, shrubs, and trees. Elevation varies from between 200 feet (ft) to over 2,000 ft above mean sea level. Figure 2-4 shows the FUDS boundary overlain on available topographic maps.

2.4.2 Land Use

Current and expected future land use within the area of former Camp Adair include agriculture, private, state and national forest land, wildlife management and recreation areas, state and county parks, residences, and business. The Oregon National Guard maintains a rifle range and training areas that are not included in this SI. Figure 2-2 shows the FUDS boundary overlain on aerial

photographs taken in 2005 and 2006. The aerial photographs illustrate the diverse use of the land.

2.4.3 Nearby Population

Monmouth and Adair Village are the nearest towns, with estimated populations of 8,987 and 549, respectively, as of 2005 (U.S. Census, 2000). Polk County has an estimated population of 70,295, Benton County has approximately 78,640, and Linn County has over 108,914 as of 2005 (U.S. Census, 2000) (Figure 2-5). Estimated population (2000 census) within a 2-mile radius of the Camp Adair FUDS property boundary is 15,365. The population density is 76.2 persons per square mile. The estimated numbers of housing units and households within a 2-mile radius are 5,771 and 5,485, respectively.

2.4.4 Climate

The site area has a temperature range of approximately 28 degrees Fahrenheit (°F) between the coldest month, January, and the warmest, July. Lows of sub-zero temperatures or highs above 100°F rarely occur. Most precipitation occurs during the winter months in the form of rain. Annual rainfall totals range between 35 and 45 inches (USACE, 2001).

2.4.5 Area Water Supply

The site is located within the Upper Willamette watershed and is drained in a generally eastern direction by tributaries of the Willamette River. The Luckiamute River, which is the largest surface water feature flowing through the area of the former Camp Adair, is characterized by relatively high flows in winter months (generally 500 to 2,000 cubic feet per second), with low summer flows. Both surface water and groundwater serve as the primary sources of water for various public water systems in the area. The Adair Village water system uses surface water from the Willamette River; the Monmouth water system uses groundwater. Much of the central and northern portions of Camp Adair are served by the Luckiamute Domestic Water Cooperative, which uses water from deep aquifer supply wells located east of Camp Adair. Some local residences rely on personal domestic wells for water supply.

2.4.6 Geologic and Hydrogeologic Setting

Camp Adair is located in the Oregon Coast Range section of the Pacific Border physiographic province. Soils at the site are silty, sandy clays with varying gravel content. Potential for soil erosion is severe in some areas. Potential frost depths extend to 24 inches.

Bedrock consists of Tertiary submarine lavas and marine sediments. Alluvial deposits of silts and pebbly sands with lenses of gravel overlie bedrock in the valleys of the Luckiamute River and tributary streams.

Shallow groundwater within the site is generally within one of two hydrogeologic units: the basement confining unit (bedrock) in upland areas, characterized by low permeability, porosity, and well yield; and the Willamette silt unit, characterized by high porosity but low permeability

and well yield, although it may be a significant source of recharge to underlying units (Conlon et al., 2005). In lowland areas, groundwater discharges to streams. During wet winter months, this may be a relatively small component of the total stream flow, but in dry summers groundwater is the main component of stream flow (Conlon et al., 2005). Domestic water supply wells located throughout the site typically tap the basement confining unit (bedrock). Depths range from 50 ft or less to several hundred feet. In many cases, well records indicate that the well bores are uncased through most of the bedrock interval. Static water levels are generally from 10 to 40 ft below ground surface (bgs). Groundwater flow direction in the bedrock unit has not been mapped but is assumed to flow to the east towards the Willamette River, although local geologic structure could alter the direction of flow.

2.4.7 Sensitive Environments

The Camp Adair FUDS covers a diverse area that is used for managed forest areas, cultivated crops, and residential areas. Portions or all of Camp Adair qualify as Important Ecological Places (IEP) or Sensitive Environments as defined by USACE (2006) or EPA (1997) and shown in Table 2-2. A determination has been made for SI evaluation purposes to consider the whole FUDS to qualify as IEP or Sensitive Environments because: there is a stream running through the middle of the site that contains wetlands; the stream may be used by protected salmon; specific locations for protected plant species at the site are unknown.

Within the FUDS Boundary there is a wildlife management area (E.E. Wilson Wildlife Refuge). Also present are Oregon State University managed State Forest Lands. The Luckiamute River runs through the FUDS and drains to the nearby Willamette River. Both streams may be used for anadromous fish species and the wetlands are used for migratory bird species. (Anadromous fishes are those that spend all or part of their adult life in salt water and return to freshwater streams and rivers to spawn.)

Two Federal and State listed plant species grow within the Camp Adair FUDS boundary (Oregon Department of Agriculture, 2006):

- *Sidalcea nelsoniana* (Nelson's checkermallow) and
- *Lupinus sulphureus ssp. kincaidii* (Kincaid's lupine).

Seasonal use by bald eagles in winter also occurs in the area.

2.5 Previous Investigations for MC and MEC

Multiple investigations regarding MC/MEC have been performed at Camp Adair.

2.5.1 Archives Search Report

The USACE completed an ASR in 2001, which compiled available information for Camp Adair with emphasis on types, quantities, and areas of ordnance use and disposal. The ASR compiled a summary of range clearance activities prior to transfer of the Camp Adair property to non-War Department ownership. As part of the ASR, members of the USACE visited the site to

"characterize OE [ordnance and explosives] and CWM [chemical warfare materiel] potential based on a determination of ordnance and chemical warfare material presence and/or disposed at Camp Adair." The site visit team concluded that there was no information obtained that would indicate any lands at the former Camp Adair as unusable because of OE/CWM hazards or other military debris.

2.5.2 ASR Supplement

The USACE completed an ASR Supplement in 2004, which identified specific AOCs (USACE, 2004b). Twenty-one ranges were identified in the ASR Supplement. These ranges are listed on Table 1-1. A risk assessment was completed in 2004 on explosives safety hazards related to munitions. The risk assessment did not address the environmental hazards associated with munitions constituents. The Risk Assessment Code (RAC) score was assigned each AOC. Possible scores range from 1 to 5, with 1 having the highest risk and 5 the lowest. Four of the five small arms ranges AOCs (Range Complex Nos. 4, 5, and 6; Skeet Range No. 580) were scored 5, with the Infiltration Range No. 143 scoring 2. For the Explosive Ranges, the Moving Target Range, Bombing Target No. 1, and Range Complex No. 3 were scored 3; the Mortar Range and Range Complex No. 1 were scored 2; and Range Complex No. 2 was scored 1. The live hand grenade courts were all scored 3, the practice grenade courts scored 4, and the Chemical Identification Area scored 1.

2.5.3 Other Investigations

In 1992, USACE completed an inventory project report (INPR) for Camp Adair, identifying a potential hazard from ordnance at the FUDS.

In 1996, URS Consultants completed a Screening Site Inspection (SSI) for Camp Adair for the EPA focusing on the sediment pathway (URS, 1996). The data contained in this 1996 report was reviewed for use in this SI. The SSI report data did not show any adverse impacts to sediments from activities related to Camp Adair. However, the data, collected in April 1996, may not meet the requirements for analysis and thus have limited value. The analytical reports provided in the appendix, which contain the complete analytical results, do not use the same sample numbers as reported in the main text of the SSI report. Furthermore, there is no cross-reference key provided in the report to equate the different sample numbers.

2.6 Other Land Uses that May Have Contributed to Contamination

Portions of the Camp Adair area have been used extensively for agricultural purposes since the end of World War II. Agricultural uses may have included the use of fertilizers and pesticides containing nitrate-based compounds and heavy metals, which may also occur as MC.

The Oregon National Guard may have contributed to contamination within portions of Range Complex No. 4. This contamination would be primarily lead from small arms firing. The

National Guard facility is fenced as a separate property and was not included in the SI. There is only a small overlap between the National Guard property and one of the FUDS AOCs

2.7 Past Regulatory Activities

There have been no regulatory actions, with respect to MEC or MC, reported for the site.

2.8 Previous MEC Finds

MEC or suspected MEC finds for Camp Adair are listed on Table 2-3 and shown on Figure 2-6. Details are unavailable for most of these finds.

3.0 SI Tasks and Findings

The SI tasks conducted at the FUDS involved compiling and reviewing historical reports and information that were then used in the TPP process. Following the TPP meeting, the *Site-Specific Work Plan* (SSWP) was prepared to define the SI field activities necessary to collect the information needed to address the data gaps and data quality objectives (DQOs). Field work was conducted at the site in August and September, 2006.

3.1 Technical Project Planning

TPP involved compiling and reviewing historical reports and information to identify data gaps and develop a path forward. The TPP meeting for the Camp Adair was conducted on April 5, 2006 at the Holiday Inn Express, located at Corvallis, Oregon. This meeting included representatives from: USACE – Omaha Military Munitions Design Center, USACE Hazardous, Toxic, and Radioactive Waste Center of Expertise, and Seattle District; Shaw; Oregon Department of Environmental Quality (ODEQ); Oregon National Guard; U.S. Forest Service; Benton County; Oregon Department of Fish and Wildlife (ODFW); Polk County; Oregon State University Forestry Department; and Allied Waste.

In the TPP meeting, historical information was discussed and historical aerial photographs were reviewed. It was concluded by those in attendance that 21 AOCs were to be inspected during the SI field work (Figure 3-1). Soil, surface water, and groundwater warrant inspection to evaluate the potential presence of MEC and MC. Specific details of the TPP meeting are contained in the *Final TPP Memorandum* (Shaw, 2006b).

The results of the TPP meeting were documented in the *TPP Memorandum* (Shaw, 2006b), which was issued final on July 21, 2006 after incorporating comments from the stakeholders. The proposed technical approach was defined in the SSWP (Shaw, 2006c), which was issued final on August 17, 2006 after incorporating comments from the stakeholders. A more complete discussion of the TPP meeting is contained in Appendix B.

Following the TPP meeting with institutional stakeholders on April 5, 2006, a second TPP/public information meeting was held at Santiam High School in Adair Village. The meeting presented to interested public an overview of the proposed work at Camp Adair. Discussed were the overall project purpose, contact information, preliminary sampling areas, and rights of entry. Questions were answered following the meeting. An additional public information meeting was held on July 18, 2006 to brief the public on the upcoming sampling that was to be completed in August and September.

As discussed during the TPP meeting and documented in the TPP Memo (Shaw, 2006b), the following project objectives and DQOs were developed.

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

DQO #1 – At AOCs where MEC has not been reported in the past, trained UXO personnel will conduct a visual search of the AOCs using handheld magnetometers, searching for evidence of the presence of MEC (e.g., craters and ground scars indicative of ordnance burial/ordnance disposal (OB/OD) activities, MEC on the surface, munitions debris indicative of OB/OD activities, 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:

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

DQO #2 – At AOCs where MEC has been reported in the past (explosive munitions ranges and live hand grenade courts), the following decision rules will apply:

- The presence of MEC is confirmed on the basis of past finds, and these areas will be recommended for additional investigation following the SI.
- If, in the course of reconnaissance for sample targets and/or UXO avoidance, there is indication of an imminent MEC hazard, the site may be recommended for a TCRA.

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#3 – Soil, sediment, and groundwater samples will be collected and analyzed. 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 AOCs will be recommended for NDAI relative to MC.
- If sample results exceed both human health screening values and background values, the AOCs 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.

3.2 Additional Records Research

3.2.1 Coordination with State Historic Preservation Office

Preparation of the SSWP included coordination with the State Historic Preservation Office (SHPO). The SHPO for Oregon is located within the Parks and Recreation Department. A search of the SHPO's archaeological database indicated that identified sites were located in or in proximity to several of the project AOCs. Range Complex No. 4 was identified as containing cultural resources (archeological). As a result of further discussions between USACE, SHPO, and Shaw representatives, it was determined that these cultural sites could be avoided based on the type and location of environmental samples to be taken.

3.2.2 Coordination with Natural Resources Offices

The ODFW was contacted to identify any potentially impacted threatened or endangered species in the area. The ODFW indicated there was no impact to threatened or endangered wildlife species in the area (ODFW, 2006). The Oregon Department of Agriculture was contacted for evaluation for potentially impacted threatened or endangered species and concluded that while there were two plant species in the Camp Adair area, the scope of the field work should not result in an impact.

3.2.3 Historical Aerial Photographs

Historical aerial photographs of Camp Adair area were reviewed and interpreted prior to field mobilization to aid in site reconnaissance and to refine proposed sampling locations. Limited aerial photographs were available. Aerial photographs were obtained from the United States Geological Survey and evaluated. Because of the wet environment that is conducive to vegetative growth, most features have been obscured or have been removed during tilling for agricultural purposes. Firing points and target areas were not evident on the aerial photos because of growth of vegetation and farming practices.

3.2.4 Environmental Database Search

A search of available environmental records was conducted by EDR, Inc. (2005). The government records search met the requirements of ASTM Standard Practice for Environmental Site Assessments. Search results indicated that Camp Adair does appear on mapped sites in known federal, state, or local environmental databases (Appendix L). Within a 3-mile radius of the Camp Adair FUDS the following sites were identified:

- Federal Insecticide, Fungicide, and Rodenticide Act/Toxic Substances Control Act Tracking System – 1 site
- Resource Conservation and Recovery Act Small Quantity Generator – 2 sites
- Facility Index System – 24 sites
- Environmental Cleanup Site Information System – 5 sites
- Solid Waste Facilities List – 2 sites
- Leaky Underground Storage Tank List – 15 sites

- Underground Storage Tanks – 11 sites
- Above Ground Storage Tanks – 16 sites
- Oregon Department of Environmental Quality Spill list – 3 sites
- Oregon HAZMAT Spill database – 2 sites
- Oregon Hazardous Substance Information Survey – 21 sites

Note that some sites may be listed under several categories. Additional information on the databases searched and the results for surrounding properties is included in the EDR report found in Appendix L.

3.2.5 Rights of Entry

The USACE Seattle District is responsible for Camp Adair and for obtaining the Rights of Entry (ROEs) for properties where SI activities will be performed. Access to identified property is necessary for conducting field activities. ROEs were obtained for all properties identified for sampling.

3.3 Field Work

SI field activities, conducted between August 21 and September 21, 2006, included site reconnaissance and collection of surface soil, sediment, and groundwater samples. In addition, background samples were also collected as shown in Figure 3-2. The following conditions were recorded in the field logbook (Appendix D) and/or by digital photographs (Appendix E):

- Presence or absence of evidence of MEC;
- Changes, if any, in sample location because of field constraints;
- Vegetative cover; and
- Presence or absence of water for sediment and surface water samples, and other conditions encountered that impacted sample collection.

The approach used in the Camp Adair SI was to group the 21 AOCs (Figure 3-1) into similar historical use, types of MEC/MC expected, and environmental conditions. This grouping was documented in the TPP Memo. The AOC groupings identified within Camp Adair were:

- Small Arms Ranges
  - Infiltration Range No. 143
  - Range Complex No. 4
  - Range Complex No. 5
  - Range Complex No. 6
  - Skeet Range No. 580
- Explosive Munitions Ranges
  - Range Complex No. 1
  - Range Complex No. 2
  - Bombing Target No. 1
  - Range Complex No. 3

    - Mortar range
    - Moving Target Range No. 75
- Live Hand Grenade Courts
    - East Live Hand Grenade Court
    - Live Hand Grenade Court No. 129
    - West Live Hand Grenade Court
- Practice Grenade Courts
    - Practice Grenade Court No. 122
    - Practice Grenade Court No. 120
    - Practice Grenade Court No. 121
    - Practice Grenade Court No. 127
    - Practice Grenade Court No. 125
    - Practice Grenade Court No. 126
- Chemical Identification Area No 182

3.4 Data Quality Review

Laboratory analysis was performed by GPL Laboratories of Frederick, Maryland, using methods defined in the SSWP. Analytical results are provided in Appendix F.

One hundred percent of the analytical data have been reviewed based on EPA Contract Laboratory Program (CLP) *National Functional Guidelines for Organic Data Review*, October 1999 and EPA CLP *National Functional Guidelines for Inorganic Data Review*, October 2004. Automated Data Review software (version 8.1) was used to assist in the data validation process for all areas with the exception of initial calibration blanks, continuing calibration blanks, interference check standards, serial dilutions, internal standards, instrument tuning standards, and second-column confirmation. Data were evaluated against specific criteria to verify the achievement of all precision, accuracy, representativeness, completeness, comparability, and sensitivity goals established to meet the project DQOs.

The overall quality of the data collected is discussed in the Analytical Data QA/QC Report (Appendix G). Results of the analyses suggest that representative samples were collected and analyzed, and the results are indicative of the media analyzed. Some results were qualified as described in the report. No data were qualified “R” as unusable. Overall, the data reflect expected site conditions and they are fully usable for their intended purpose.

3.5 Variances from the SSWP

The following summarizes variances to the SSWP (Shaw, 2006c). The SSWP identified that all background groundwater samples were to be analyzed for dissolved metals, while the normal (non-background) samples were to be analyzed for total metals. A variance was issued to change the text so that all metals analyses would be for total metals. A Variance Report was filed with the USACE. A copy of the Variance Report is in Appendix D.

Background sediment sample NWO-017-5012 was shown in the SSWP to be collected along the upper reaches of Berry Creek. Information obtained from the SHPO cautioned Shaw that the proposed sample location may be at or near a cultural resource site and that sampling should avoid the area. The sampling location was moved downstream to a road bridge crossing where impact to potential cultural resources would be avoided.

During the collection of groundwater samples from domestic wells, water levels and well depths could not be obtained because of the sanitary well seal at the well heads.

3.6 Third TPP Meeting

A third TPP meeting is planned to present the SI findings to stakeholders and reach consensus regarding conclusions.

4.0 Munitions and Explosives of Concern

A survey for potential MEC was completed at each AOC. A visual reconnaissance of site conditions was performed prior to collection of samples, and a hand-held magnetometer was used to aid in discovering unseen items obscured by shallow soil or vegetative cover.

4.1 Field Observations

The reconnaissance team located each planned sampling location and documented conditions with respect to vegetative cover, soil conditions, unexpected debris or material, presence or absence of water, and any other conditions that could potentially impact the collection of samples. Particular attention was paid to munitions debris, potential indications of contamination such as vegetative stress, and other features of interest (e.g., building foundations, floor slabs, drain tiles, etc.). Additionally, the reconnaissance team recorded the path walked within the AOC using a hand-held Global Positioning System (GPS) unit. Digital photographs were taken to document significant features. Representative photographs of reconnaissance activities and observations are included as Appendix E.

The approach used for MEC evaluations/investigations at Camp Adair was that if MEC or munitions debris had been previously reported at an AOC, no visual reconnaissance survey would be completed. MEC has been previously identified in all explosive munitions ranges AOCs and in two of three Live Hand Grenade AOCs. No MEC has been previously identified in the small arms ranges. No sampling was proposed or conducted at Infiltration Range No. 143, practice grenade court AOCs, or the Chemical Identification Area No. 182 AOC.

A visual reconnaissance survey, for the purpose of looking for evidence of MEC, was only completed for Range Complex No. 4. At other AOCs, prior to sampling at all sediment and soil sampling locations, a visual reconnaissance was conducted aided by a hand-held magnetometer. This was done for avoidance of MEC along the path taken from the vehicle to the sample point, for sampling crew safety.

4.1.1 Small Arms Ranges

The field activities conducted at the small arms ranges included a visual reconnaissance to confirm the presence or absence of MEC, and collection of surface soil, sediment, and groundwater samples.

A visual reconnaissance survey was completed in three areas within Range Complex No. 4 AOC (Figure 4-1) to confirm the small arms range CSM. The northern reconnaissance survey was 2,653 ft, the central one was 2,839 ft, and the southern survey was 1,453 ft. Visual reconnaissance surveys were not completed at the other small arms range AOCs because of their very small area and because, historically, use of explosive munitions would not be expected. The areas surveyed are within Oregon State Forest Lands and ground cover varies from heavily

timbered with thick undergrowth to replanted clear cut areas with native grasses and plants. No MEC or munitions debris was observed. No evidence was found that would indicate the use of Range Complex No. 4 for other than small arms training.

Reconnaissance surveys of the small arms ranges were also conducted prior to collection of samples to allow safe passage for the sample team from the vehicle to the sample point. During the visual survey, evidence of military use (presence of lead bullets or shot, target fragments, and ground-scarring) was noted in field notes. During visual reconnaissance and sampling activities a lead bullet was found at sample location NWO-017-0001 at Range Complex No. 4 and a clay target fragment was found at sample location NWO-017-0019 at Skeet Range No. 580. No MEC or other munitions debris was located during field activities at the small arms ranges.

4.1.2 Explosive Munitions Ranges

No visual reconnaissance surveys were conducted in the explosive munitions ranges for the sole purpose of identifying MEC. The presence of MEC at these AOCs has been previously documented in the ASR and ASR Supplement, as listed on Table 2-3.

During sampling of the explosive munitions ranges, anomaly avoidance procedures were performed to avoid potential encounter with MEC or munitions debris. No MEC or munitions debris were observed. Much of the land within the explosive munitions ranges is currently being used for agriculture purposes and thus has been disturbed or reworked by tilling or grazing farming practices.

4.1.3 Live Hand Grenade Courts

No visual reconnaissance surveys were conducted in the live hand grenade court AOCs for the sole purpose of identifying MEC. The presence of MEC at these AOCs has been previously documented in the ASR and ASR Supplement, as listed on Table 2-3.

During sampling of the live hand grenade courts, anomaly avoidance procedures were performed to avoid potential encounters with MEC or munitions debris. No MEC or munitions debris were observed. The land within the live hand grenade court AOCs is currently being used for raising grass for seed (East and West Live Hand Grenade Courts) or as a Christmas tree farm (Live Hand Grenade Court No. 129).

4.1.4 Practice Grenade Courts

No field activities were conducted at the practice grenade courts in accordance with the TPP memo and SSWP. The practice grenade courts used only training munitions that contained only small spotting charges containing black powder or used inert training shapes.

4.1.5 Chemical Identification Area No. 182

No field activities were conducted within Chemical Identification Area No. 182 in accordance with the TPP memo and SSWP. It was agreed to at the TPP meeting that there was no

significant risk from MEC at this range. In addition, it was agreed to that only a small quantity of explosive material may have been used in this area and does not pose a significant MEC risk.

4.2 MEC Risk Assessment

The following sections present a qualitative assessment of the risk associated with MEC at each of the AOCs. This assessment is based on historical documentation and limited visual inspection conducted during the SI. This is provided to convey relative risk on a scale from low to high and is not intended to be a thorough risk assessment as required by CERCLA. Low risk is indicated for AOCs where no MEC or munitions debris has been reported or the only munitions used were practice with only a signal charge (i.e., practice grenades). Moderate risk is indicated where records indicate that MEC has been historically reported, munitions debris is present at greater than an occasional occurrence, and public access is possible. High MEC risk is indicated where MEC has been reported within the previous several years or was found during the SI field work, or munitions debris is present in concentrated large quantities, and public access is possible.

4.2.1 Small Arms Ranges

Three magnetometer assisted visual reconnaissance surveys were completed within the Oregon State Forest to evaluate the presence of MEC within Range Complex No. 4. No MEC or munitions debris was identified. The routes taken are shown on Figure 4-1. Historically, no MEC (other than expended small arms munitions) has been reported within any of the small arms ranges. Dropped or misfired live rounds may be present on the range floor near the firing line. The explosive component for small arms is the powder in the munitions casing. A direct impact to the primer would be required to initiate the explosive in the round.

The only known potential use of explosives at the small arms ranges would have been at Infiltration Range No. 141 (within Range Complex No. 4 AOC) and Infiltration Range No. 143 AOC where static demolition explosive charges may have been used. Neither of these ranges was accessible for the SI field investigation. Infiltration Range No. 141 is located within the active Oregon National Guard facility, which is not part of this FUDS SI. Infiltration Range No. 143 has been incorporated into the Coffin Butte Landfill operations. The area of Infiltration Range No. 143 has been heavily excavated and the soil has been disturbed, reworked, or removed. During expansion of the landfill in 1994, a small amount of soil containing white phosphorus was discovered in the vicinity of the Infiltration Range No. 143 AOC (EMCON, 1994). Approximately 50 to 70 cubic yards of soil was treated by allowing the white phosphorus soil to auto-ignite and burn. This area is now covered with waste.

Based on the use of the small arms ranges (Infiltration Range No. 143, Range Complex No. 4, Range Complex No. 5, Range Complex No. 6, and Skeet Range No. 580) for only small arms training, no evidence of MEC or other explosive hazard, and the extensive reworking of the much of the surface soil for farming, there is low MEC risk at all of the small arms range AOCs.

4.2.2 Explosive Munitions Ranges

All types of explosive munitions were used within the explosive munitions ranges. Munitions would have included anti-tank rockets, field artillery, mortars, aerial bombs, small arms, and grenades. Shaw completed magnetometer assisted MEC avoidance surveys at soil and sediment sampling locations within the explosive munitions ranges. No MEC or munitions debris was observed. Historically, MEC and munitions debris has been found in five of the six explosive munitions AOCs (USACE, 2001; 2004b). MEC has not been reported in Range Complex No. 3. The majority of the reported MEC and munitions debris is within Range Complex Nos. 1 and 2, and Bombing Target No. 1. MEC finds have also been reported at the Mortar Range and at the Moving Target Range No. 75. Locations of reported MEC finds are shown on Figure 2-6. Within Range Complex No. 1, two impact areas were been identified in a 1947 Certificate of Clearance and a recommendation that land use be restricted to grazing or timbering activity due to risk. Many of the rounds used in the explosive munitions ranges contain high explosives and detonation may be triggered by walking, driving, or handing of the munitions. The detonation of one of these rounds could cause serious injury or death.

Current land use for the explosive munitions ranges is farming, ranching, Christmas tree farms, undeveloped wooded and timbered areas, and residences. Access to the land is unrestricted to the public. Based on the current use of the explosive munitions ranges and the historical occurrence of MEC and munitions debris, the overall MEC risk is considered to be moderate.

4.2.3 Live Hand Grenade Courts

Munitions used at the live hand grenade courts included the Mk II hand grenade (fragmentation), and the M21 practice hand grenade. Shaw completed limited magnetometer assisted MEC avoidance surveys at soil and sediment sampling locations within the live hand grenade court AOCs. No MEC or munitions debris was located. Historically, MEC and munitions debris has been found at the Live Hand Grenade Court No. 129 and the West Live Hand Grenade Court AOCs (USACE, 2001).

The munitions used at the live hand grenade courts could detonate if tampered with or, potentially, if struck. If detonated, the explosion and resulting metal fragments could cause serious injury or death.

The East and West Live Hand Grenade Court AOCs are currently within tilled farm land that is used for growing grass seed. Live Hand Grenade Court No. 129 is within a Christmas tree farm and the ground has been cleared and tilled. There are no noticeable remnants of munitions activity at these AOCs. Access to the land is unrestricted and open to the public. Based on the current use of the live hand grenade court AOCs and limited historical occurrence of MEC and munitions debris, the overall MEC risk is considered to be moderate.

4.2.4 Practice Grenade Courts

The likely munitions used at these AOCs were the MK 1A1 training grenade, which is an inert device and the M21 practice grenade that contained only a small charge of black powder to simulate detonation of a live grenade. During sampling activities for a nearby background soil sample, the landowner, whose property is located south of Practice Grenade Courts Nos. 125, 126, and 127, showed the Shaw field team seven inert training grenades that were recovered many years ago by the landowner's father.

The munitions used at the practice hand grenade courts would require the deliberate detonation of the grenade. If triggered, a small explosive charge would result that may cause injury to the hand.

The practice grenade court AOCs are located in tilled farm land. There are no noticeable remnants of the AOCs. Access to the land is unrestricted and open to the public. Based on the current use of the practice grenade court AOCs and types of munitions used at these ranges, the overall MEC risk is considered to be low.

4.2.5 Chemical Identification Area No. 182

The likely munitions used at this AOC included Chemical Agent Identification Sets (CAIS) and detonation sets. No MEC or munitions debris has been reported at this AOC; none was found by the ASR inspection team. The buildings that were used are no longer present.

The Chemical Identification Area No. 182 is located on tilled farm land. There are no noticeable remnants of the AOC. Access to the land is unrestricted and open to the public. Based on the current use of this AOC and the types of munitions used, the overall MEC risk is considered to be low.

4.2.6 Other Areas

Several MEC finds have been reported outside of established ranges. A 2.36-inch anti-tank rocket was found by local residents in the area of the Parade field in the cantonment area and a mortar round was uncovered while digging a pond in the south central portion of the cantonment area. A 2.36-inch rocket was also discovered in an area north of Coffin Butte and Range Complex No. 5. These are isolated incidents not associated with a known AOC.

5.0 Munitions Constituents Sampling and Analysis

The results from sampling and analysis for MC are described in this section. As appropriate, results are compared to background values to determine if there is a release with respect to MC regardless of whether the individual compound is a listed hazardous substance or not. If a release is confirmed, analytical results are compared to screening values for human health risk assessment and, if appropriate, for ecological risk assessment. Results are considered in terms of groundwater, surface water/sediment, terrestrial, and air pathways for each AOC.

5.1 General Setting

The general setting of the Camp Adair FUDS was provided in Section 2.0.

Figure 5-1 shows the groundwater wells in the vicinity if Camp Adair in relation to distance from the AOCs. Figure 5-2 shows the surface water features in the vicinity of Camp Adair in relation to the distance from the AOCs. Figure 5-3 shows the location of sensitive receptors, such as schools in the vicinity of Camp Adair in relation to the distance from the AOCs.

5.2 Determination of Background Concentrations

Ten background soil samples were collected from the Camp Adair area (Figure 3-2) and analyzed for target analyte list metals. The selection of the soil background locations was aided by Visual Sampling Plan (VSP) (PNNL, 2005). VSP is a computer software program that allows for an independent sampling location selection across a designated area. The area provided to the VSP software was all areas within the FUDS boundary not included in a known AOC. After VSP identified potential sampling locations, the locations were adjusted by hand to place the background sample location on a property for which the USACE has a signed ROE. Background sediment sampling locations were selected from locations within stream channels upstream of sediment sampling locations and AOCs. Background groundwater sampling locations were from groundwater wells interpreted to be upgradient or distant from source areas.

The background soil sample analytical results were used to calculate background metal soil concentrations using published EPA Guidance (1989, 1992, 1994, 1995, and 2006). The background concentrations are either a 95th upper tolerance limit (UTL) for normally and lognormally distributed analytes or the 95th percentile for nonparametric distributed analytes. The background soil sample analytical results are provided in Appendix G. Table 5-A lists the soil, groundwater, and sediment background concentrations used in this SI report. A summary of the soil background calculations is presented in Appendix L.

Three sediment and two groundwater background samples were collected from the Camp Adair vicinity (Figure 3-2). The analytical results are presented in Appendix G.

The method for comparing sediment and groundwater results to background was not defined in the TPP process. For purposes of comparison in this SI, the background concentrations for sediments and groundwater are taken to be the maximum values observed in the background data set. The approach for determining if a release has occurred is consistent with the EPA's HRS (40 CFR Part 300: Appendix A): "The minimum standard to establish an observed release by chemical analysis is analytical evidence of a hazardous substance in the media significantly above the background level." Table 2-3, "Observed Release Criteria for Chemical Analysis" has the following criteria:

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

In the discussions below, these criteria are used to determine whether a release of MC has occurred in sediment and groundwater, regardless of whether the analyte is considered a hazardous substance. However, these criteria are not applied for soils because a statistically based determination of background has been established, and an exceedance of the 95th UTL or 95th percentile, depending on the individual analyte, is used to establish a release of MC.

5.3 Small Arms Ranges

5.3.1 General History and Field Findings

The small arms range AOCs were used between 1942 and 1945, except for the Skeet Range No. 580, which was used by the Air Force between 1955 and 1964. Table 1-1 provides a listing of the ranges and subranges and approximate acreage included in the small arms range designation. Munitions used at these AOCs were limited to small arms (.22 to .50 caliber and shotgun shells). Known use of explosives at these ranges was limited to static charges of dynamite or trinitrotoluene (TNT) (detonated with blasting caps) in craters at Infiltration Range No. 141 (Range Complex No. 4) and Infiltration Range No. 143. At some ranges, small arms fire would tend to be concentrated in backstops; i.e., manmade berms or natural hillsides. Berms are still evident at the Known Distance Rifle Ranges Nos. 1 through 4 (Range Complex No. 4). At other ranges, small arms fire would tend to be dispersed over a wide area; e.g., the anti-aircraft ranges and the skeet range. The expected distribution for MEC and MC at small arms ranges is shown by the CSM (Appendix J). When known, approximate locations of firing lines and target areas are shown on Figures 5-4A through 5-7. Several of the small arms subranges were used for dispersed training and firing and specific firing and target locations are not known.

Bullets, principally lead, accumulate mainly in or behind the backstop berm with soil, rocks, and other bullets causing some degree of fragmentation. Redistribution of the lead may have occurred with the removal of the berm and years of farming activity. At the skeet range, in addition to the lead shot accumulation, fragments from the clay targets containing polycyclic aromatic hydrocarbons (PAHs) would accumulate mainly near the firing line. As described in Section 4.1.1, no MEC was observed at the small arms ranges. Other than a lead bullet observed within the Known Distance Range No. 1 subrange (Range Complex No. 4), no munitions debris was observed. A clay target fragment, which is neither MEC nor munitions debris, was observed at the Skeet Range No. 580 AOC.

Range Complex No. 4 AOC is currently used as managed timberland by the Oregon State Department of Forestry, with agricultural uses including row crops, grass seed, Christmas tree farms, and residences. Range Complex Nos. 5 and 6 AOCs are currently used as small farms and residential sites. The Skeet Range No. 580 AOC is used as a county park with open lands, ball fields, and playgrounds. Infiltration Range No. 143 AOC has been incorporated into the Coffin Butte Landfill operations. The area of Infiltration Range No. 143 has been heavily excavated and the soil has been disturbed, reworked, or removed.

5.3.2 Sampling and Analysis

Sample details are provided in Table 5-1 and analytical detections are listed in Tables 5-2A through 5-4D. Figures 5-4 through 5-7 show the SI sampling locations and indicate if an exceedance of background concentrations and human health and/or ecological screening values has occurred. Field records are provided in Appendix D and representative photographs of sampling activities are included as Appendix E. Complete analytical data are presented in Appendix F and the Analytical Data QA/QC Report is included as Appendix G.

5.3.3 Groundwater Pathway

Groundwater sample results were compared to the maximum detected concentration from the two background groundwater samples. The background groundwater sample results are provided in Appendix G. Groundwater samples were collected from Range Complex No. 4 (NWO-017-3001), Range Complex No. 5 (NWO-017-3002), and Range Complex No. 6 (NWO-017-3003 and field duplicate NWO-017-3004). No groundwater samples were planned from the Skeet Range No. 580 AOC or the Infiltration Range No. 143. Existing wells selected for sampling were located within the individual AOCs generally downgradient of target areas and/or safety fans provided a signed ROE with the property owner was available. All samples were collected using pumps installed in the wells. All wells are used as domestic water sources. No boring or well logs are available for the wells located in Range Complex Nos. 4 and 6. Well depths or water levels could not be measured due to the well seal at the well head. A well log is available for the well located in Range Complex No. 5, which indicated a well depth of 166 ft bgs. The water level in this well could not be measured due to the well seal at the well head.

Wells were purged prior to sampling. All samples were collected from a sampling point as close to the well as possible. Generally, this was a hose bib at the well house. Samples were analyzed for lead and perchlorate. Groundwater analytical result detections, background values, and human heath and ecological screening values for the small arms ranges are shown on Tables 5-2A through 5-2C.

5.3.3.1 Comparison to Background Data

Lead was detected in all three groundwater samples collected at the small arms ranges. The result for lead from sample NWO-017-3002 (0.51 J micrograms per liter [µg/L]) was equal to the maximum concentration (0.5 J µg/L) detected in the background samples. Perchlorate was not detected in groundwater samples. Based on this, there appears to be no impact to groundwater from the small arms range AOCs.

5.3.3.2 Comparison to Human Health Screening Values

The analytical results were compared to the human health screening value for groundwater of 15 µg/L. The results were below the screening value.

5.3.4 Surface Water/Sediment Pathway

No surface water samples were collected at the small arms ranges. In accordance with the SSWP, one sediment sample was collected at Range Complex No. 4 (sample NWO-017-1001). The sample was collected from the bottom of Berry Creek. The sample location was selected based on its position downstream from some of the subranges within Range Complex No. 4. The sediment sample was analyzed for lead only. No sediment samples were proposed or collected at Range Complex Nos. 5 or 6, or Skeet Range No 580.

The sediment sample was collected as a wet sample. The sediment lead analytical result detections, background value, and human heath and ecological screening values for the small arms ranges are shown on Table 5-3. Potential receptors are residents, farm and forest workers, and recreational users. For the screening risk assessment, it was conservatively assumed that worker exposures to sediments would be similar to those of soil.

5.3.4.1 Comparison to Background

Lead was detected in sample NWO-017-1001 at a concentration of 7 milligrams per kilogram (mg/kg). This result was compared to the maximum background sediment concentration (11.1 mg/kg) collected from Camp Adair. The sediment value is less than the background value.

5.3.4.2 Comparison to Human Heath Screening Values

The lead analytical result was compared to the human health screening value of 400 mg/kg. The result was below the screening value.

5.3.4.3 Comparison to Ecological Screening Values

The lead analytical result was compared to the ecological screening value for sediment of 35 mg/kg. The result was below the screening value.

5.3.5 Terrestrial Pathway

The potential routes of human exposure to lead in the surface soil include incidental ingestion, dermal contact, or inhalation of soil particulates during intrusive work. Current exposure scenarios would primarily involve farm workers exposed to surface soil while planting crops. In addition, workers would be potentially exposed to surface and subsurface soil during intrusive activities such as tilling or digging. Children playing in soils also are viable exposure scenarios. Future land use is expected to remain as discussed in Section 5.2.1 above. Therefore, potential future exposures to soil would be similar to current exposures.

Soil sampling at the small arms ranges was completed as planned in accordance with the SSWP with the collection of:

- Eight surface soil samples (plus one field duplicate) from Range Complex No. 4 were analyzed for lead only. Sample locations were selected based on position relative to targets when known. Where signed ROEs were not available, samples were collected from accessible property behind the targets within safety zones;
- Four surface soil samples from Range Complex No. 5 were analyzed for lead only. Sample locations were selected based on position relative to targets when known. Where signed ROEs were not available samples were collected from accessible property behind the targets within safety zones;
- Four surface soil samples (plus one field duplicate) from Range Complex No. 6 were analyzed for lead only. Sample locations were selected based on position relative to targets when known. Where signed ROEs were not available samples were collected from accessible property behind the targets within safety zones; and
- Three surface soil samples from the Skeet Range No. 580 AOC were analyzed for lead and PAHs. Sampling locations were selected from where the expected clay target fall would be and in the safety fan area where much of the lead pellets would fall if clay targets were missed.

All samples were composite samples, collected at or near the locations and coordinates specified in the Final SSWP. Each composite surface soil sample was collected from between 0 to 6-inches depth and consisted of seven surface samples collected in a wheel pattern (2 foot diameter). Samples were sieved by the laboratory prior to analysis for lead. Soil analytical result detections, background soil concentrations, and human health and ecological screening values for the small arms ranges are shown on Tables 5-4A through 5-4D.

5.3.5.1 Comparison to Background Data

Analytical results were compared to the lead background concentration of 29.5 mg/kg. At Range Complex No. 4 AOC, lead was detected in all samples. Lead was detected above the background concentration in two samples (NWO-017-0001 and NWO-017-0003).

At Range Complex Nos. 5 and 6 AOCs, lead was detected in all samples at concentrations below the background concentration of 29.5 mg/kg.

At the Skeet Range No. 580 AOC, lead was detected in all three samples. Lead was detected above the background concentration in two samples (NWO-017-0020 and NWO-017-0021). PAHs were detected in sample NWO-017-0019. Some PAH compounds can occur naturally due to burning, such as from forest fires. However, because PAH compounds are contained in clay targets and the targets were used at the Skeet Range No. 580, it can be logically concluded that the PAH compound detections are likely from the use of clay targets at the AOC, and all detections are considered to be above natural background concentrations.

5.3.5.2 Comparison to Human Health Screening Values

The analytical results from all small arms range AOCs were compared to the human health screening value for lead in soil of 400 mg/kg. All surface soil analytical results were below this screening value. The detections of PAHs were below human health screening criteria (Table 5-4D).

5.3.5.3 Comparison to Ecological Screening Values

Analytical results were compared to the ecological screening value for lead (16 mg/kg). At Range Complex No. 4 AOC, lead was detected above the ecological screening value in two samples (NWO-017-0001 and NWO-017-0003). The results from these two samples are considered significant as the site meets some of the criteria for designation as an Important Ecological Place (Section 2.4.7). Based on the Ecological Screening-Level Risk Assessment (SLERA) (Appendix L) adverse ecological effects are possible at Range Complex No. 4.

At Range Complex Nos. 5 and 6, lead was not detected above both the background concentrations and the ecological screening value.

At the Skeet Range No. 580 AOC, lead was detected above the background concentration (29.5 mg/kg) and ecological screening value (16 mg/kg) in both samples (NWO-017-0020 [58.4 mg/kg] and NWO-017-0021 [41.1 mg/kg]). Some parts of Camp Adair meet some of the criteria for designation as an IEP (Section 2.4.7), but the Skeet Range No. 580 is currently a county park that is grassed and mowed. Ecological habitat identified in Section 2.4.7 is not present at the Skeet Range No. 580. The detections of PAHs were below ecological screening values.

5.3.6 Air Pathway

By agreement at the TPP meeting, air is not considered to be a significant pathway as inhalation of MC in vapor form is not a pathway of concern for non-volatile MC under normal environmental conditions. The potential inhalation of soil particles is included in the development of health-based screening values for soil.

5.4 Explosive Munitions Ranges

5.4.1 General History and Field Findings

The explosive munitions ranges were used by the Army between 1942 and 1945. Table 1-1 provides a listing of the ranges and subranges and approximate acreage included in the Explosive Munitions Range designation. Navy and Marine Corps pilots also conducted bombing and gunnery operations in the north area of the FUDS sometimes referred to as the artillery range (principally Range Complex Nos. 1 and 2, and Bombing Target No. 1).

Munitions used varied from range to range but at Range Complex Nos. 1 and 2 all infantry and crew-served conventional weapons were authorized for use. Weapons used included the .30-caliber rifle, automatic rifle, .30-caliber light and heavy machine guns, .50-caliber machine gun, anti-tank guns, 105-mm and 155-mm howitzers, mortars, and 2.36-inch anti-tank and practice rockets.

Exercises included support by tank and aircraft (the latter using 100-lb, 300-lb, and 500-lb general-purpose and practice bombs). Explosives, blasting caps, and incendiary, illumination, and smoke devices were also used.

The range complexes included many overlapping safety fans and supported multiple activities that simulated combat conditions. Much of the explosive munitions fire was directed toward specific targets, creating impact areas in the center of the range complexes. A 1947 Certificate of Clearance included a recommendation that three land tracts (shown on Figure 5-8) be restricted to grazing or timbering activity due to a high concentration of shell firing (War Department, 1947). Because of the wide range of munitions used and training activities that occurred, identifying specific firing points and target areas is not possible. Generally the firing positions would be from the outer perimeter of the ranges into the center. At the Mortar Range the specific firing point and target area is not known. Firing was likely toward the hills. At Moving Target Range No. 75, a worn pathway was identified approximately 1,500 yards down range from the firing point (Appendix E, photographs 3, 4, and 5).

Craters caused by explosive munitions were visible during and shortly after the use of these ranges, but these areas have generally been regraded for agricultural or other purposes.

During SI field activities at the explosive munitions ranges, only MEC avoidance surveys were conducted. During these surveys, no MEC or munitions debris were found.

The explosive munitions ranges are currently used primarily for farming, with much of the land reworked through tilling. Crops grown include grass seed and Christmas trees. Farm residences are also present. The western portion of Range Complex No. 3 is currently managed as a private forest. The future land use is expected to remain the same as today.

5.4.2 Sampling and Analysis

Sample details are provided in Table 5-1 and analytical detections are listed in Tables 5-5A through 5-7F. Figures 5-8 through 5-11 show the SI sampling locations for the explosive munitions ranges and indicate if an exceedance of background concentrations and human health and/or ecological screening values has occurred. Field records are provided in Appendix D and representative photographs of sampling activities are included as Appendix E. Complete analytical data are presented in Appendix F and the Analytical Data QA/QC Report is included as Appendix G.

5.4.3 Groundwater Pathway

Groundwater samples were collected from Range Complex No. 1 (NWO-017-3005), Range Complex No. 2 (NWO-017-3006 and NWO-017-3007), Bombing Target No. 1 (NWO-017-3008), Range Complex No. 3 (NWO-017-3009), the Mortar Range (NWO-017-3010), and Moving Target Range No. 75 (NWO-017-3011 and field duplicate NWO-017-3011-FD). Existing wells selected for sampling were located within or near the individual AOCs, generally downgradient of target areas and/or safety fans provided a signed ROE with the property owner was available. Wells were sampled either with an existing installed pump (samples NWO-017-3008, NWO-017-3009, NWO-107-3010, and NWO-017-3011) or a decontaminated portable submersible pump (samples NWO-017-3005, NWO-017-3006, and NWO-017-3007). All wells are used as domestic water source except for the wells for samples NWO-017-3005 and NWO-017-3007. The well for sample NWO-017-3005 was formerly used for irrigation but is currently not used and the well for sample NWO-017-3007 is used for filling an irrigation pond. No logs are available for these wells. Well depths and water levels could only be measured at wells for samples NWO-017-3005, NWO-017-3006, and NWO-017-3007. The well depths and depths to water for sample NWO-017-3005 were 160.85 ft bgs and 58.25 ft bgs, for NWO-017-3006 were 113 ft bgs and 9.9 ft bgs, and for sample NWO-017-3007 were 21.6 ft bgs and 5.1 ft bgs. Well depths and water levels could not be measured in the other wells due to the well seal at the well head. All samples were collected from a hose bib or from the pump discharge for those sampled with the portable pump. Samples were analyzed for select metals, explosives, and perchlorate. Groundwater analytical result detections, background value, and human heath and ecological screening values for the explosive munitions ranges are shown on Tables 5-5A through 5-5F.

5.4.3.1 Comparison to Background Data

Groundwater sample results were compared to the maximum detected concentration from the two background groundwater samples. The background groundwater sample results are provided in Appendix F. The following samples had background concentration exceedances.

- Sample NWO-017-3005 (Range Complex No. 1) concentrations exceeded the concentration in the background wells for magnesium (7,500 µg/L vs. 6,850 µg/L) and strontium (197 µg/L vs. 73.8 µg/L). All exceedances were less than a factor of three times the maximum background value.

- Sample NWO-017-3006 (Range Complex No. 2) concentrations exceeded the concentration in the background wells for antimony (0.21 µg/L vs. 0.17 µg/L), barium (22 µg/L vs. 20 µg/L), cobalt (0.61 µg/L vs. 0.28 µg/L), iron (893 µg/L vs. 188 µg/L), molybdenum (5.8 µg/L vs. 1.8 µg/L), and nickel (3.8 µg/L vs. 1.8 µg/L). Iron (factor of 4.8) and molybdenum (factor of 3.2) exceeded the maximum background concentrations by a factor greater than three.
- Sample NWO-017-3007 (Range Complex No. 2) concentrations exceeded the concentration in the background wells for barium (35.9 µg/L vs. 20 µg/L), cobalt (1.2 µg/L vs. 0.28 µg/L), manganese (310 µg/L vs. 85.2 µg/L), nickel (3.7 µg/L vs. 1.8 µg/L), and strontium (83.5 µg/L vs. 73.8 µg/L). Only cobalt (factor of 3.6) exceeded the maximum background concentration by a factor of greater than three.
- Sample NWO-017-3008 (Bombing Target No. 1) background concentrations were exceeded for lead (0.81 µg/L vs. 0.5 µg/L). The exceedance was less than a factor of three times the maximum background value.
- Sample NWO-017-3010 (Mortar Range) background concentrations were exceeded for magnesium (13,000 µg/L vs. 6,850 µg/L) and strontium (115 µg/L vs. 73.8 µg/L). All exceedances were less than a factor of three times the maximum background value.
- Sample NWO-017-3011 (Moving Target Range No. 75) background concentrations were exceeded for barium (20.2 µg/L vs. 20 µg/L) and strontium (101 µg/L vs. 73.8 µg/L). All exceedances were less than a factor of three times the maximum background value.

There were no background exceedances for sample NWO-017-3009. Perchlorate was not detected in any sample. Based on the above, iron, molybdenum, and cobalt were detected at a concentration significantly (by a factor of 3 or more) above the maximum background concentration.

5.4.3.2 Comparison to Human Health Screening Values

The analytical results that exceeded background concentrations were compared to human health screening values and are identified below. The following summarizes the exceedances of human health screening values:

- Iron in sample NWO-017-3006 (Range Complex No. 2) (893 µg/L) exceeded the federal drinking water secondary maximum contaminant level (MCL) (300 µg/L) but not the EPA Region 9 tap water preliminary remediation goal (PRG) (11,000 µg/L).
- Manganese in sample NWO-017-3007 (Range Complex No. 2) (310 µg/L) exceeded the secondary MCL (50 µg/L) but not the PRG (880 µg/L).

Secondary MCLs are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply.

There were no human health screening value exceedances in the other groundwater samples from the explosive munitions ranges.

Explosive compounds were detected in one sample (NWO-017-3005) at concentrations below human health screening values. The compounds detected, with detected concentrations, and human health screening values were:

- 1,3-dinitrobenzene (0.038 µg/L, 3.6 µg/L),
- 2,4,6-trinitrotolunene (0.077 µg/L, 2.2 µg/L),
- 2,4-dinitrotoluene (0.027 µg/L, 0.099 µg/L),
- 2-amino-4,6-dinitrotoluene (0.072 µg/L, 7.3 µg/L),
- 4-amino-2,6-dinitrotoluene (0.079 µg/L, 7.3 µg/L, and
- octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) (0.14 µg/L, 1,800 µg/L).

All concentrations were qualified as estimated between the method detection limit (MDL) and practical quantitation limit (PQL). This well is located in an assumed downgradient direction from Bombing Target No. 2 (Range Complex No. 1) and within Field Combat Range No. 84 (Range Complex No. 2). This well was previously used for irrigation water supply, but is currently unused.

5.4.4 Surface Water/Sediment Pathway

No surface water samples were collected at the explosive munitions ranges. In accordance with the SSWP, eight sediment samples and one field duplicate were collected from the explosive munitions ranges. The samples were: Range Complex No. 1 (NWO-017-1002 and NWO-017-1003), Range Complex No. 2 (NWO-017-1004, NWO-017-1005, and field duplicate NWO-017-1006), Bombing Target No. 1 (NWO-017-1007), Range Complex No. 3 (NWO-017-1008), Mortar Range (NWO-017-1009R), and Moving Target Range No. 75 (NWO-017-1010R).

The sediment sample locations were selected based on locations that were downstream from a target area on property where a signed ROE was available. The sediment analytical result detections, background value, and human heath and ecological screening values for the explosive munitions ranges are shown on Tables 5-6A through 5-6F. Potential receptors are residents, farm and forest workers, and recreational users. For the screening risk assessment, it was conservatively assumed that worker exposures to sediments would be similar to those of soil.

5.4.4.1 Comparison to Background

Sediment sample results were compared to the maximum detected concentration from the three background sediment samples. The background sediment sample results are provided in Appendix G. The following samples had background concentration exceedances.

- For Range Complex No. 1, background concentrations for lead (11.1 mg/kg) were exceeded in samples NWO-017-1002 (13.8 mg/kg) and NWO-017-1003 (11.9 mg/kg); background for mercury (0.049 mg/kg) was exceeded in sample NWO-017-1003 (0.058 mg/kg). All exceedances were less than a factor of three times the maximum background value and are not considered significant.
- For Range Complex No. 2, the background concentrations were exceeded for barium (177 mg/kg vs. 173 mg/kg) and lead (11.2 mg/kg vs. 11.1 mg/kg) in sample NWO-017-

1004. All exceedances were less than a factor of three times the maximum background value and are not considered significant.

- For Bombing Target No. 1, the background concentration was exceeded in sample NWO-017-1007 for antimony (0.15 mg/kg vs. not detected), barium (202 mg/kg vs. 173 mg/kg), lead (15.7 mg/kg vs. 11.1 mg/kg), and molybdenum (0.56 mg/kg vs. not detected). Only the antimony detection is considered significant (greater than 3 times background), as the metal was not detected in the background samples. However, antimony is not a metal of concern at Bombing Target No. 1.
- For Range Complex No. 3, background concentrations were exceeded in sample NWO-017-1008 for lead (17.5 mg/kg vs. 11.1 mg/kg) and molybdenum (0.62 mg/kg vs. 0.56 mg/kg). All exceedances were less than a factor of three times the maximum background value and are not considered significant.
- For the Mortar Range, background concentrations were exceeded in sample NWO-017-1009R for aluminum (39,300 mg/kg vs. 36,900 mg/kg), barium (181 mg/kg vs. 173 mg/kg), chromium (117 mg/kg vs. 100 mg/kg), cobalt (76.5 mg/kg vs. 45.8 mg/kg), magnesium (12,900 mg/kg vs. 12,000 mg/kg), manganese (1,800 mg/kg vs. 1,290 mg/kg), nickel (79.5 mg/kg vs. 44.2 mg/kg), and strontium (88 mg/kg vs. 52.4 mg/kg). All exceedances were less than a factor of three times the maximum background value and are not considered significant.
- For the Moving Target Range No. 75, background concentrations were exceeded in sample NWO-017-1010R for barium (444 mg/kg vs. 173 mg/kg), lead (12 mg/kg vs. 11.1 mg/kg), manganese (2,320 mg/kg vs. 1,290 mg/kg), molybdenum (1.2 mg/kg vs. 0.56 mg/kg), and strontium (107 mg/kg vs. 52.4 mg/kg). All exceedances were less than a factor of three times the maximum background value and are not considered significant.

Based on the above, only antimony significantly exceeded the maximum background concentration for sediments at the explosive munitions ranges. However, antimony is not a metal of concern at these AOCs.

5.4.4.2 Comparison to Human Heath Screening Values

The analytical results that significantly exceeded background were compared to human health screening values. No metals significantly exceeded the background concentration and also the human health screening value.

5.4.4.3 Comparison to Ecological Screening Values

The analytical results were compared to ecological screening values if they also significantly exceeded background concentrations. There were no samples that had concentrations that significantly exceeded the background concentrations and also ecological screening values.

5.4.5 Terrestrial Pathway

The potential routes of human exposure to metals and explosives in the surface soil include incidental ingestion, dermal contact, or inhalation of soil particulates during intrusive work. Current exposure scenarios would primarily involve farm workers exposed to surface soil while planting crops. In addition, workers would be potentially exposed to surface and subsurface soil

during intrusive activities such as tilling or digging. Children playing in soils also are viable exposure scenarios. Future land use is expected to remain as discussed in Section 5.3.1 above. Therefore, potential future exposures to soil would be similar to current exposures.

Soil sampling at the explosive munitions ranges was completed as planned in accordance with the SSWP with the collection of:

- Four surface soil samples from Range Complex No. 1. Soil sampling locations were selected based on suspected troop maneuver areas. No direct information of areas of concentrated activity was available. Sample locations within the Bombing Target No. 2 subrange were located near the target center, where an existing ROE was available.
- Seven surface soil samples from Range Complex No. 2. Soil sampling locations were selected based on suspected troop maneuver areas and at known artillery target areas provided a ROE was available for the property.
- One surface soil sample from range Bombing Target No. 1. The sample location was selected near the target center where an existing ROE was available.
- Four surface soil samples from Range Complex No. 3. Sample locations were selected based on suspected maneuver areas where an ROE was available. No direct information of areas of concentrated activity was available.
- Three surface soil samples plus one field duplicate from the Mortar Range. Sample locations were selected within the suspected impact area, although no specific information was available as to the location of the impact area.
- Two surface soil samples plus one field duplicate from the Moving Target Range No. 75. The sample locations were selected from where the suspected roads (trails) for the moving targets were indicated on aerial photos.

All samples were composite samples, collected at or near the locations and coordinates specified in the Final SSWP. Each composite surface soil sample was collected from between 0 to 6-inches depth and consisted of seven surface samples collected in a wheel pattern (2 ft diameter). All soil samples were analyzed for metals and explosives, including nitroglycerin and pentaerythritol tetranitrate (PETN). Soil analytical result detections, background soil concentrations and human health and ecological screening values for the explosive munitions ranges are shown on Tables 5-7A through 5-7F.

5.4.5.1 Comparison to Background Data

Analytical results were compared were compared to the metals background concentrations. The following summarizes the background concentration exceedances.

- For Range Complex No. 1 AOC, the background concentration for mercury (0.06 mg/kg) was exceeded in sample NWO-017-0022 at a concentration of 0.089 mg/kg.
- For Range Complex No. 2 AOC, the background concentration for mercury (0.06 mg/kg) was exceeded in sample NWO-017-0030 at a concentration of 0.086 mg/kg.

- For the Range Complex No. 3 AOC, the background concentration for molybdenum (1.36 mg/kg) was exceeded in sample NWO-017-0036 at a concentration of 5.7 mg/kg.
- For the Mortar Range AOC, the background concentration for strontium (57.1 mg/kg) was exceeded in samples NWO-017-0039R, NWO-017-0040RR, and field duplicate NWO-017-0040RR-ED at concentrations of 78.4 mg/kg, 86.3 mg/kg, and 89.3 mg/kg, respectively. The background concentration for cadmium (0.996 mg/kg) was exceeded in sample NWO-017-0040R at a concentration of 1 mg/kg. The background concentration for chromium (153 mg/kg) was exceeded in samples NWO-017-00040R and field duplicate sample NWO-017-0040RR-ED at concentrations of 175 mg/kg and 155 mg/kg, respectively.
- For Moving Target Range No. 75 AOC, the background concentration for strontium (57.1 mg/kg) was exceeded in samples NWO-017-0041, NWO-017-0042, and field duplicate NWO-017-0043 at concentrations of 131 mg/kg, 61.4 mg/kg, and 62.6 mg/kg, respectively. The background concentration for barium (472 mg/kg) was exceeded in sample NWO-017-00041 at a concentration of 646 mg/kg. However, strontium is not a metal of concern of the explosive munitions ranges.

All explosives, nitroglycerine, and PETN results in soil were not detected. It is noted that explosives were detected at low concentrations below human health screening values in a groundwater well in the Explosives Munitions Ranges (Section 5.4.3). These results may indicate a release to soil that was not detected by the soil sampling.

5.4.5.2 Comparison to Human Health Screening Values

The analytical results that exceeded background concentrations were compared to human health screening values. No analytical results exceeded both the human health screening value and background concentrations.

5.4.5.3 Comparison to Ecological Screening Values

Analytical results were compared to the ecological screening values and are identified below if the also exceeded the background concentrations. The following samples had concentrations that exceeded both the background concentrations and ecological screening values.

- For Range Complex No. 3, the ecological screening value for molybdenum (2 mg/kg) was exceeded in sample NWO-017-0036 at a concentration of 5.7 mg/kg.
- For the Mortar Range, the ecological screening value for chromium (0.4 mg/kg) was exceeded in samples NWO-017-0040R and field duplicate sample NWO-017-0040RR-ED at concentrations of 175 mg/kg and 155 mg/kg, respectively.
- For Moving Target Range No. 75, the ecological screening value for barium (85 mg/kg) was exceeded in sample NWO-017-0041 at a concentration of 646 mg/kg).

As ecological receptors are possible at the site, and the maximum detected concentrations of these inorganics in soil exceed the ecological screening values by a significant factor, adverse ecological effects are possible.

5.4.6 Air Pathway

By agreement at the TPP meeting air is not considered to be a significant pathway as inhalation of MC in vapor form is not a pathway of concern for non-volatile MC under normal environmental conditions. The potential inhalation of soil particles is included in the development of health-based screening values for soil.

5.5 Live Hand Grenade Courts

5.5.1 General History and Field Findings

The live hand grenade courts were used by the Army between 1942 and 1945. Table 1-1 provides a listing of the ranges and approximate acreage included in the Live Hand Grenade Courts designation. The courts were used for training in the use of live (explosive) and/or training hand grenades. Grenades were thrown from individual throwing bays constructed from sandbags or concrete, or from a trench. Grenades were thrown toward targets in an impact area approximately 25 yards from the throwing line. A danger area of approximately 600 ft would have been established around each court.

During SI field activities, no MEC or munitions debris was found.

The East and West Live Hand Grenade Court AOCs are currently within tilled farm land that is used for growing grass seed. Live Hand Grenade Court No. 129 AOC is within a Christmas tree farm and the ground has been cleared and tilled. There are no noticeable remnants of the grenade courts. The actual grenade courts were assumed to be near the center of the AOC, the number of throwing bays in each court is unknown. Access to the land is unrestricted and open to the public.

5.5.2 Sampling and Analysis

Sample details are provided in Table 5-1 and analytical detections are listed in Tables 5-8A through 5-9C. Figures 5-12, 5-13, and 5-14 show the live hand grenade courts SI sampling locations and indicate if an exceedance of background concentrations and human health and/or ecological screening values has occurred. Field records are provided in Appendix D and representative photographs of sampling activities are included as Appendix E. Complete analytical data are presented in Appendix F and the Analytical Data QA/QC Report is included as Appendix G.

5.5.3 Groundwater Pathway

No groundwater samples were proposed or collected within the live hand grenade court AOCs. It was agreed at the TPP meeting that groundwater sampling would not be required due to the proximity of the AOC boundaries with those of Range Complex Nos. 1 and 2.

5.5.4 Surface Water/Sediment Pathway

No surface water samples were collected at the live hand grenade court AOCs. In accordance with the SSWP, two sediment samples and one field duplicate were collected. The samples

were: East Live Hand Grenade Court AOC (NWO-017-10011) and Live Hand Grenade Court No. 129 AOC (NWO-017-1012 and field duplicate NWO-017-1013). The sediment sample collected from the East Live Hand Grenade Court was selected from the creek bottom located east of the AOC center. The sample collected for Live Hand Grenade Court No. 129 was collected from a creek located southwest and down slope of the AOC.

The sediment analytical result detections, background value, and human heath and ecological screening values for the live hand grenade courts are shown on Tables 5-8A and 5-8B. Potential receptors are residents, farm and forest workers, recreational users, and ecological receptors. For the screening risk assessment, it was conservatively assumed that worker exposures to sediments would be similar to those of soil.

5.5.4.1 Comparison to Background

Sediment sample results were compared to the maximum detected concentration from the three background sediment samples. The background sediment sample results are provided in Appendix F. Background concentrations were exceeded in sample NWO-017-1011 for barium (188 mg/kg vs. 173 mg/kg), lead (11.6 mg/kg vs. 11.1 mg/kg), and manganese (1,460 mg/kg vs. 1,290 mg/kg). All exceedances were less than a factor of three times the maximum background value and are not considered significant.

5.5.4.2 Comparison to Human Heath Screening Values

The analytical results were compared to human health screening values and are identified if they also significantly exceeded background concentrations. No sample results significantly exceeded background groundwater concentrations and also the human health screening values.

5.5.4.3 Comparison to Ecological Screening Values

The analytical results were compared to ecological screening values and are identified if they also significantly exceeded background concentrations. No samples significantly exceeded background concentrations and also the ecological screening values.

5.5.5 Terrestrial Pathway

The potential routes of human exposure to metals and explosives in the surface soil include incidental ingestion, dermal contact, or inhalation of soil particulates during intrusive work. Current exposure scenarios would primarily involve farm workers exposed to surface soil while planting crops. In addition, workers would be potentially exposed to surface and subsurface soil during intrusive activities such as tilling or digging. Future land use is expected to remain as discussed in Section 5.3.1 above. Therefore, potential future exposures to soil would be similar to current exposures.

Soil sampling at the live hand grenade courts was completed as planned in accordance with the SSWP with the collection of one sample each from the three live hand grenade court AOCs.

Sample locations were selected from the center of the AOC, as there was no visible evidence of the grenade court.

All samples were composite samples, collected at or near the locations and coordinates specified in the Final SSWP. Each composite surface soil sample was collected from between 0 to 6-inches depth and consisted of seven surface samples collected in a wheel pattern (2 ft diameter). Soil samples were analyzed for metals and explosives, including nitroglycerin and PETN. Soil analytical result detections, background soil concentrations, and human health and ecological screening values for the live hand grenade courts are shown on Tables 5-9A through 5-9C.

5.5.5.1 Comparison to Background Data

All explosives, nitroglycerine, and PETN results in soil were not detected.

Analytical results were compared to the metals background concentrations. There were no exceedances of soil background concentrations in any sample.

5.5.5.2 Comparison to Human Health Screening Values

The analytical results were compared to human health screening values and are identified if they also exceeded background concentrations. No analytical results exceeded both the human health screening value and background concentrations.

5.5.5.3 Comparison to Ecological Screening Values

Analytical results were compared to the ecological screening values and are identified below if the also exceeded the background concentrations. No analytical results exceeded both the ecological screening value and background concentrations.

5.5.6 Air Pathway

By agreement at the TPP meeting air is not considered to be a significant pathway as inhalation of MC in vapor form is not a pathway of concern for non-volatile MC under normal environmental conditions. The potential inhalation of soil particles is included in the development of health-based screening values for soil.

5.6 Practice Grenade Courts

5.6.1 General History and Field Findings

The ranges were used by the Army between 1942 and 1945. Table 1-1 provides a listing of the ranges and approximate acreage included in the Practice Grenade Courts designation. The courts were used to allow troops to throw training or practice grenades prior to throwing a live grenade (see Figure 24 of the *Final TPP Memorandum*). A typical practice court consisted of a number of individual courts designed to allow men to throw under a variety of conditions. The AOCs shown on Figure 24 of the Final TPP Memorandum are assumed to have been used for practice grenade training and no safety zones were included in the boundaries.

The practice grenade courts are currently within tilled farm land that is used for growing row crops, grass seed, and other agricultural crops. There are no noticeable remnants of the AOCs (USACE, 2004b). Access to the land is unrestricted and open to the public.

5.6.2 Sampling and Analysis

No field activities were proposed or completed within the practice grenade court AOCs. It was agreed at the TPP meeting that MEC (other than black powder spotting charges) would not be expected and MC from the training grenades would be minimal. Black powder consists of charcoal, potassium nitrate, and sulfur, which are not hazardous substances under CERCLA.

5.7 Chemical Identification Area

5.7.1 General History and Field Findings

The area was used by the Army between 1942 and 1945. According to a Camp Adair Training Aids General Layout map dated January 1944, Range No. 182 was used for CWM recognition and decontamination exercises. Another map lists the area as a gas chamber. CWM recognition training was likely to have included the use of CAIS and/or detonation sets. CAIS consisted of several bottles containing small quantities of CWM gases or solids; bottles were opened so that trainees could experience the smell of the specific CWM. Detonation sets were containers (one gallon) holding larger quantities of CWM agents, which were detonated, creating an agent cloud. Trainees would then try to identify the agent based on its odor and other characteristics. The location for the training with detonation sets was not specified in the ASR documentation, but it is likely that it occurred on a training course or range that had sufficient land area for the exercise and not at Chemical Identification Area No. 182, which was primarily a gas chamber.

Decontamination exercises, as documented in historical photos from the camp, involved small sections of wooden floors and walls contaminated by vesicant gas (mustard and Lewisite) being treated with a decontaminant solution such as “chloride of lime.” The location of the training exercises was not identified in the ASR.

Other CWM activities documented at unspecified locations within Camp Adair include:

- Decontamination of mustard-contaminated vehicles,
- Neutralization of chemical land mines, possibly containing mustard filling,
- Field simulation of a CWM battlefield, in which troops traverse an area, contaminated with a mustard mixture, applying their training skills.
- Gas mask training using tear gas in gas chambers.

The Chemical Identification Area No. 182 AOC is currently within tilled farm land that is used for growing row crops, grass seed, and other agricultural crops. No MEC was observed in the ASR inspection and there were no noticeable remnants of the AOC (USACE, 2004b). Access to the land is unrestricted and open to the public.

5.7.2 Sampling and Analysis

No field activities were proposed or completed within the Chemical Identification Area No. 182 AOC. It was agreed at the TPP meeting that only a small quantity of explosive material may have been used in this area and does not pose a significant risk of environmental contamination and any CWM agents that may have been released in this area would not be expected to have persisted and/or have been released in quantities that would pose a significant risk of environmental contamination.

6.0 Summary and Conclusions

The conclusions of the SI are presented in this section. Recommendations for further action are presented in Section 7.0 and Appendix K.

Camp Adair is included in the MMRP Inventory in the *Defense Environmental Programs Fiscal Year 2005 Annual Report to Congress* (DoD, 2005a), and in the ASR *Supplement* (USACE, 2004b), with 21 identified ranges. The 21 ranges and associated subranges are identified on Table 1-1.

6.1 Small Arms Ranges

No MEC or munitions debris, other than an expended bullet and a fragment of a clay target were encountered or have been reported at the small arms ranges. Based on the discussion in Section 4.2.1 the small arms ranges have low MEC risk, due to the use for small arms training only and extensive reworking of the surface soil for farming.

During the SI field work, 4 groundwater, one sediment, and 18 soil samples were collected from the small arms ranges. Analytes included lead in all soil, sediment, and groundwater samples, perchlorate in groundwater samples, and PAHs in the three samples from the Skeet Range No. 580. Analytical results were compared to site background values. If the analytical results significantly exceeded the background value (greater than three times background concentration), the results were then compared to EPA Region 9 PRGs for human health risk screening and site inspection ecological risk screening values developed during the TPP process. The exceedances and subsequent evaluation are summarized below.

6.1.1 Groundwater Pathway

There were no exceedances of Camp Adair groundwater background values and human health risk screening values. There does not appear to be an impact to groundwater at the small arms ranges based on the four groundwater samples collected at the small arms ranges.

6.1.2 Surface Water/Sediment Pathway

No surface water samples were collected during the SI field work. Analytical results from the sediment sample indicate no exceedances of Camp Adair sediment background concentrations and human health or ecological screening values. There does not appear to be an impact to sediments at the small arms ranges based on the sediment sample collected at the small arms ranges.

6.1.3 Terrestrial Pathway

Analytical results from soil samples collected during the SI indicate the following:

- There were no exceedances of background concentrations and the EPA Region 9 PRGs for human health. Therefore there is no expected adverse impact to human health from military activity at the five AOCs included in the small arms ranges.
- The detected concentration for lead in two surface soil samples from Range Complex No. 4 exceeded the background concentration and the ecological screening value. Based on the SLERA (Appendix L) adverse ecological effects are possible at Range Complex No. 4.
- The detected concentration for lead in two surface soil samples from the Skeet Range No. 580 exceeded the background concentrations and the ecological screening value. Based on the SLERA (Appendix L) adverse ecological effects are possible at Skeet Range No. 580.
- PAHs were detected in one soil sample from the Skeet Range No. 580. Concentrations were all below human health and ecological screening levels.

6.2 Explosive Munitions Ranges

MEC and munitions debris have been reported at all AOCs except for Range Complex No. 3. No MEC or munitions debris was identified during the SI field activities. Based on the current use of the explosive munitions ranges and the historical occurrence of MEC and munitions debris, the overall MEC risk is considered to be moderate.

During the SI field work, 7 groundwater, 8 sediment, and 21 soil samples were collected from the explosive munitions ranges. Analytes included metals and explosives in all samples, plus perchlorate in groundwater samples. Analytical results were compared to site background values. If the analytical results exceeded the background value, the results were then compared to EPA Region 9 PRGs for human health risk screening and site inspection ecological risk screening values developed during the TPP process. The exceedances and subsequent evaluation is summarized below.

6.2.1 Groundwater Pathway

Based on analytical results from groundwater samples collected during the SI, the groundwater pathway impacts are as follows:

- Iron, molybdenum, and cobalt were detected at concentrations greater than three times their respective background values and may indicate a release to the environment has occurred.
- Iron in one sample and manganese in a second sample from Range Complex No. 2 significantly exceeded (by a factor of 3) their respective Camp Adair maximum background concentration and the secondary Federal MCL, but did not exceed the EPA Region 9 tap water PRG. Both the iron and manganese MCLs are secondary MCLs that reflect primarily taste and odor impacts and are not a human health risk.
- No other groundwater analytical results significantly exceeded the maximum groundwater background values and human health screening values.

- Explosive compounds were detected at estimated concentrations between the MDL and PQL in one groundwater sample from a well located adjacent to Range Complex No. 1. All detections were below groundwater human health screening values.

Based on the above discussion, military activity at the explosive munitions ranges has not resulted in an adverse impact to groundwater with respect to human health.

6.2.2 Surface Water/Sediment Pathway

No surface water samples were collected during the SI field work. Based on analytical results from sediment samples collected during the SI, there were no samples that had concentrations that significantly exceeded the background concentrations and also either human health or ecological screening values. Based on these results, military activity at the explosive munitions ranges has not resulted in adverse impact to sediments with respect to human health or ecological receptors.

6.2.3 Terrestrial Pathway

Based on analytical results from surface soil samples collected during the SI, the terrestrial pathway impacts are as follows:

- There were no exceedances of background concentrations and the EPA Region 9 PRGs for human health.
- Molybdenum from Range Complex No. 3, chromium in samples from the Mortar Range, and barium in a sample from Moving Target Range No. 75 exceeded both the soil background value and the ecological screening value. Based on the SLERA, the maximum detected concentrations of these metals in soil exceed the ecological screening values by a significant amount, and adverse ecological effects are possible.

Based on the above discussion, military activity at the explosive munitions ranges has not resulted in an adverse impact to human health via the terrestrial pathway. However, there appear to be potential ecological impacts in soil at the Range Complex No. 3, Mortar Range, and Moving Target Range No. 75.

6.3 Live Hand Grenade Courts

MEC and munitions debris have been reported at Live Hand Grenade Court No. 129 and the West Live Hand Grenade Court. No MEC or munitions debris was identified during the SI field activities. Based on the current use of the live hand grenade court AOCs and limited historical occurrence of MEC and munitions debris, the overall MEC risk is considered to be moderate.

During the SI field work, two sediment and three soil samples were collected from the live hand grenade courts. Analytes included metals and explosives in all samples. Analytical results were compared to site background values. If the analytical results exceeded the background value, the results were then compared to EPA Region 9 PRGs for human health risk screening and site inspection ecological risk screening values developed during the TPP process. The exceedances and subsequent evaluation are summarized below.

6.3.1 Groundwater Pathway

No groundwater samples were collected from the live hand grenade courts. It was agreed at the TPP meeting that groundwater sampling would not be required due to the proximity of the AOC boundaries with those of Range Complex Nos. 1 and 2.

6.3.2 Surface Water/Sediment Pathway

No surface water samples were collected during the SI field work. Based on analytical results from sediment samples collected during the SI, there were no significant exceedances of background concentrations.

Based on the above discussion, military activity at the live hand grenade courts has not resulted in an adverse impact to human health or ecological receptors via the surface water and sediment pathway.

6.3.3 Terrestrial Pathway

Based on analytical results from surface soil samples collected during the SI, the terrestrial pathway impacts are as follows:

- There were no exceedances of background concentrations and the EPA Region 9 PRGs for human health. Therefore, there is no adverse impact to humans from military activity at the three AOCs included in the live hand grenade courts.
- There were no exceedances of background concentrations and the ecological screening values. Therefore, there is no adverse impact to ecological receptors from military activity at the three AOCs included in the live hand grenade courts would be expected.

Based on the above discussion, military activity at the live hand grenade courts has not resulted in an adverse impact to human or ecological receptors inform potential exposure to soils.

6.4 Practice Grenade Courts

MEC has not been reported at the practice grenade courts. However, munitions debris consisting of training grenades have been reported being found at Practice Grenade Court Nos. 125, 126, and 127. These practice grenades would have contained only a spotting charge of black powder. Based on the current use of the practice grenade court AOCs and no occurrence of MEC or munitions debris, the overall MEC risk is considered to be low.

No field activities were conducted at the practice grenade courts during the SI. Based on reported use of the site for the use of practice grenades only, the only contaminant impact would be from metals (i.e., rusting of grenade bodies). Using SI results for metals from the live hand grenade courts as a model, there would be no adverse human health impacts in either the sediment or terrestrial pathways. It is possible that adverse impact to ecological receptors may occur in sediments as a result of elevated metals concentrations.

6.5 Chemical Identification Area No. 182

MEC has not been reported at Chemical Identification Area No.182. Based on the current use of this AOC and no historic occurrence of MEC or munitions debris, the overall MEC risk is considered to be low. No field activities were conducted. It was agreed at the TPP meeting that only a small quantity of explosive material (detonation cord) may have been used in this area and does not pose a significant risk. Any CWM agents that may have been released in this area would not be expected to have persisted (other than mustard agent, which crusts over and does not migrate) and would not have been released in quantities that would pose a significant risk of environmental contamination.

6.6 Camp Adair FUDS Summary

Camp Adair consisted of nearly 57,000 acres of land that were used during World War II to train infantry troops for battle. A wide range of munitions were used, from small arms to field artillery, to aerial bombs. The results of this SI indicate that portions of Camp Adair, specifically the explosive munitions ranges and the live hand grenade courts have a moderate risk for MEC. Other areas within Camp Adair have a low MEC risk.

Sampling of groundwater indicates that MC impacts to groundwater are minimal and sampling of soils and sediments indicate that it is unlikely that there is an MC source that could in the future adversely impact groundwater. Sampling of soil and sediment indicates that some metals concentrations were above background and ecological screening values. The SI sampling did not detect any explosives compounds above screening values and no perchlorate was detected in groundwater.

7.0 Recommendations

Results of the SI provide the basis for conclusions and/or recommendations for further actions at each of the AOCs.

7.1 Small Arms Range

Based on historical evidence and results from the SI field activities, there is no evidence of MEC at any of the five small arms ranges. All of the small arms ranges are recommended for NDAI for MEC.

Sampling results at Range Complex No. 5 and Range Complex No. 6 show that concentrations of potential contaminants are below human health and ecological screening levels agreed by the stakeholders. These two ranges are recommended for NDAI for MC.

The Infiltration Range No. 143 has been incorporated into the Coffin Butte Landfill operations. The area of Infiltration Range No. 143 has been heavily excavated and the soil has been disturbed, reworked or removed. In 1994 a small amount of soil containing white phosphorus was discovered and was subsequently allowed to burn and the risk has been eliminated. No soil sampling was conducted during the SI field activities. Based on these findings, the Infiltration Range No. 143 is recommended for NDAI for MC.

Soil from Range Complex No. 4 had lead concentrations that were above the background soil concentration and the ecological screening level. The lead concentrations in these samples are considered significant as Camp Adair meets some of the criteria for designation as an IEP (Section 2.4.6). As agreed to during the TPP and documented in the DQOs, "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." No recommendation for either NDAI or RI/FS is made relative to MC until consultation with the stakeholders is completed.

Skeet Range No. 580 had lead concentrations above the background soil concentration and ecological screening level. Sheet Range No. 580 is currently a county park with baseball fields, tennis courts, and playgrounds and does not in itself contain any criteria that would identify it as an IEP. As agreed to during the TPP and documented in the DQOs, "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." No recommendation for either NDAI or RI/FS is made relative to MC until consultation with the stakeholders is completed.

7.2 Explosive Munitions Ranges

Based on historical evidence, MEC and munitions debris have been identified in five of the six explosive munitions ranges. No MEC or munitions debris has been reported at Range Complex No. 5. Field activities conducted during the SI did not find any MEC or munitions debris. Based on historical findings, the explosive munitions ranges are recommended for RI/FS with regard to MEC.

SI sampling results show that concentrations of metals and explosives in groundwater, sediment, and soil are low and are below human health screening values. Exceedances of soil background and ecological screening values were identified as follows:

- Molybdenum in soil at Range Complex No. 3,
- Chromium in soil at the Mortar Range, and
- Barium in soil at the Moving Target Range No. 75.

The metals concentrations in these samples are considered significant as Camp Adair meets some of the criteria for designation as an IEP (Section 2.4.6). As agreed to during the TPP and documented in the DQOs, "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." No recommendation for either NDAI or RI/FS is made relative to MC until consultation with the stakeholders is completed.

7.3 Live Hand Grenade Courts

Based on historical evidence, as documented in the ASR, MEC has been reported at the Live Hand Grenade Court No. 129 and the West Live Hand Grenade Court. No MEC has been reported at the East Live Hand Grenade Court. However, based on similar historical uses there is risk of MEC at the East Live Hand Grenade Court. Field activities conducted during the SI did not identify any MEC or munitions debris. Based on these findings, the three live hand grenade courts are recommended for RI/FS with respect to MEC.

SI sampling results show that concentrations of metals in sediment and soil are low and below both human health and ecological screening values. There were no detections of explosives in sediment or soil. Based on these findings, the three live hand grenade courts are recommended for RI/FS with respect to MC.

7.4 Practice Hand Grenade Courts

Based on historical evidence and results from the SI field activities, training grenades have been found at Practice Grenade Courts Nos. 125, 126, and 127. These training grenades may contain a small black powder spotting charge. The risk of injury from these training grenades is

considered low. Based on the potential presence of MEC, the practice grenade courts are recommended for RI/FS with respect to MEC.

No sampling was conducted at the practice grenade courts. However, potential contaminants are limited to a few common metals (iron, and small quantities of manganese and nickel). The spotting charges were black powder, which does not contain CERCLA hazardous substances. The practice grenade courts are recommended for NDAI with respect to MC.

7.5 Chemical Identification Area No. 182

Based on historical documentation, there is no evidence of MEC at the Chemical Identification Area No. 182. The area is currently tilled farm land. No sampling was completed at this range. Based on the possibility of buried MEC and MC, the Chemical Identification Area No. 182 is therefore recommended for RI/FS with respect to MEC and MC.

7.6 Removal Actions

Section 1.3 identified as one of the decision rules evaluation of whether a TCRA is warranted. A TCRA would be warranted if a high MEC hazard or an elevated MC risk were identified. There is no indication that a high MEC risk is present at Camp Adair. No MEC was identified during the SI field activities and no reports of MEC have been made since 2001 (USACE, 2001). In addition, reports of MEC have progressively declined since the 1950s.

Based on SI sampling results, no elevated MC risk has been identified. Only limited exceedances of human heath or ecological screening criteria were noted. Based on the above discussion, a TCRA at Camp Adair is not warranted.

7.7 Munitions Response Sites

Results of the SI field activities and the range inventory contained in the MMRP Inventory in the *Defense Environmental Programs Fiscal Year 2005 Annual Report to Congress* (DoD, 2005) provide the basis for identifying munitions response areas (MRAs) and/or munitions response sites (MRSs) and for scoring each MRS using the MRSPP. Individual range identifier numbers are listed on Table 1-1.

Based on the use and physical distribution of the ranges at Camp Adair, 19 MRA/MRSs are identified Figures 7-1a and 7-1b:

- MRA/MRS No. 1: Includes Range Complex No. 1, Range Complex No 2, and Bombing Target No. 1. The three ranges overlap geographically and have overlapping impact areas.
- MRS No. 2: Consists of Range Complex No. 3.
- MRS No. 3: Consists of the East Live Hand Grenade Court.
- MRS No. 4: Consists of Live Hand Grenade Court No. 129.
- MRS No. 5: Consists of the West Live Hand Grenade Court.

- MRS No. 6: Consists of Moving Target Range No. 75.
- MRS No. 7: Consists of Range Complex No. 4.
- MRS No. 8: Consists of the Mortar Range.
- MRS No. 9: Consists of Range Complex No. 5.
- MRS No. 10: Consists of Range Complex No. 6.
- MRS No. 11: Consists of Infiltration Range No. 143.
- MRS No. 12: Consists of Skeet Range No. 580.
- MRS No. 13: Consists of Practice Grenade Court No. 120.
- MRS No. 14: Consists of Practice Grenade Court No. 121.
- MRS No. 15: Consists of Practice Grenade Court No. 122.
- MRS No. 16: Consists of Practice Grenade Courts No. 125.
- MRS No. 17: Consists of Practice Grenade Courts No. 126.
- MRS No. 18: Consists of Practice Grenade Courts No. 127.
- MRS No. 19: Consists of Chemical Identification Area No. 182.

The MRSPP scoring packages for the MRA/MRS are included in Appendix K.

8.0 References

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Figures

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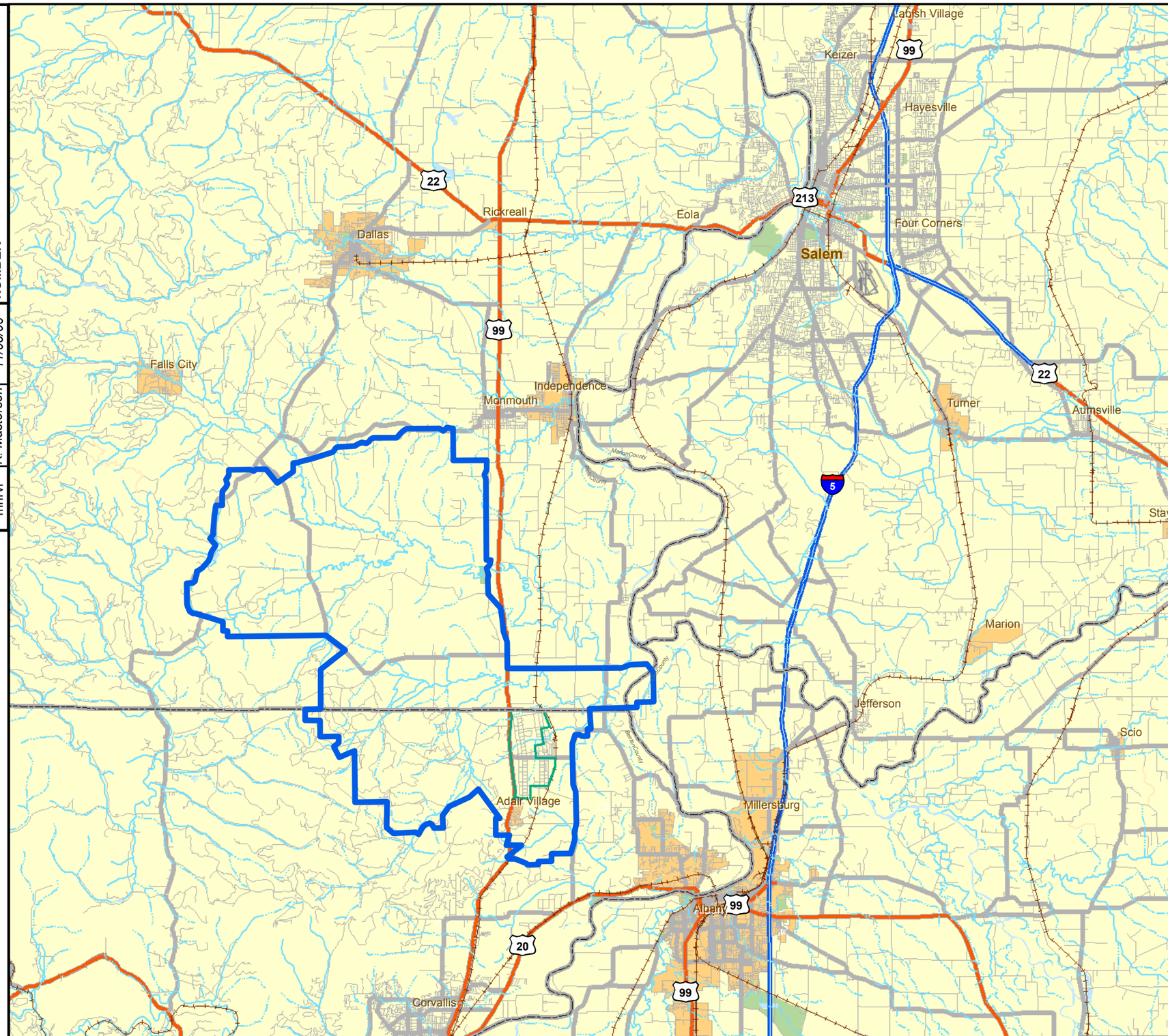


Legend

Camp Adair Installation Area

NOTES:
1) Installation area was derived from the Camp Adair ASR Supplement.

N

0 0.5 1 2
Miles

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 1-1

SITE LOCATION

CAMP ADAIR

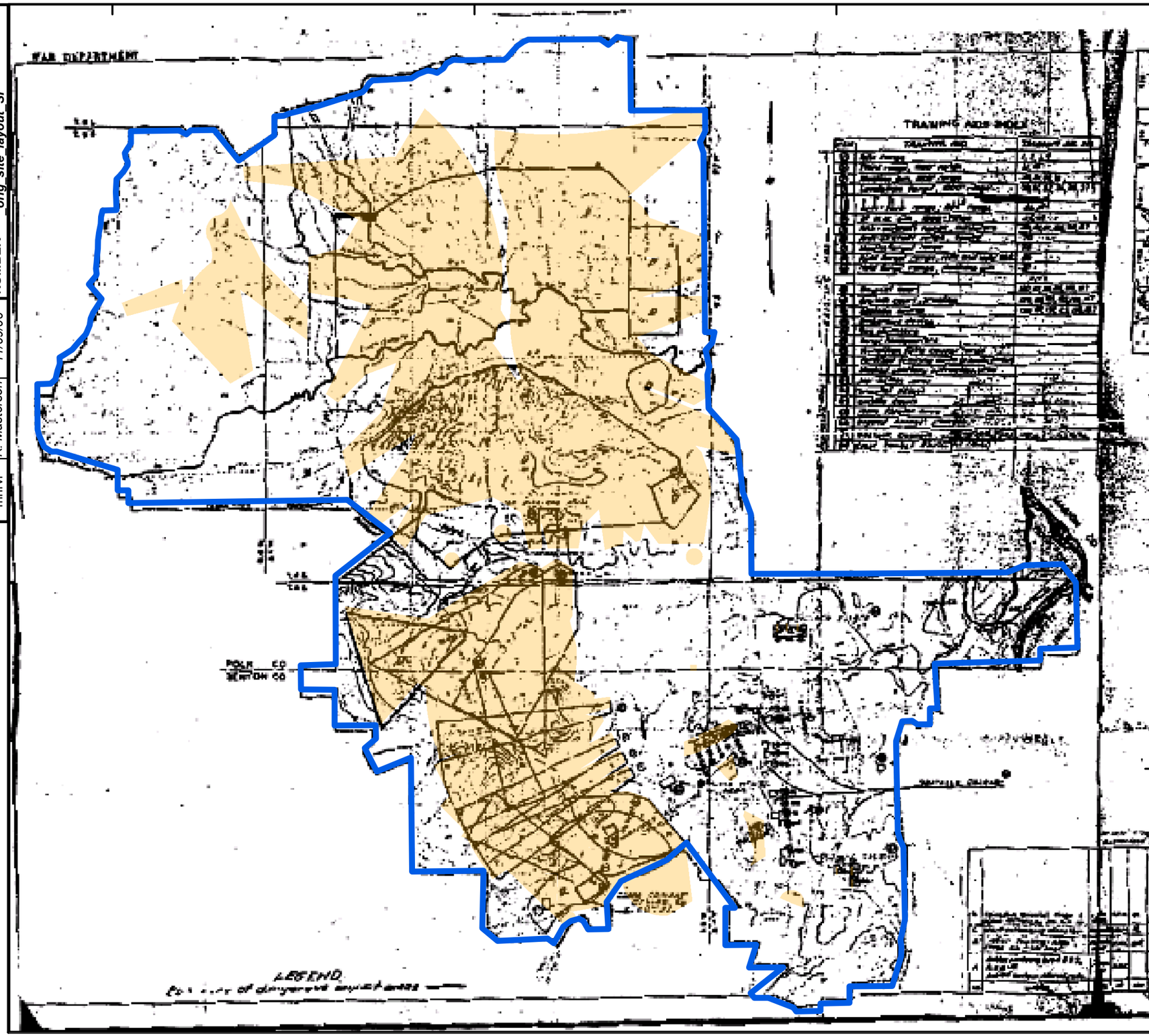
Shaw Environmental, Inc.

123°24'0"W

123°18'0"W

123°12'0"W

44°48'0"N



OFFICE	DRAWN BY		DRAWING NUMBER
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Legend

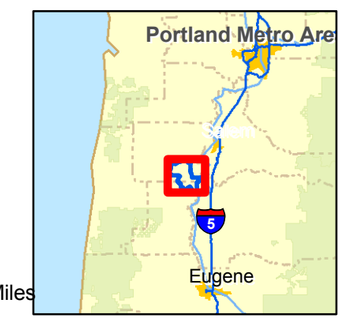
- Camp Adair Installation Area
- Camp Adair AOCs

NOTES:

1) Historical site layout was obtained from the Camp Adair ASR Document and depicts the general layout in 1945.

N

0 0.5 1 2 Miles



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 2-1

ORIGINAL SITE LAYOUT

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY			DRAWING NUMBER
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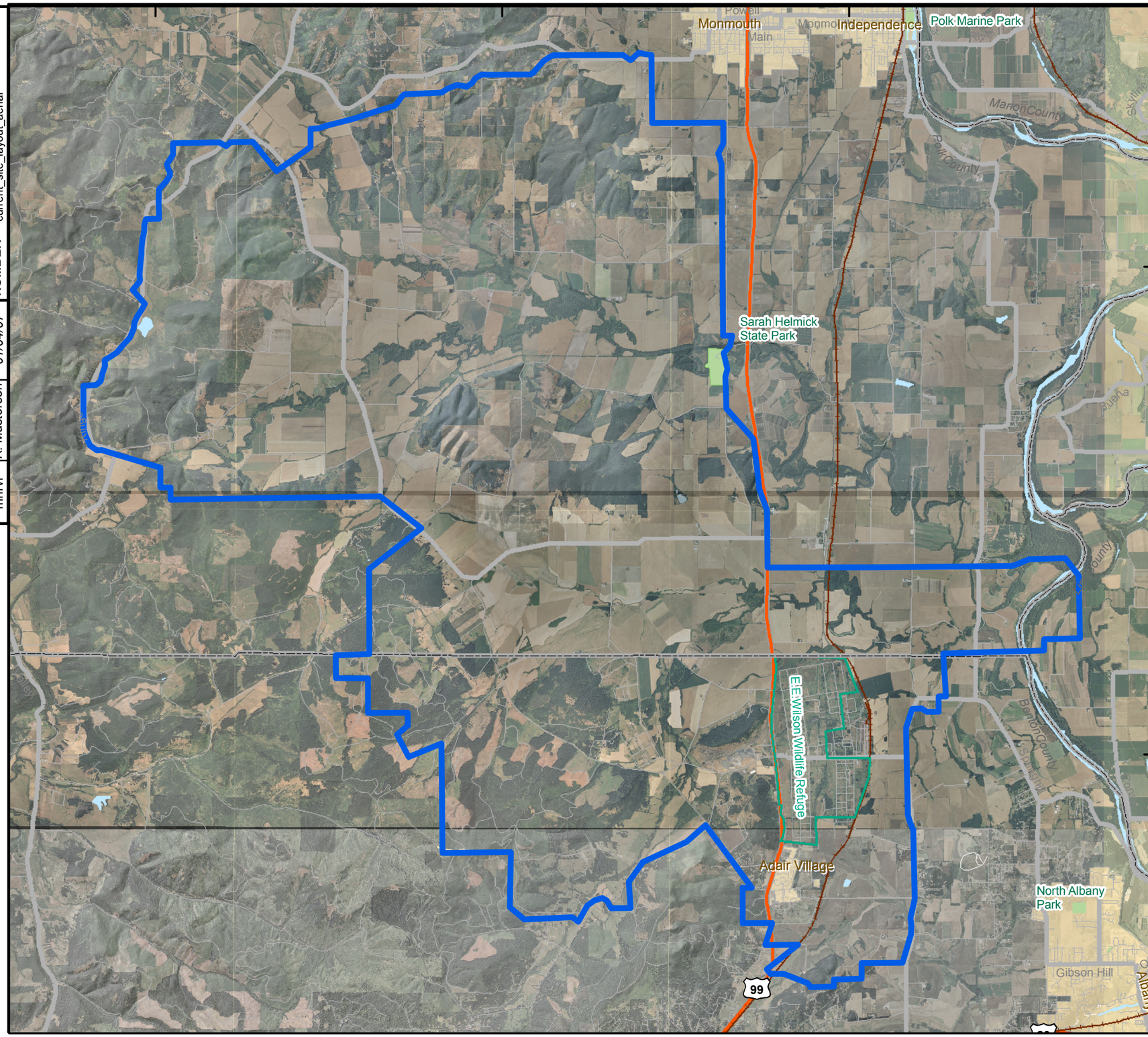

Legend

Camp Adair Installation Area

NOTES:

1) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 0.5 1 2 Miles

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

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FIGURE 2-2
CURRENT SITE CONDITIONS
AERIAL PHOTOGRAPH

CAMP ADAIR

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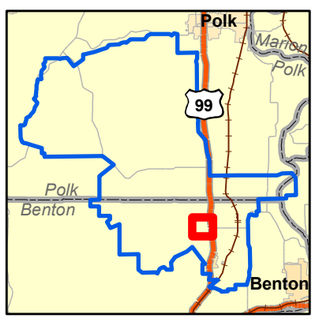
Legend

- Camp Adair FUDS Boundary
- Infiltration Range No. 143 AOC Boundary
- Range Complex No. 5 AOC Boundary
- Taxlot Parcel

Notes:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.



0 500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
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FIGURE 2-3A

PARCEL OWNERSHIP
SMALL ARMS RANGES
INFILTRATION RANGE NO. 143
CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
mnrvl	K.Masterson	01/04/07	CampAdair_075_fig2_3a_IR143_parcel_SI

OFFICE	DRAWN BY		DRAWING NUMBER
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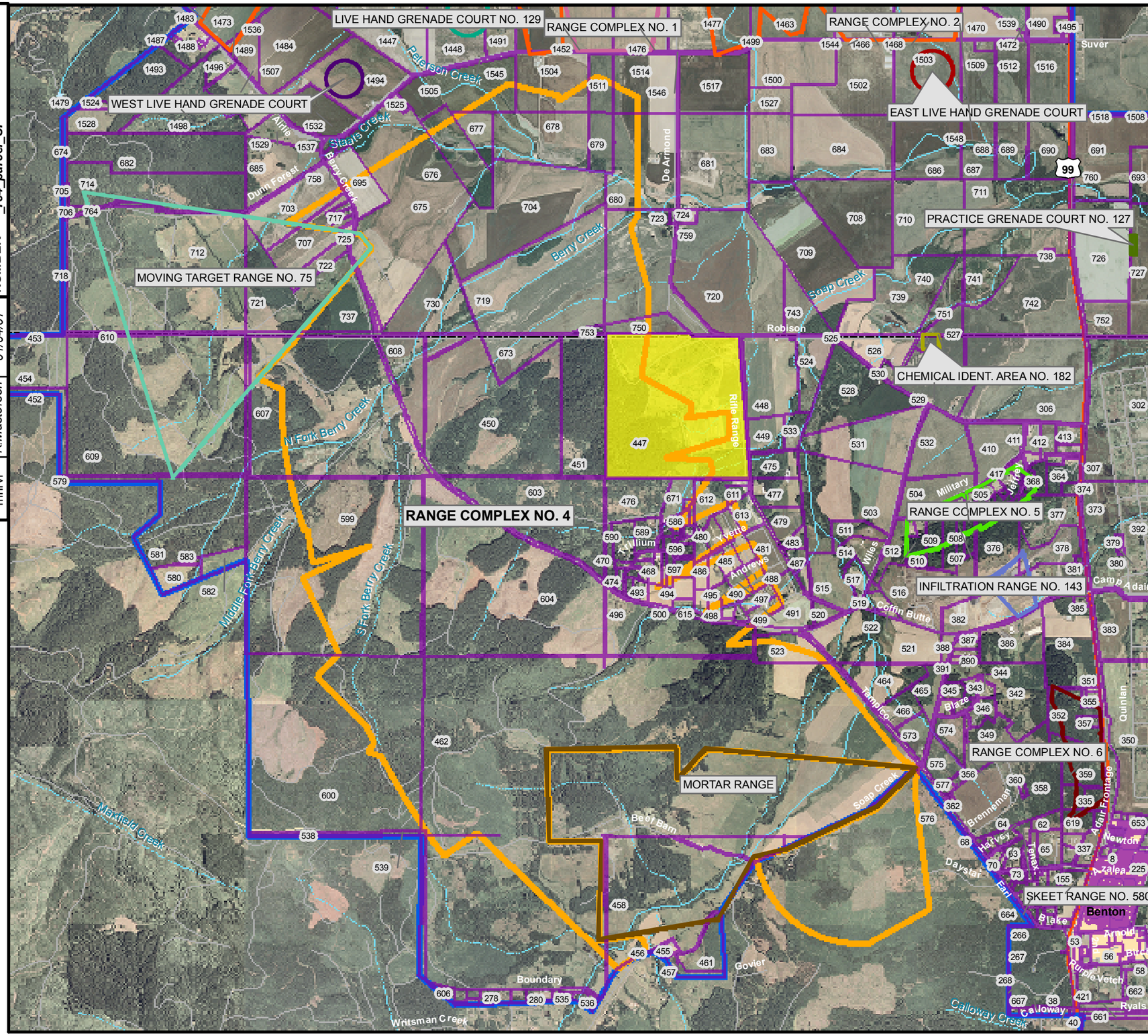


Legend

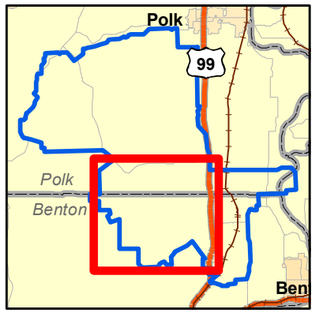
- Camp Adair FUDS Boundary
- Range Complex No. 4 AOC Boundary
- Chemical Ident. Area No. 182 AOC Boundary
- East Live Hand Grenade Court AOC Boundary
- Infiltration Range No. 143 AOC Boundary
- Live Hand Grenade Court. 129 AOC Boundary
- Mortar Range AOC Boundary
- Moving Target Range No. 75 AOC Boundary
- Practice Grenade Court No. 127 AOC Boundary
- Range Comple No. 1 AOC Boundary
- Range Complex No. 2 AOC Boundary
- Range Complex No. 5 AOC Boundary
- Range Complex No. 6 AOC Boundary
- Skeet Range No. 580 AOC Boundary
- West Live Hand Grenade Court AOC Boundary
- National Guard Facility
- Parcel

Notes:

1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 3,000 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

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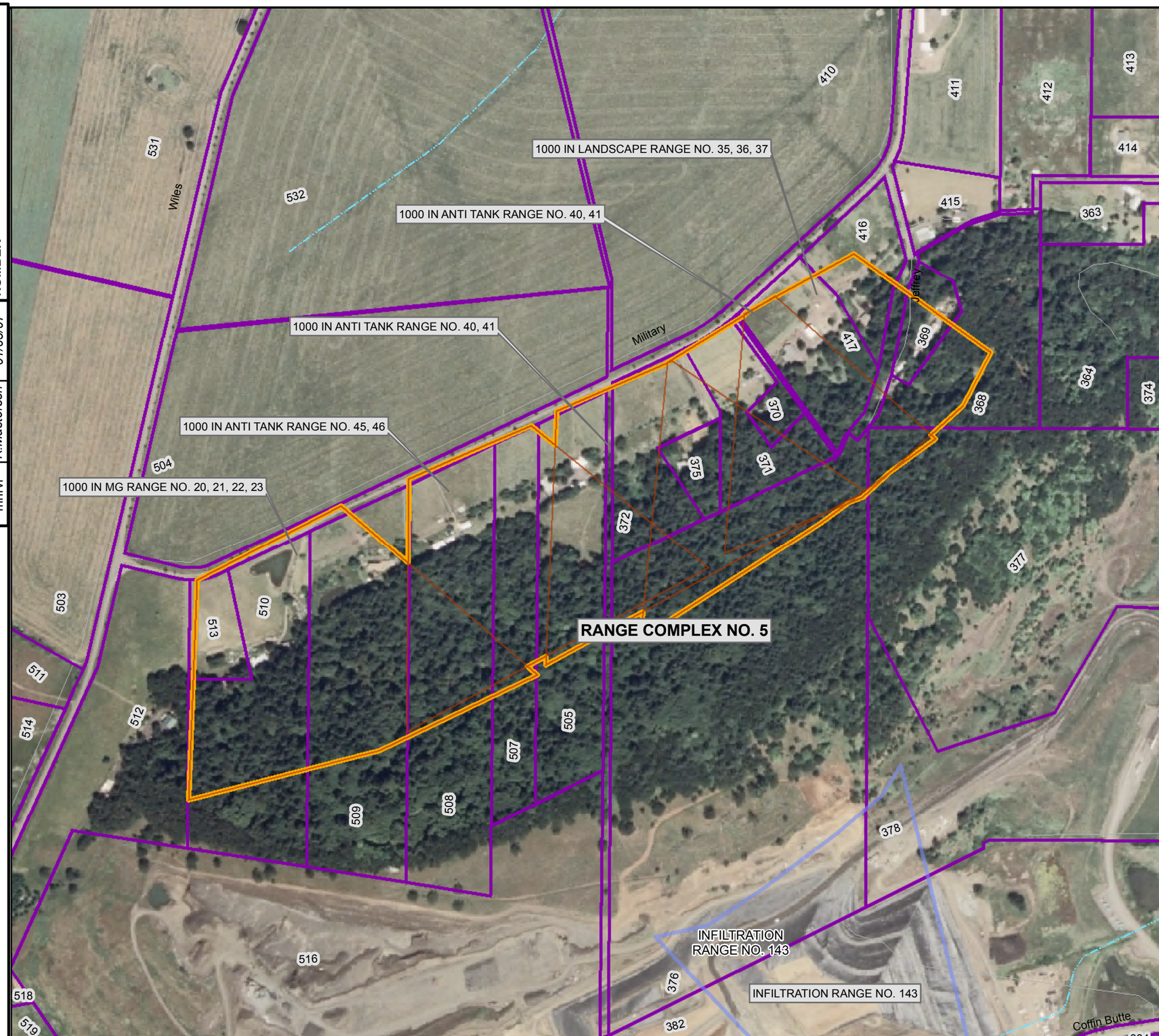
FIGURE 2-3B

PARCEL OWNERSHIP
SMALL ARMS RANGES
RANGE COMPLEX NO. 4

CAMP ADAIR

Shaw Environmental, Inc.



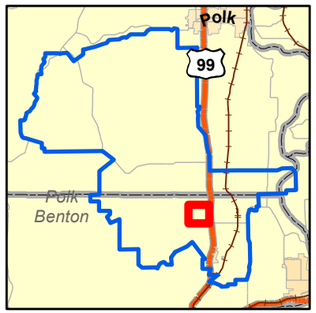
Legend

- Camp Adair FUDS Boundary
- Range Complex No. 5 AOC Boundary
- Subrange Boundary
- Infiltration Range No. 143 AOC Boundary
- Taxlot Parcel

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 500 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

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FIGURE 2-3C
PARCEL OWNERSHIP
SMALL ARMS RANGES
RANGE COMPLEX NO. 5

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
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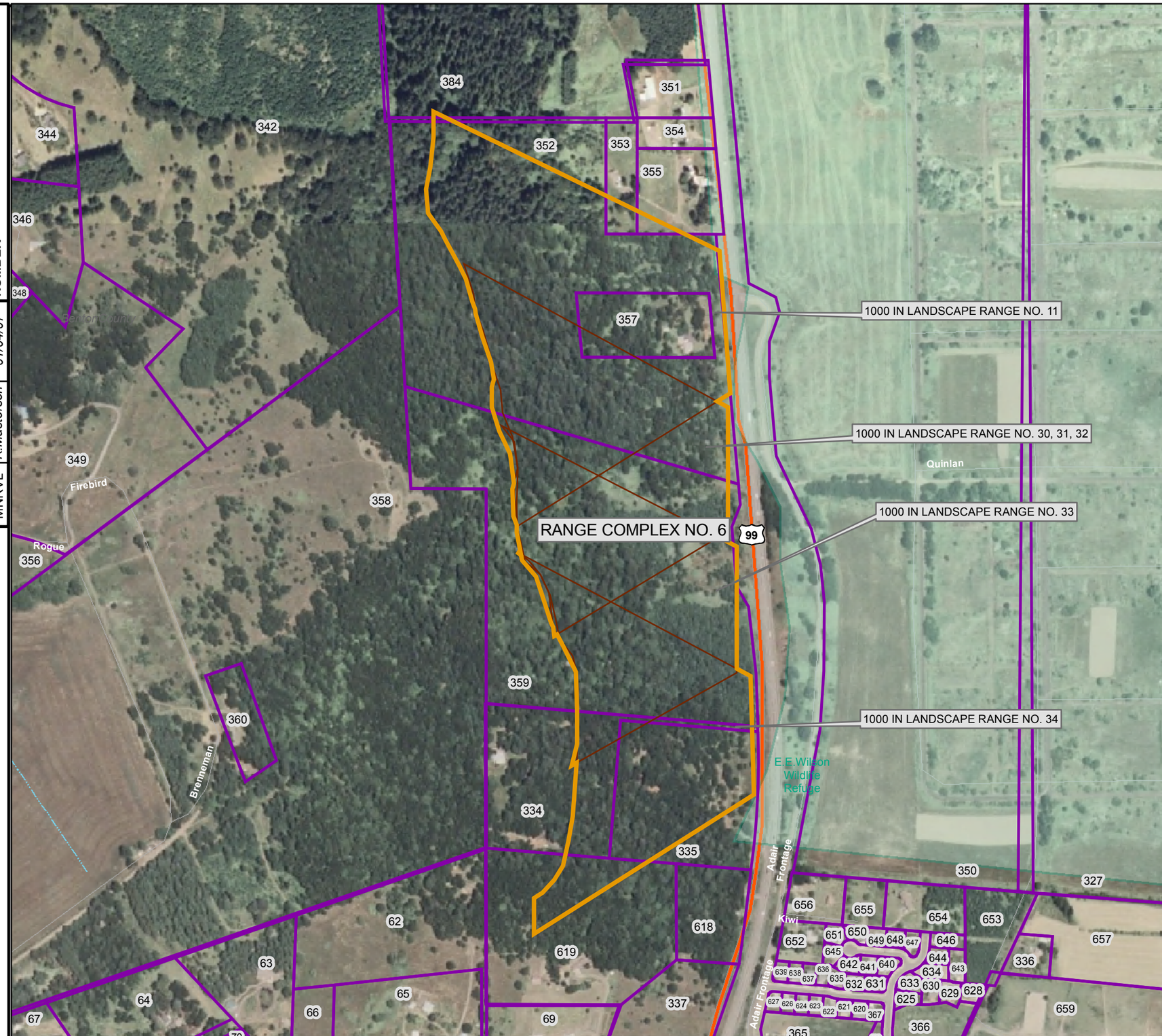

Legend

- Camp Adair FUDS Boundary
- Range Complex No. 6
- Subrange Boundary
- Taxlot Parcel
- E.E Wilson Wildlife Refuge

NOTES:

1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

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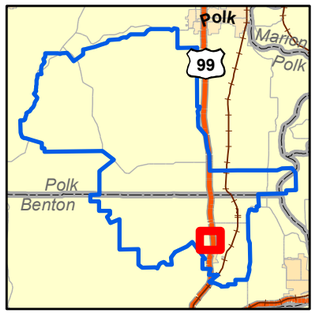
0 500 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

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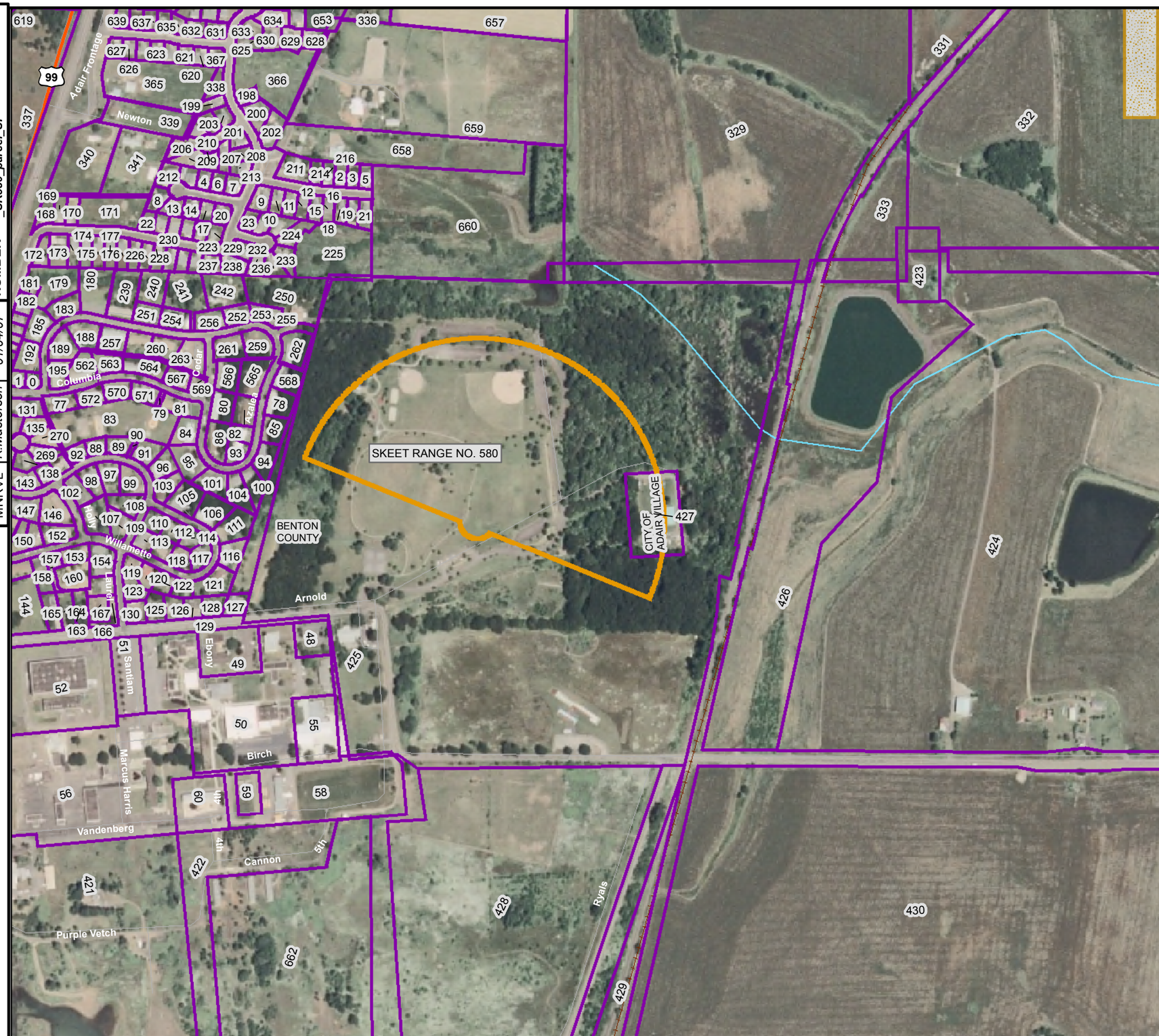
FIGURE 2-3D
PARCEL OWNERSHIP
SMALL ARMS RANGES
RANGE COMPLEX NO. 6

CAMP ADAIR

Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K.Masterson	01/04/07	CampAdair_078_fig2_3d_RC6_parcel_SI

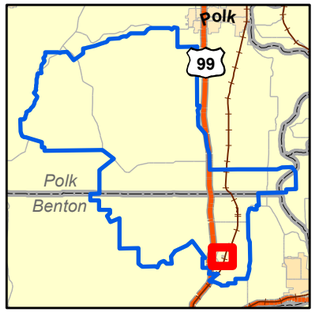
OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K.Masterson	01/04/07	CampAdair_079_fig2_3e _SK580_parcel_SI



Legend

- Camp Adair FUDS Boundary
- Skeet Range No. 580 AOC Boundary
- Taxlot Parcel

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.



0 500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

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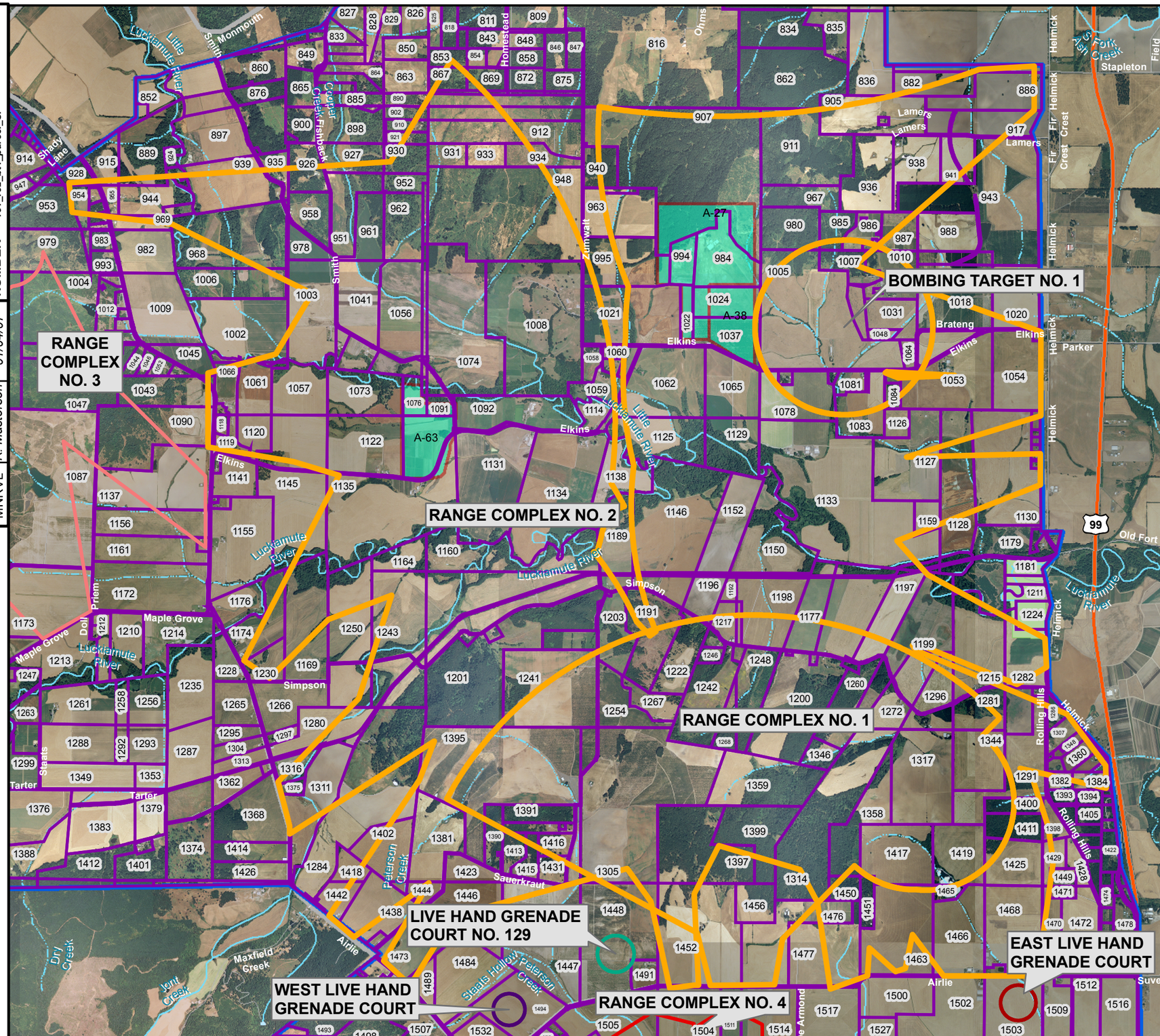
FIGURE 2-3E
PARCEL OWNERSHIP
SMALL ARMS RANGES
SKEET RANGE NO. 580

CAMP ADAIR

Shaw Environmental, Inc.

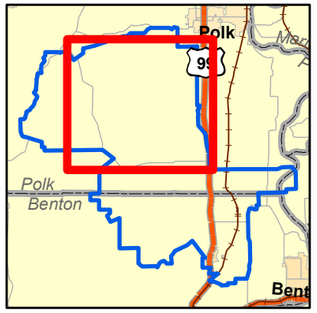


Legend

- Camp Adair FUDS Boundary
- Range Complex No. 1 and No. 2 and Bombing Target No. 1
- East Live Hand Grenade Court AOC Boundary
- Live Hand Grenade Court. 129 AOC Boundary
- Range Complex No. 3 AOC Boundary
- Range Complex No. 4 AOC Boundary
- West Live Hand Grenade Court AOC Boundary
- Impact Areas
- Taxlot Parcel

NOTES:

1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.



0 3,500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

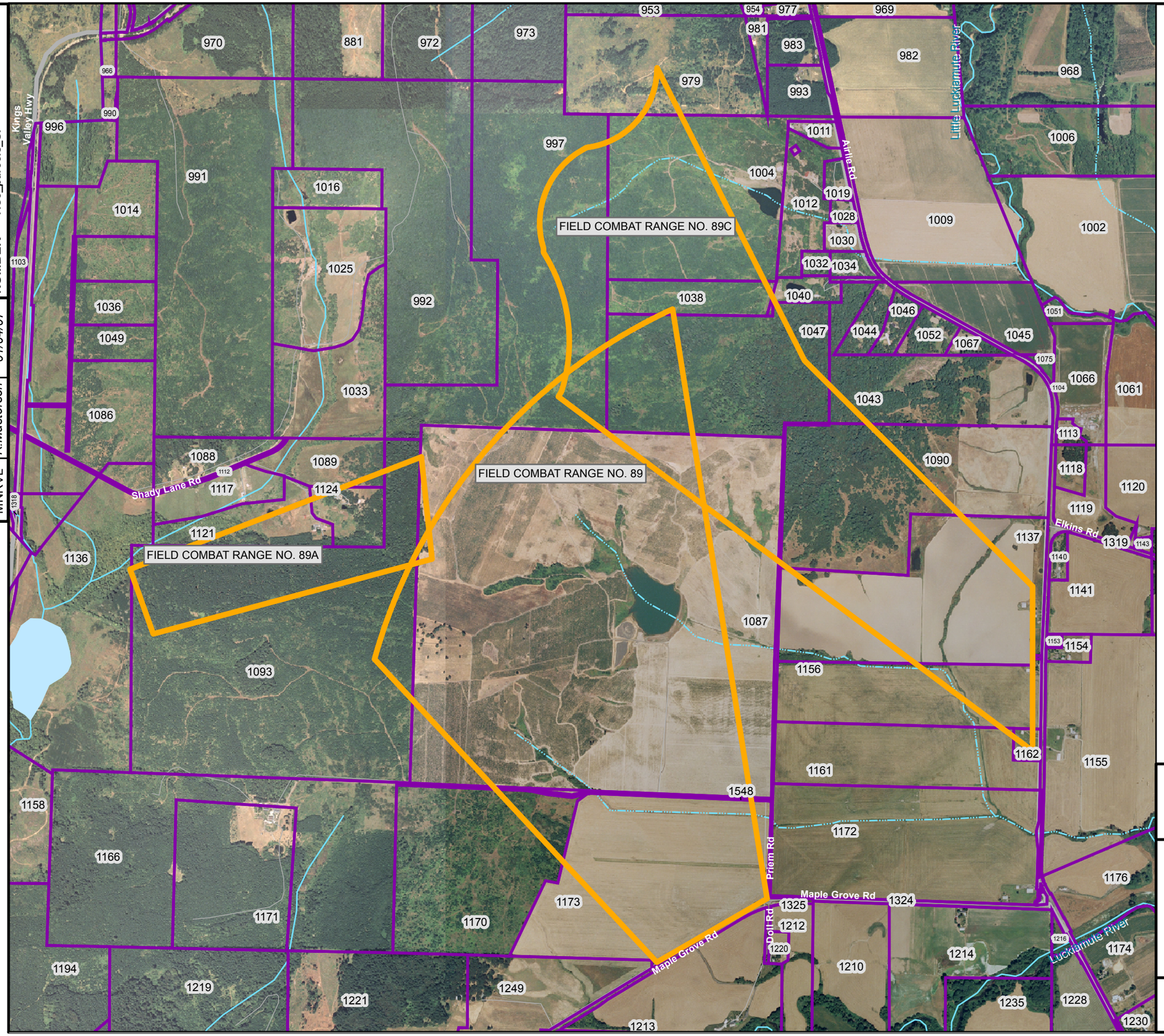
FIGURE 2-3F

PARCEL OWNERSHIP
EXPLOSIVE MUNITIONS RANGES
RANGE COMPLEXES NO. 1 and NO. 2
AND BOMBING TARGET NO. 1

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	01/04/07	CampAdair_080_fig_2_3f_rc1_rc2_bt1_parcel_SI



Legend

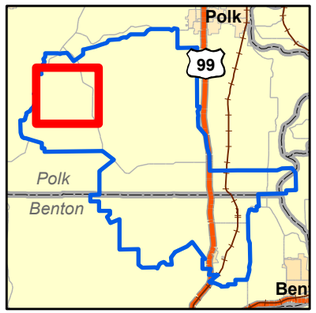
- Camp Adair FUDS Boundary
- Range Complex No. 3 AOC Boundary
- Taxlot Parcel

NOTES:

1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 1,500 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

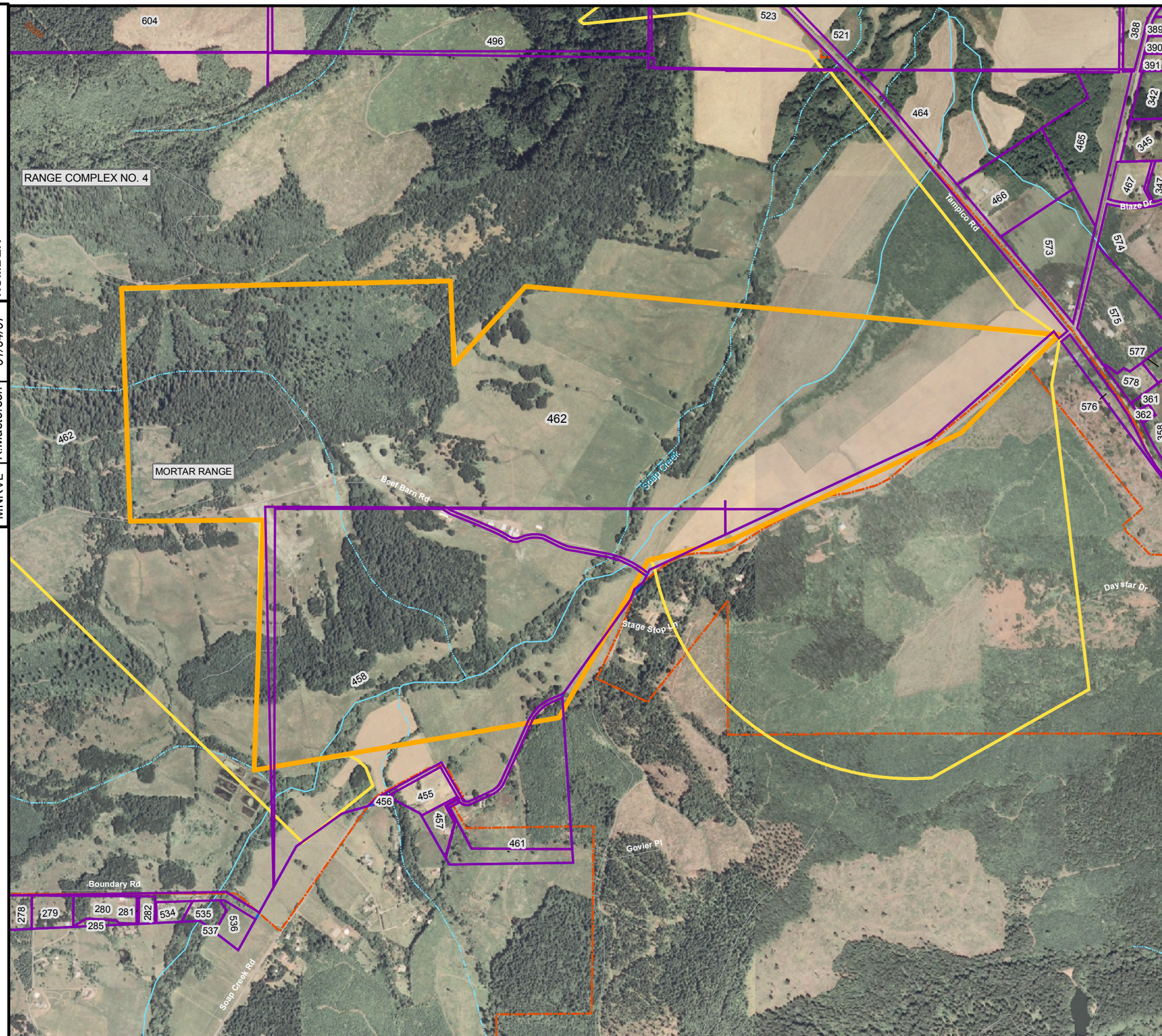
FIGURE 2-3G

PARCEL OWNERSHIP
EXPLOSIVE MUNITIONS RANGES
RANGE COMPLEX NO. 3

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K.Masterson	01/04/07	CampAdair_081_fig_2_3G_RC3_parcels_SI



Legend

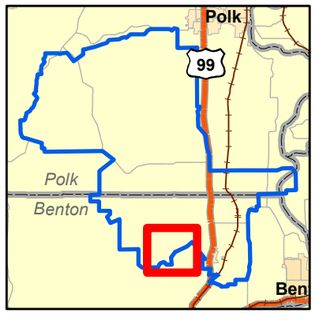
- Camp Adair FUDS Boundary
- Mortar Range AOC Boundary
- Range Complex No. 4 AOC Boundary
- Public Land (2003)
- Taxlot Parcel

NOTES:

1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 1,200 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

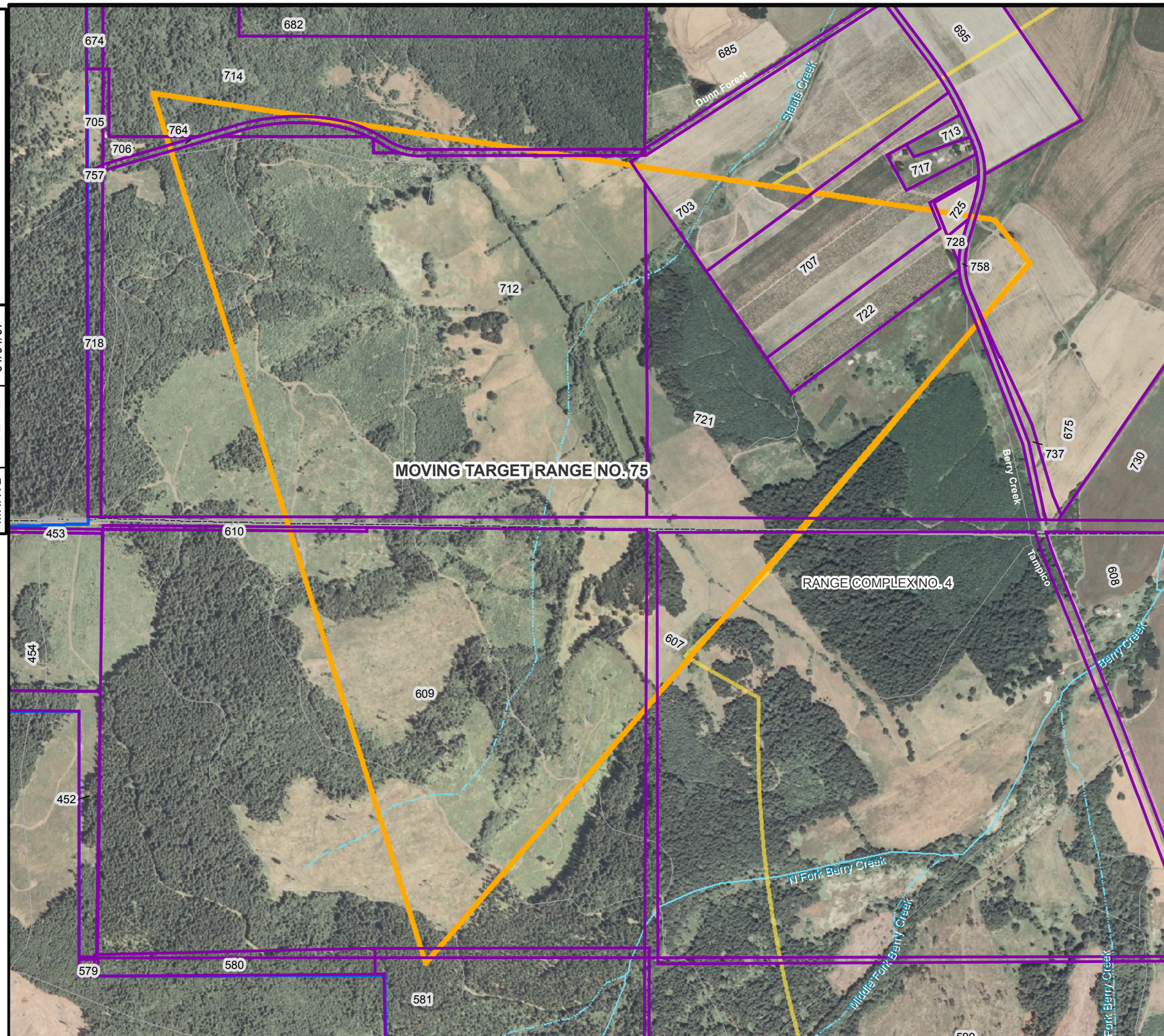
U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 2-3H
PARCEL OWNERSHIP
EXPLOSIVE MUNITIONS RANGES
MORTAR RANGE

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K.Masterson	01/04/07	CampAdair_082_fig2_3h_MR_parcel_SI

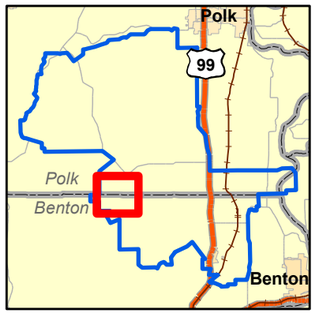


Legend

- Camp Adair FUDS Boundary
- Moving Target Range No. 75 AOC Boundary
- Range Complex No. 4 AOC Boundary
- Taxlot Parcel

NOTES:

1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.



0 1,000 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

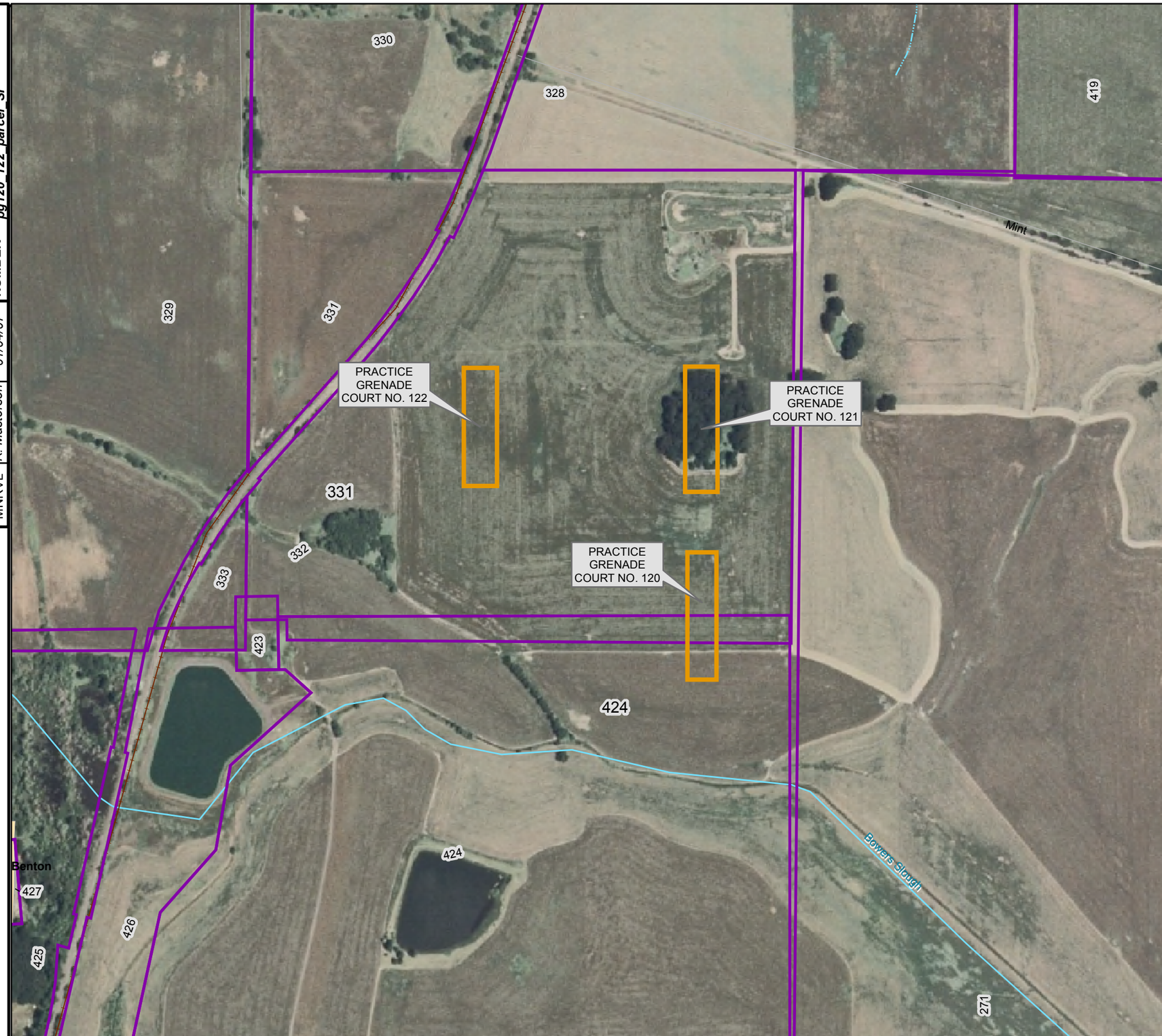
FIGURE 2-3I

PARCEL OWNERSHIP
EXPLOSIVE MUNITIONS RANGES
MOVING TARGET RANGE NO. 75

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K.Masterson	01/04/07	CampAdair_083_fig2_3i_MTR75_parcel_S



Legend

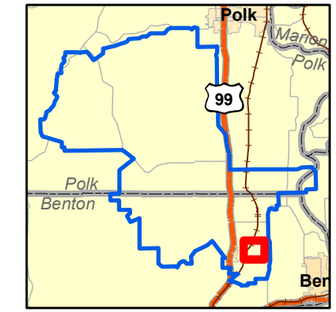
- Camp Adair FUDS Boundary
- Practice Grenade Courts Nos. 120, 121 AND 122
- Taxlot Parcel

NOTES:

1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 500 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

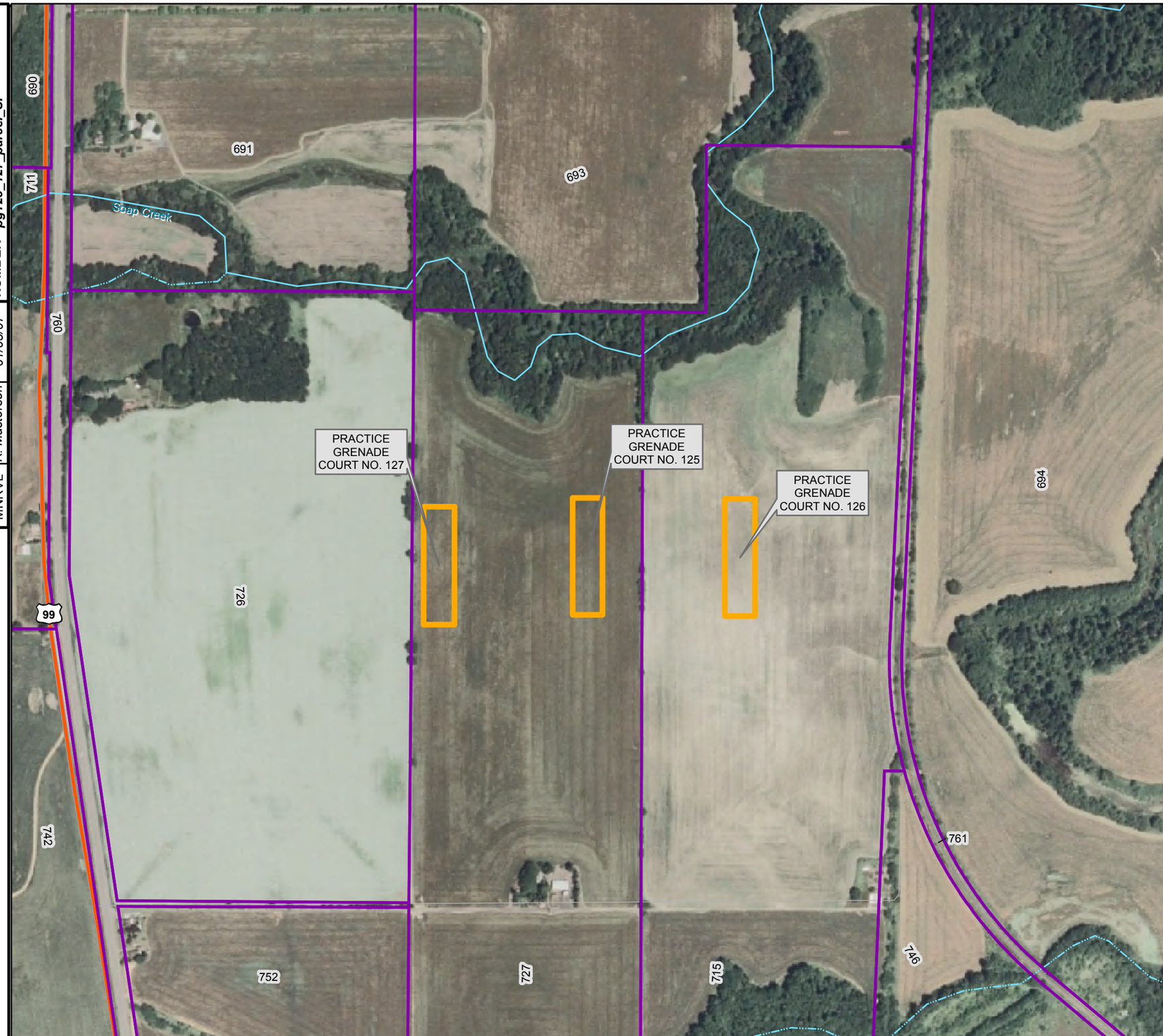
U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 2-3J
PARCEL OWNERSHIP
PRACTICE GRENADE COURTS
NOs. 120, 121 AND 122

CAMP ADAIR

Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	01/04/07	CampAdair_084_fig_2_3j_pg120_122_parcel_SI



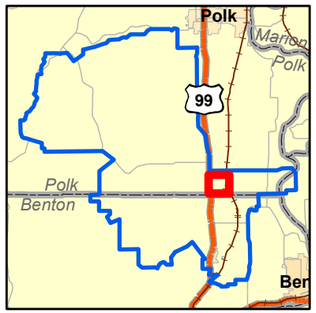
OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	01/05/07	CampAdair_085_fig2_3k_pg125_127_parcel_SI

Legend

- Camp Adair FUDS Boundary
- Practice Grenade Courts Nos. 125, 126, and 127 AOC Boundaries
- Taxlot Parcel

NOTES:

1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.



N

0 500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 2-3K

PARCEL OWNERSHIP
PRACTICE GRENADE COURTS
NOs. 125, 126, AND 127

CAMP ADAIR

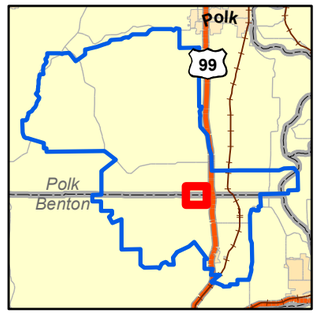
Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	01/04/07	CampAdair_086_fig2_3l_ CI182_Parcel_SI

Legend

- Camp Adair FUDS Boundary
- Chemical Ident. Area No 182 AOC Boundary
- Taxlot Parcel

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.



N

0 500 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

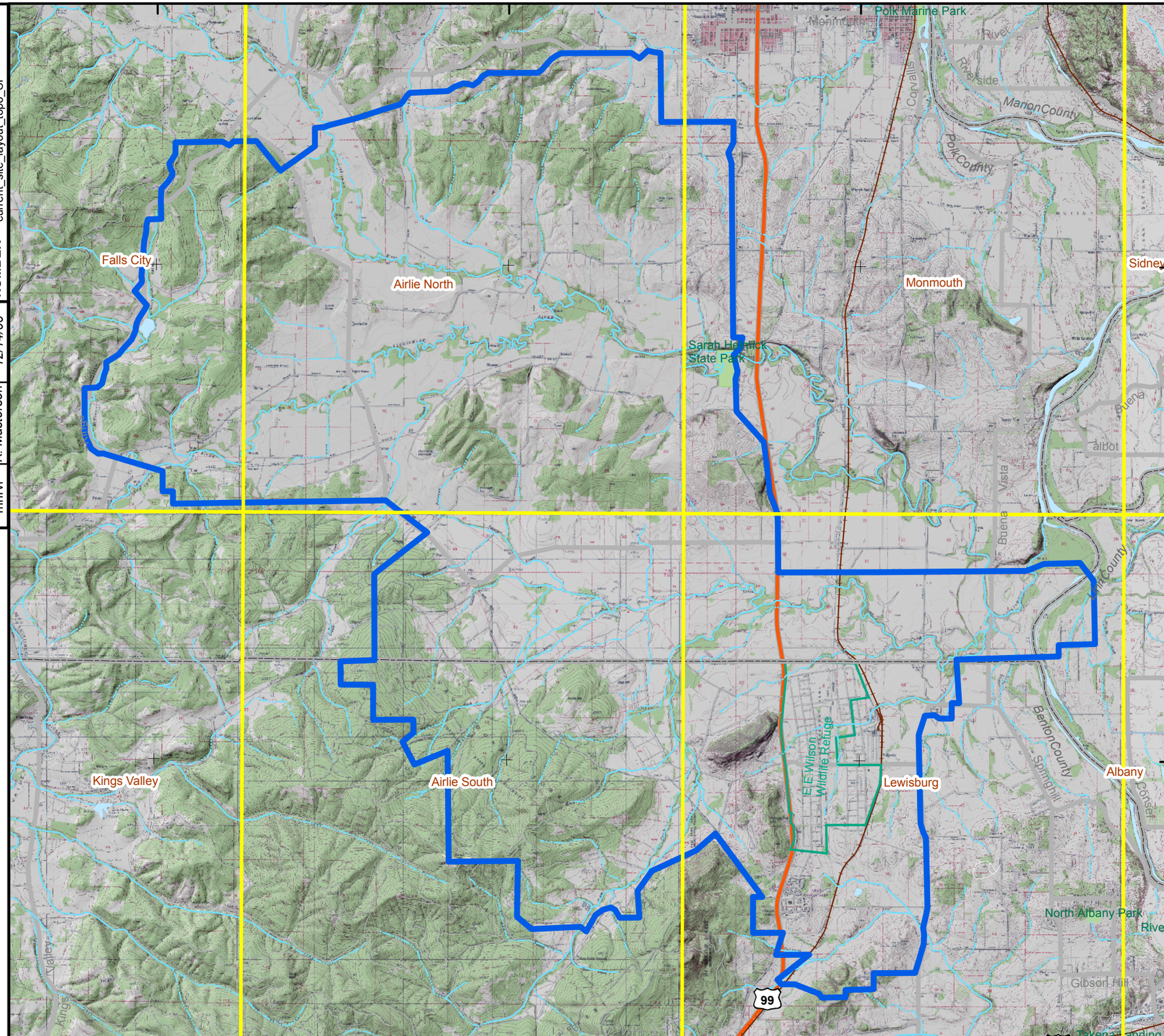
U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 2-3L

PARCEL OWNERSHIP
CHEMICAL IDENT. AREA NO. 182

CAMP ADAIR

Shaw® Shaw Environmental, Inc.



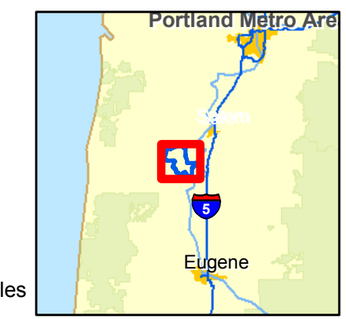
Legend

- Camp Adair FUDS Boundary
- USGS Quad Sheet

NOTES:

1) Installation area was derived from the Camp Adair ASR Supplement.
2) USGS Quads: Albanny, Arlie South, Arlie North, Falls City, Kings Valley, Lewisburg, Monmouth, Sidney
3) USGS topographic map (2 meter resolution) was obtained from Terraserver and is dated July 01, 1991.

0 0.5 1 2 Miles



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

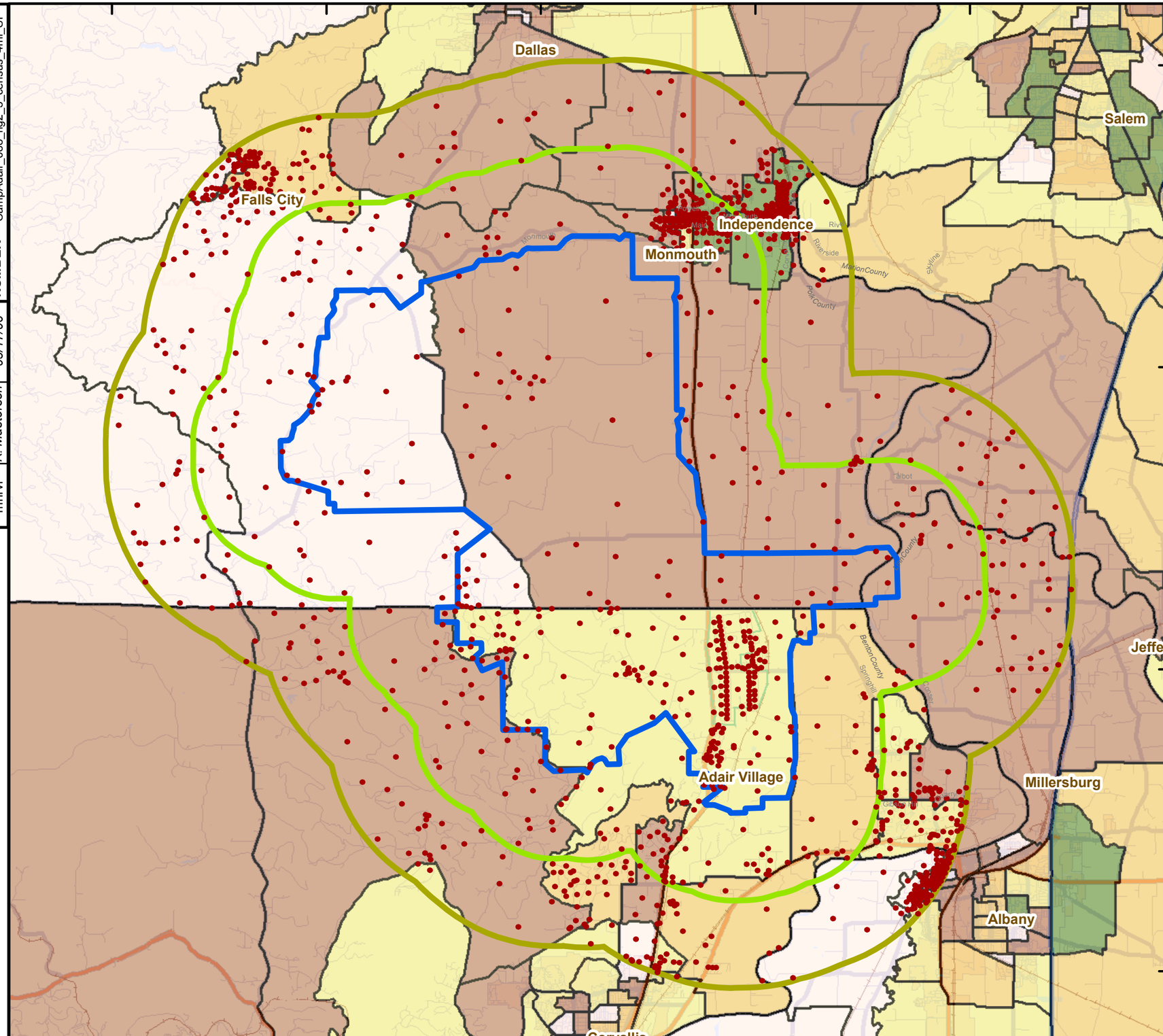
FIGURE 2-4

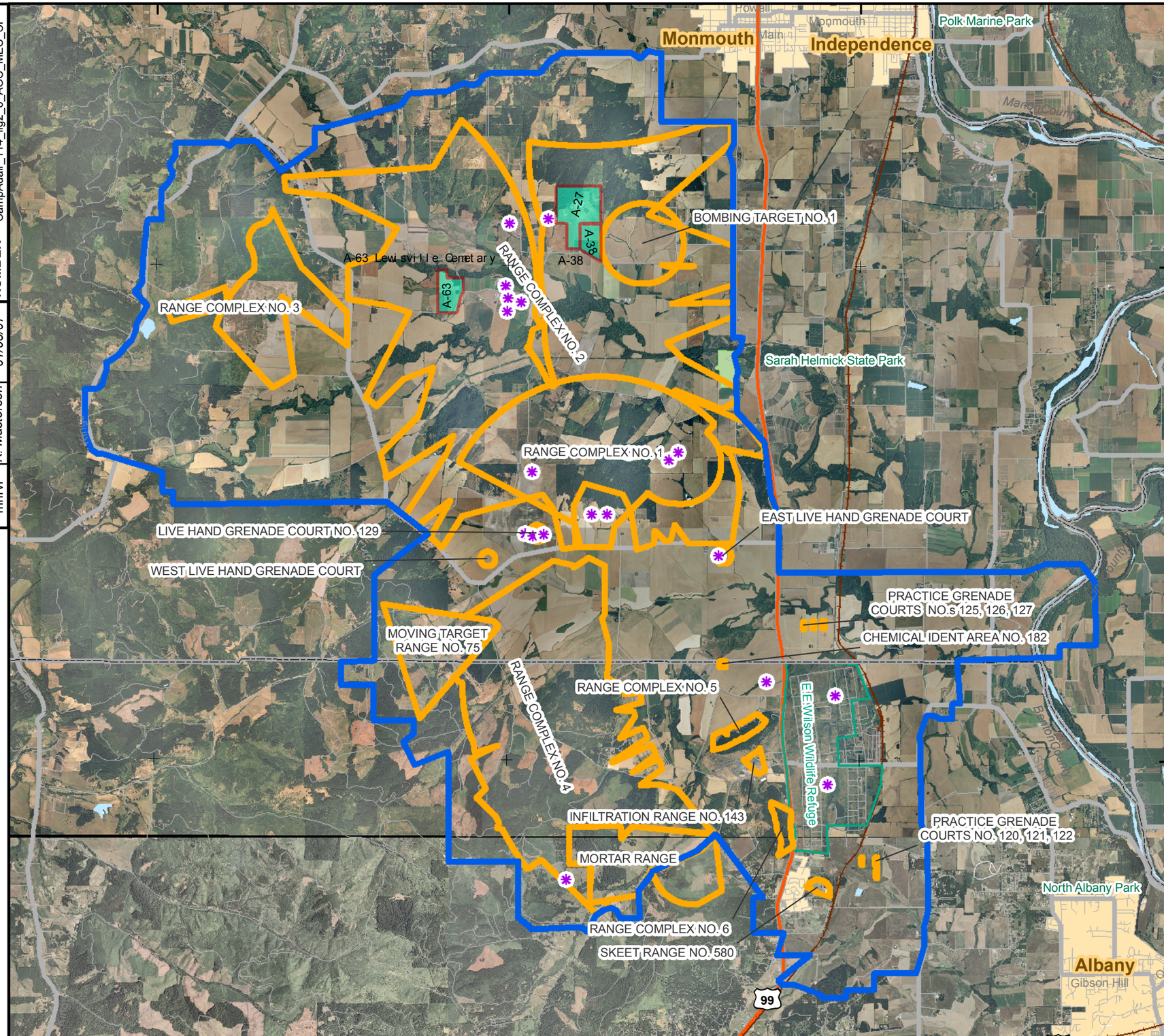
CURRENT TOPOGRAPHIC MAP

CAMP ADAIR

Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
mnrvl	K. Masterson	12/14/06	CampAdair_087_fig2_4_current_site_layout_topo_SI


123°30'0"W
123°24'0"W
123°18'0"W
123°12'0"W
123°6'0"W
44°54'0"N
44°48'0"N
44°42'0"N
Dallas
Salem
Falls City
Independence
Monmouth
Adair Village
Millersburg
Albany
Corvallis
Jeffer
Legend
Camp Adair FUDS Boundary
2-Mile Buffer Around FUDS Property
4-Mile Buffer Around FUDS Property
2004 Block Group Population
395 - 887
888 - 1259
1260 - 1676
1677 - 2284
2285 - 4414
NOTES:
1) Total population within 2-mile raduis of the FUDS property boundary is 36226.
2) The Total Housing Units within a 2-mile radius of the FUDS boundary is 13755.
3) The Total Households within a 2-mile radius of the FUDS boundary is 13022.
Total population, housing units, and households were calculated from the US Census Block Centroid Unit.
N
0 0.5 1 2
Miles
REFERENCE/PROJECTION: NAD 83 UTM Zone 10N
U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER
FIGURE 2-5
CENSUS DATA WITHIN
2- AND 4-MILE RADII
CAMP ADAIR
Shaw Environmental, Inc.
OFFICE
mnrvl
DRAWN BY
K. Masterson
03/17/06
DRAWING NUMBER
CampAdair_088_fig2_5_census_4mi_SI



Legend

- Camp Adair FUDS Boundary
- Camp Adair AOCs
- Impact Areas
- Reported MEC Find

NOTES:

1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 0.5 1 2 Miles

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

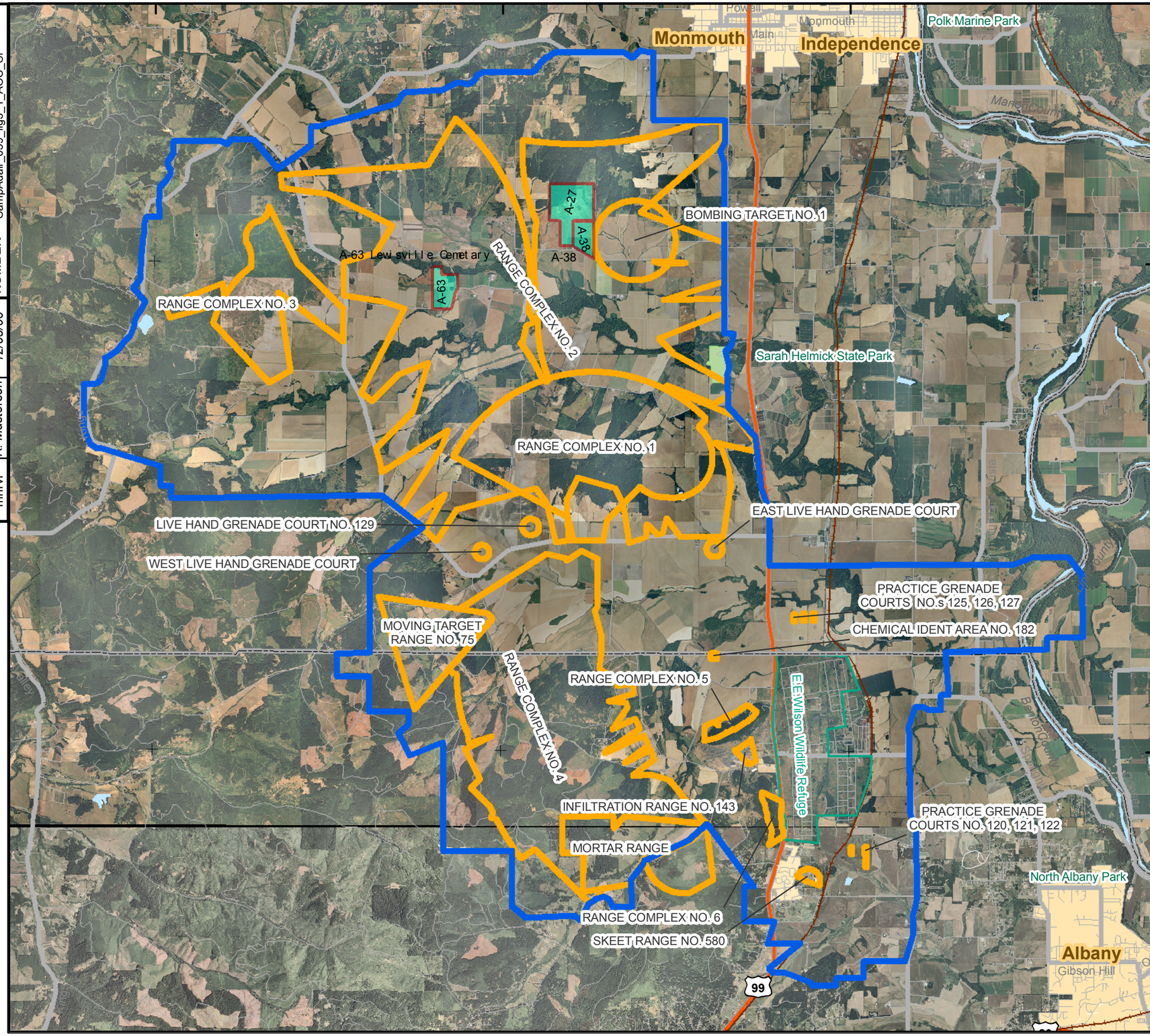
FIGURE 2-6

REPORTED MEC FINDS

CAMP ADAIR

Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
mnrvl	K. Masterson	01/05/07	CampAdair_114_fig2_6_AOC_MEC_SI



Legend

- Camp Adair FUDS Boundary
- Camp Adair AOCs
- Impact Areas

NOTES:

1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 0.5 1 2 Miles

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

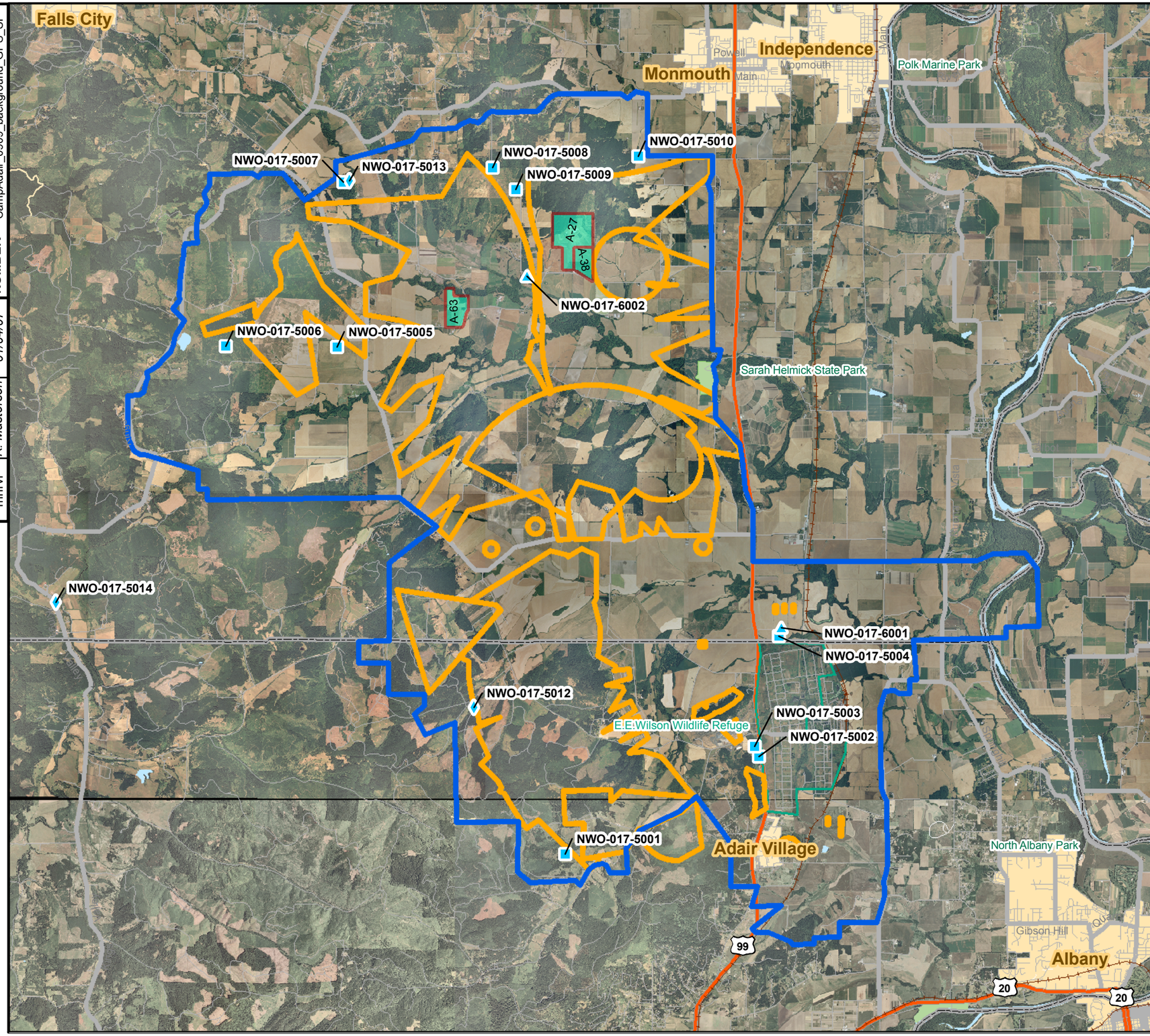
FIGURE 3-1

AREAS OF CONCERN

CAMP ADAIR

Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
mnrvl	K. Masterson	12/05/06	CampAdair_039_fig3_1_AOC_SI



Legend

- Camp Adair FUD Boundary
- Camp Adair AOCs
- Impact Areas
- Background Groundwater Sample
- Background Sediment Sample
- Background Soil Sample

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 0.5 1 2 Miles

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

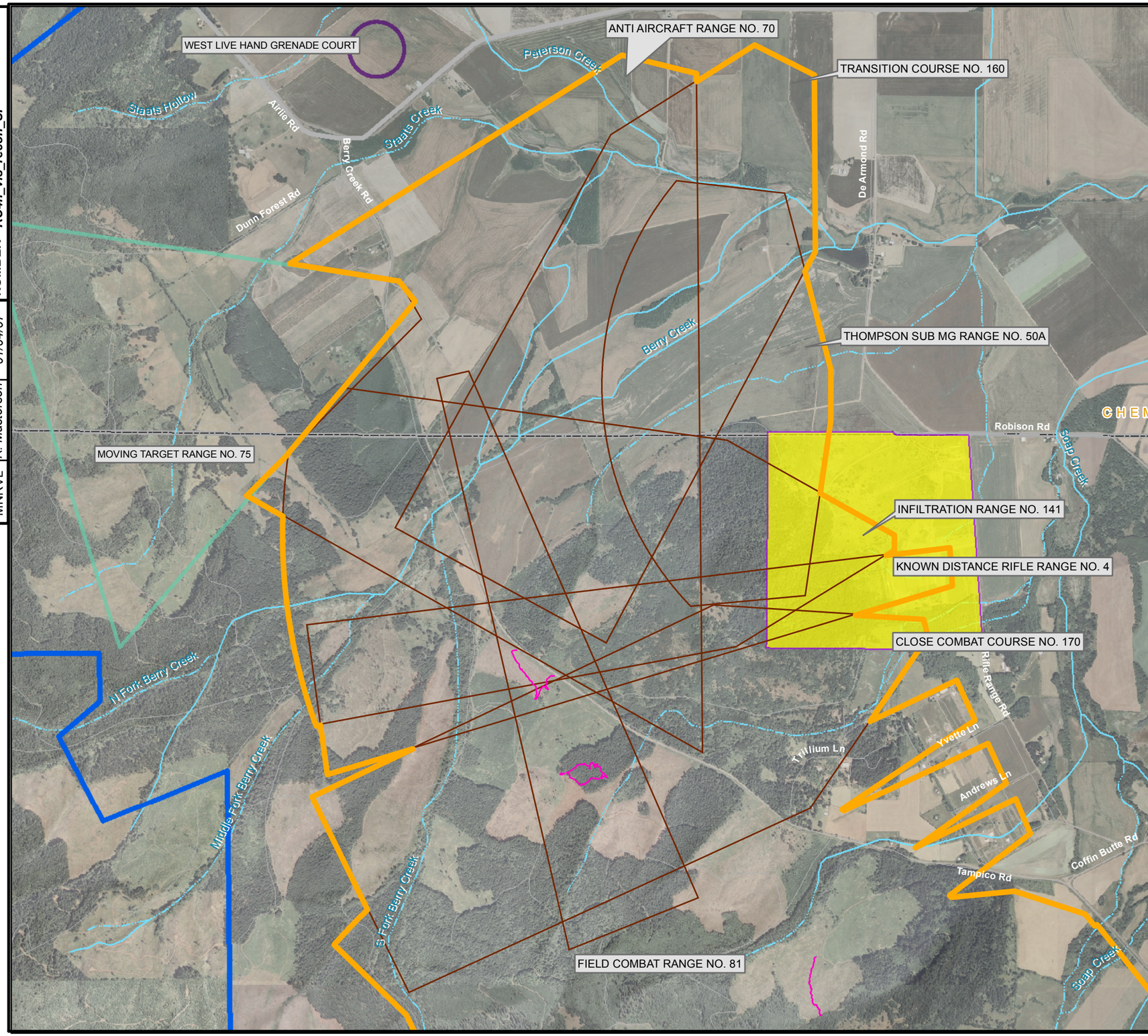
FIGURE 3-2

BACKGROUND SAMPLE LOCATIONS

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
mnrvl	K. Masterson	01/04/07	CampAdair_0909_background_GPS_SI



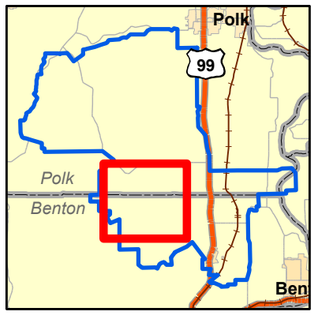
Legend

- Camp Adair FUDS Boundary
- Range Complex No. 4 AOC Boundary
- Moving Target Range No. 75 AOC Boundary
- West Live Hand Grenade Court AOC Boundary
- Subrange Boundary
- National Guard Facility
- Reconnaissance Pathway

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 2,000 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

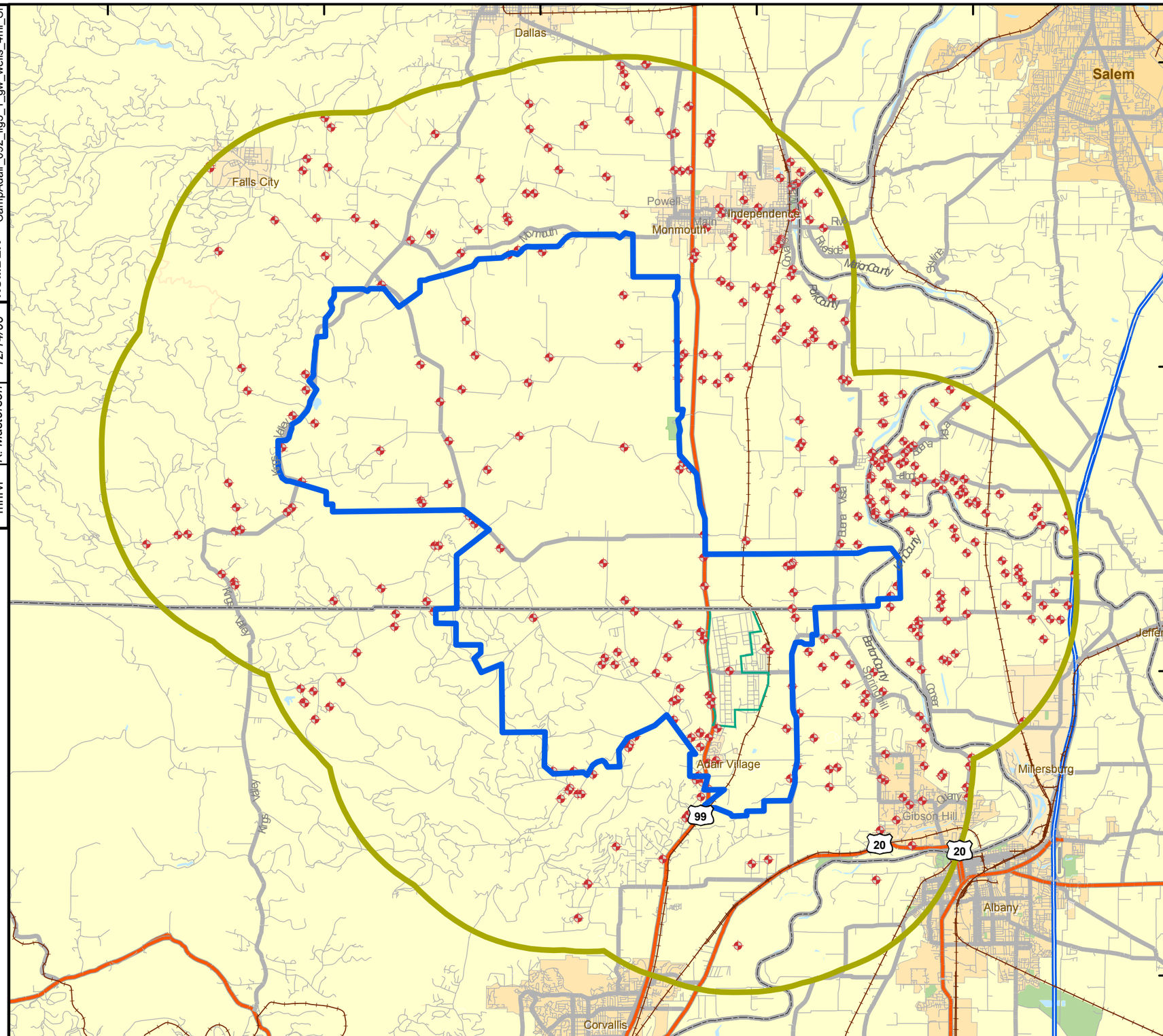
U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 4-1
VISUAL RECONNAISSANCE SURVEY
SMALL ARMS RANGES
RANGE COMPLEX NO. 4 - NORTH

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	01/04/07	CampAdair_091_fig4_1_ RC4n_vis_recon_SI



Legend

- Camp Adair Installation Area
- 4-Mile Radius from Camp Adair Installtion Area
- Well (Source: USGS)

NOTES:

1) Well data were obtained from the USGS.
2) A total of 408 wells are located within a 4-mile radius of the installation area.
3) A total of 149 wells are located within a 2-mile radius of the AOCs.

0 0.5 1 2 Miles

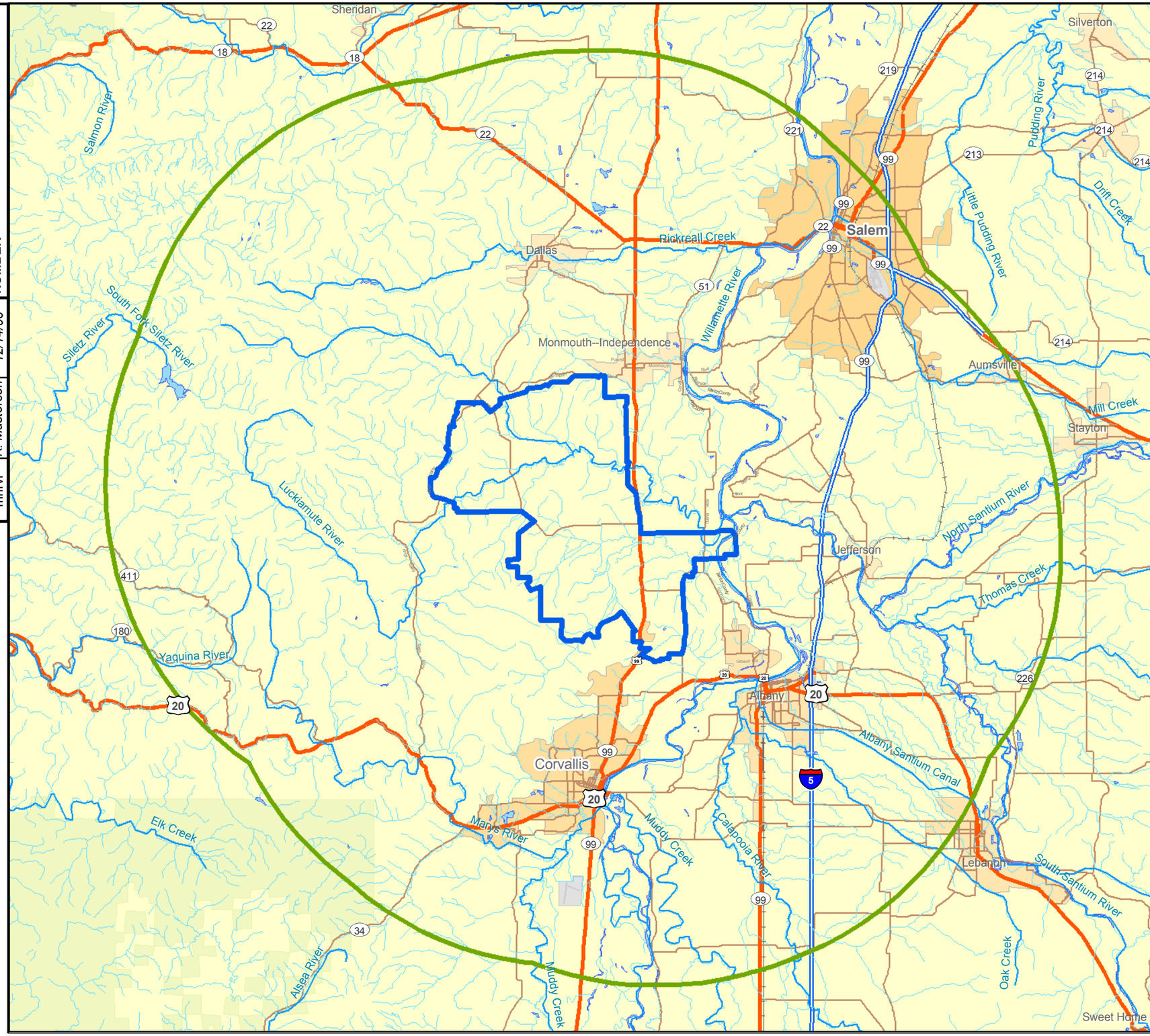
REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 5-1
GROUNDWATER WELLS WITHIN 4-MILE RADIUS
CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
mnrvl	K. Masterson	12/14/06	CampAdair_092_fig5_1_gw_wells_4mi_SI



Legend

- Camp Adair FUDS Boundary
- 15 Mile Buffer of the FUDS Property

0 0.5 1 2
Miles

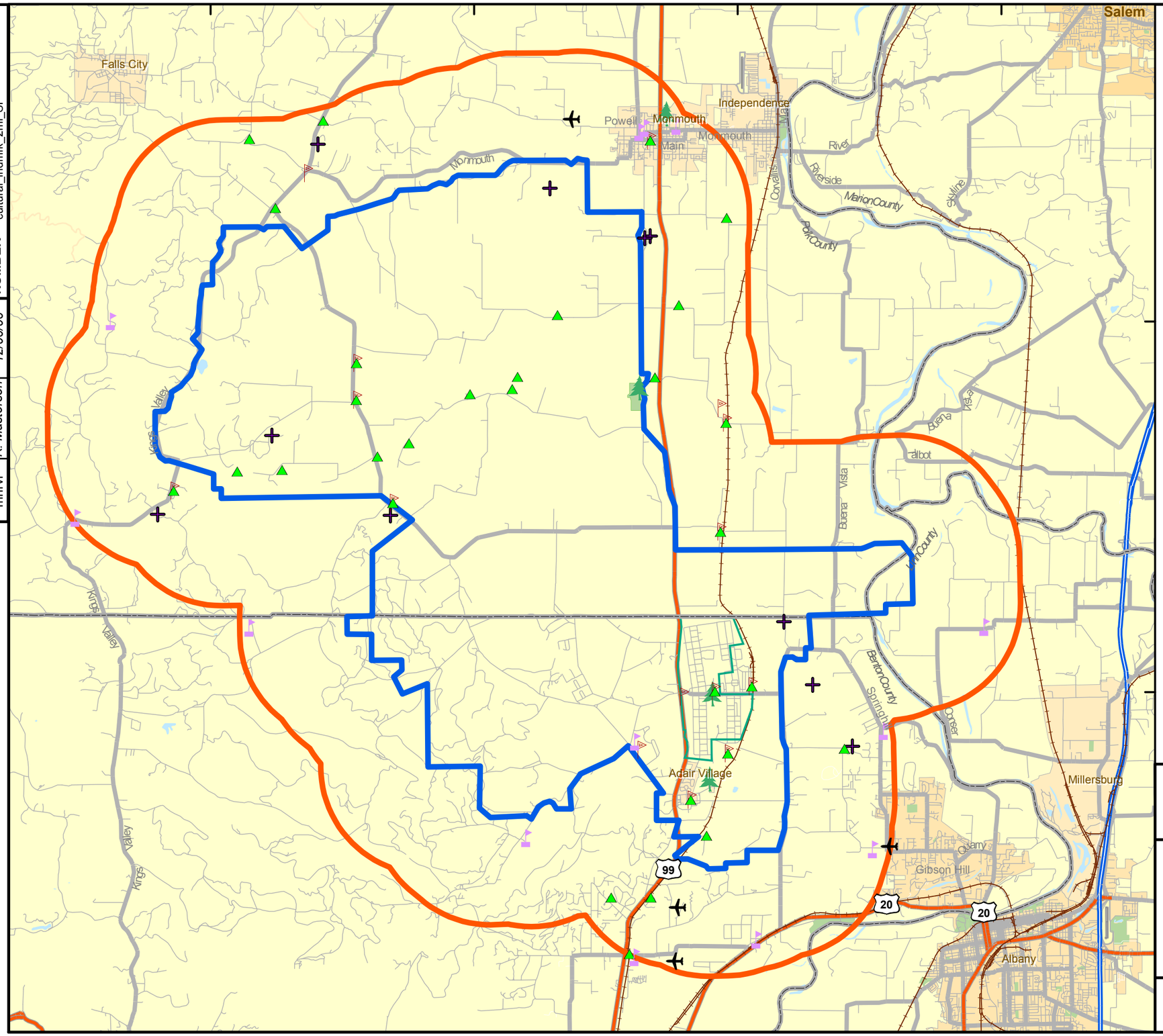
REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 5-2
SURFACE WATER DRAINAGE WITHIN A 15-MILE RADIUS OF FUDS BOUNDARY
CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
mnrvl	K. Masterson	12/14/06	CampAdair_093_fig5_2_drainage_15mi_SI



Legend

- Camp Adair FUDS Boundary
- 2-Mile Radius from Camp Adair Installation Area
- Airport
- Cemetary
- Park
- Post Office
- Public Place
- School

0 0.5 1 2 Miles

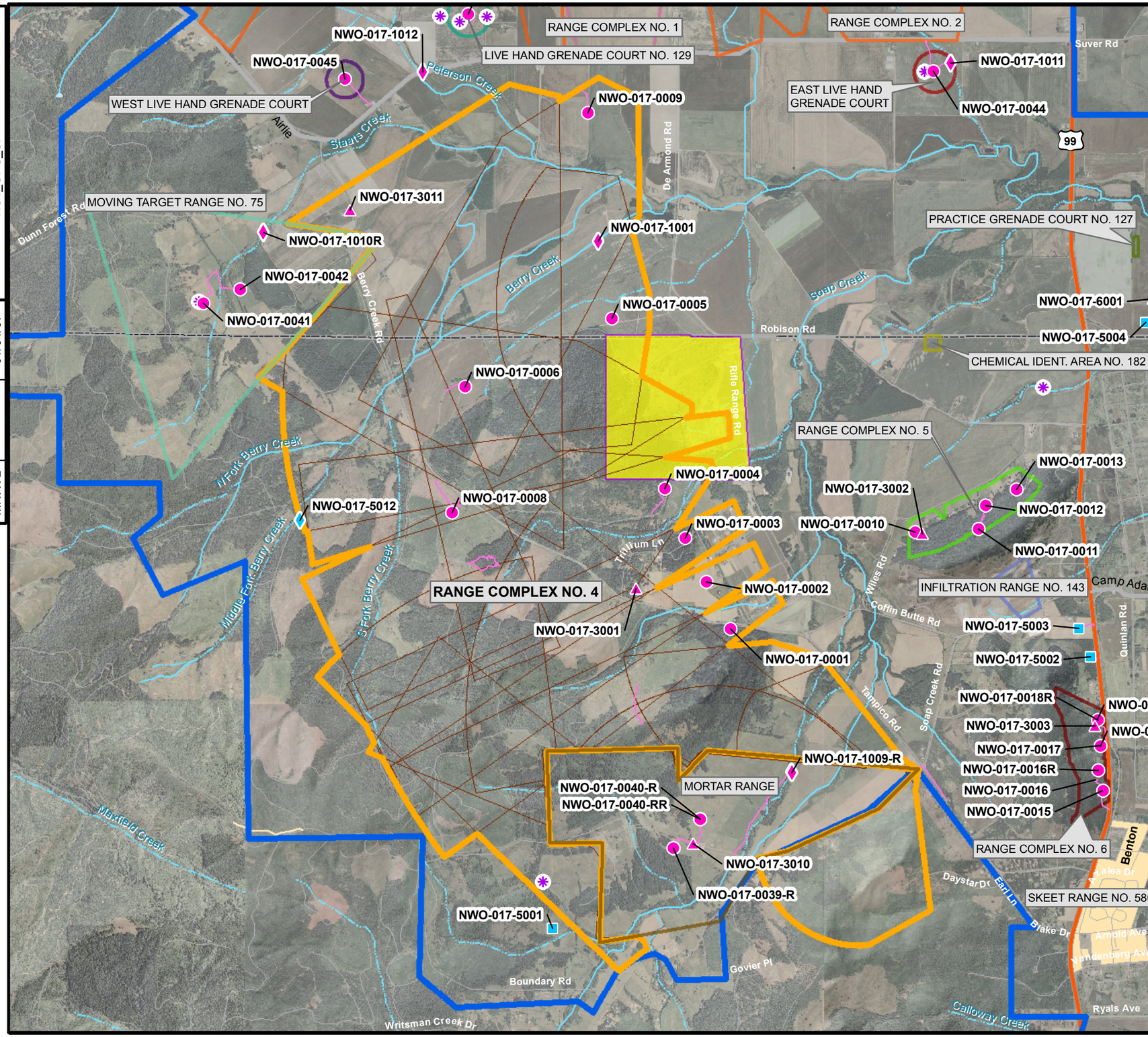
REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 5-3
SENSITIVE RECEPTOR LOCATIONS WITHIN A 2-MILE RADIUS
CAMP ADAIR

Shaw® Shaw Environmental, Inc.

DRAWING NUMBER	DRAWN BY		OFFICE
CampAdair_094_fig5_3_cultural_Indmrk_2mi_SI	K. Masterson	12/06/06	mnrvl



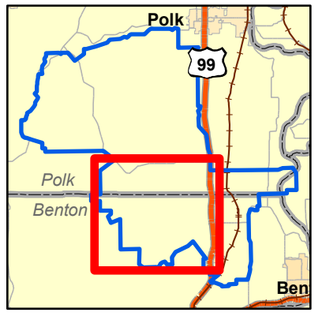
Legend

- Camp Adair FUDS Boundary
- Range Complex No. 4 AOC Boundary
- Chemical Ident. Area No. 182 AOC Boundary
- East Live Hand Grenade Court AOC Boundary
- Infiltration Range No. 143 AOC Boundary
- Live Hand Grenade Court. 129 AOC Boundary
- Mortar Range AOC Boundary
- Moving Target Range No. 75 AOC Boundary
- Practice Grenade Court No. 127 AOC Boundary
- Range Comple No. 1 AOC Boundary
- Range Complex No. 2 AOC Boundary
- Range Complex No. 3 AOC Boundary
- Range Complex No. 5 AOC Boundary
- Range Complex No. 6 AOC Boundary
- West Live Hand Grenade Court AOC Boundary
- National Guard Facility
- Subrange Boundary
- Reported MEC Find
- Reconnaissance Pathway
- Background Groundwater Sample
- Background Sediment Sample
- Background Soil Sample
- Groundwater Sample
- Sediment Sample
- Soil Sample

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 3,000 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

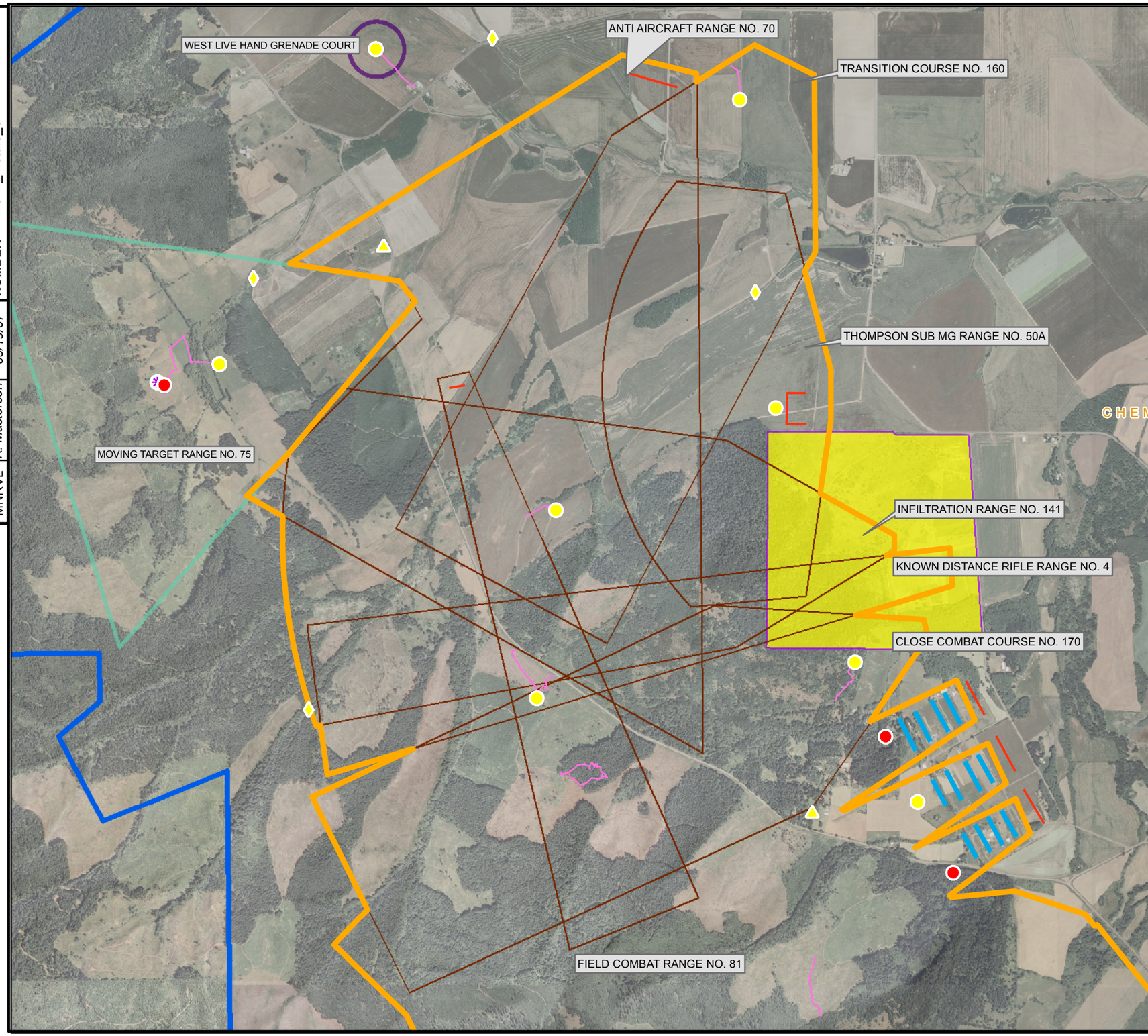
FIGURE 5-4

SMALL ARMS RANGES
RANGE COMPLEX NO. 4
SAMPLE POINTS

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	01/04/07	CampAdair_095_fig5_4_RC4_GPS_SI



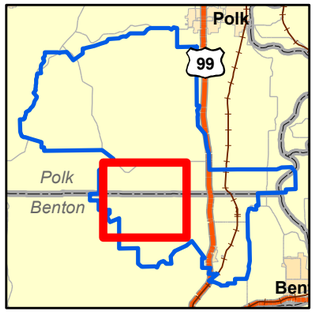
Legend

- Camp Adair FUDS Boundary
- Range Complex No. 4 AOC Boundary
- Moving Target Range No. 75 AOC Boundary
- West Live Hand Grenade Court AOC Boundary
- Subrange Boundary
- National Guard Facility
- Reported MEC Find
- Groundwater Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Sediment Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Greater than Background and Greater than Eco or Human Health Screening Values
- Reconnaissance Pathway
- Probable Firing Line
- Target Line

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 2,000 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 5-4A

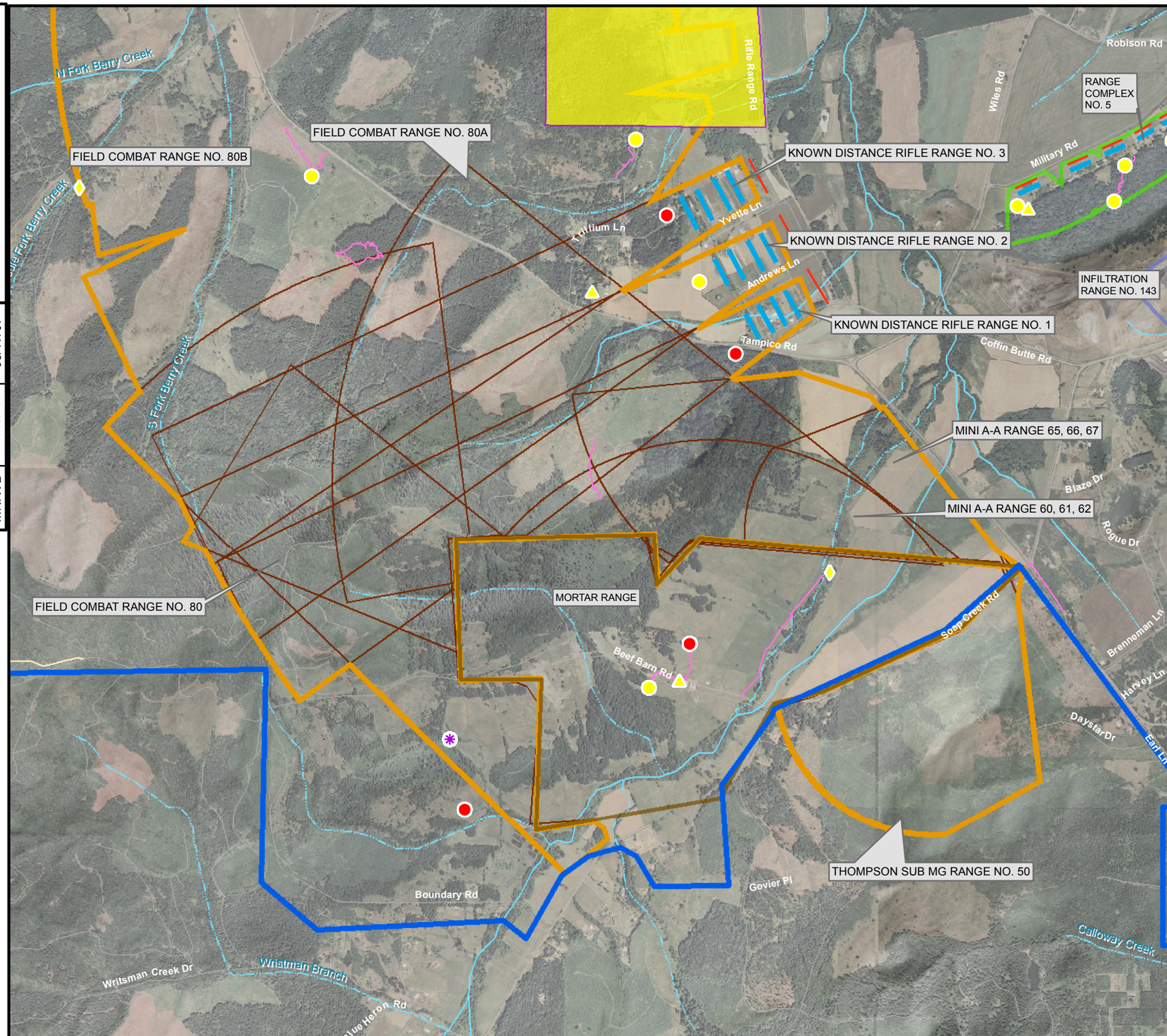
SMALL ARMS RANGES
RANGE COMPLEX NO. 4 - NORTH
SAMPLE LOCATIONS AND METALS RESULTS

CAMP ADAIR

Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	03/19/07	CampAdair_096_fig5_4a_ RC4n_metals_S

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	03/17/07	CampAdair_097_RC4s_METALS_SI



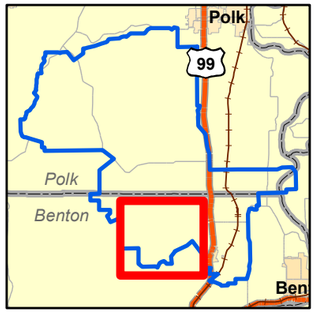
Legend

- Camp Adair FUDS Boundary
- Range Complex No. 4 AOC Boundary
- Infiltration Range No. 143 AOC Boundary
- Mortar Range AOC Boundary
- Range Complex No. 5 AOC Boundary
- Subrange Boundary
- National Guard Facility
- Groundwater Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Sediment Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Greater than Background and Greater than Eco or Human Health Screening Values
- Reconnaissance Pathway
- Probable Firing Line
- Target Line

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 2,000 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

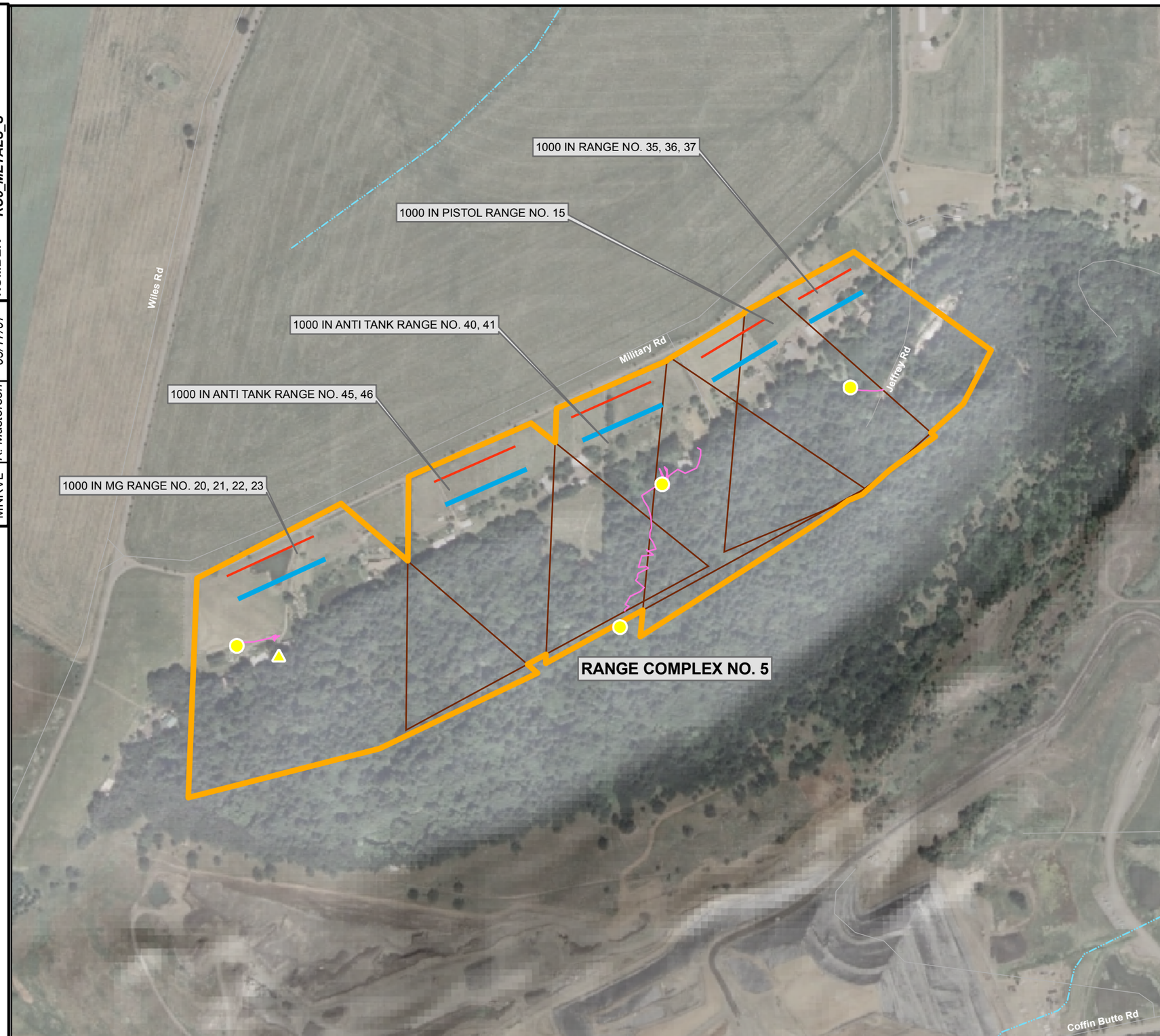
FIGURE 5-4B

SMALL ARMS RANGES
RANGE COMPLEX NO. 4 - SOUTH
SAMPLE LOCATIONS AND METALS RESULTS

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	03/17/07	CampAdair_098_fig5_5_ RC5_METALS_S



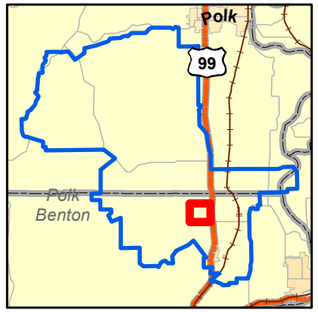
Legend

- Camp Adair FUDS Boundary
- Range Complex No. 5 AOC Boundary
- Subrange Boundary
- Groundwater Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Sediment Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Reconnaissance Pathway
- Probable Firing Line
- Target Line

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 500 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

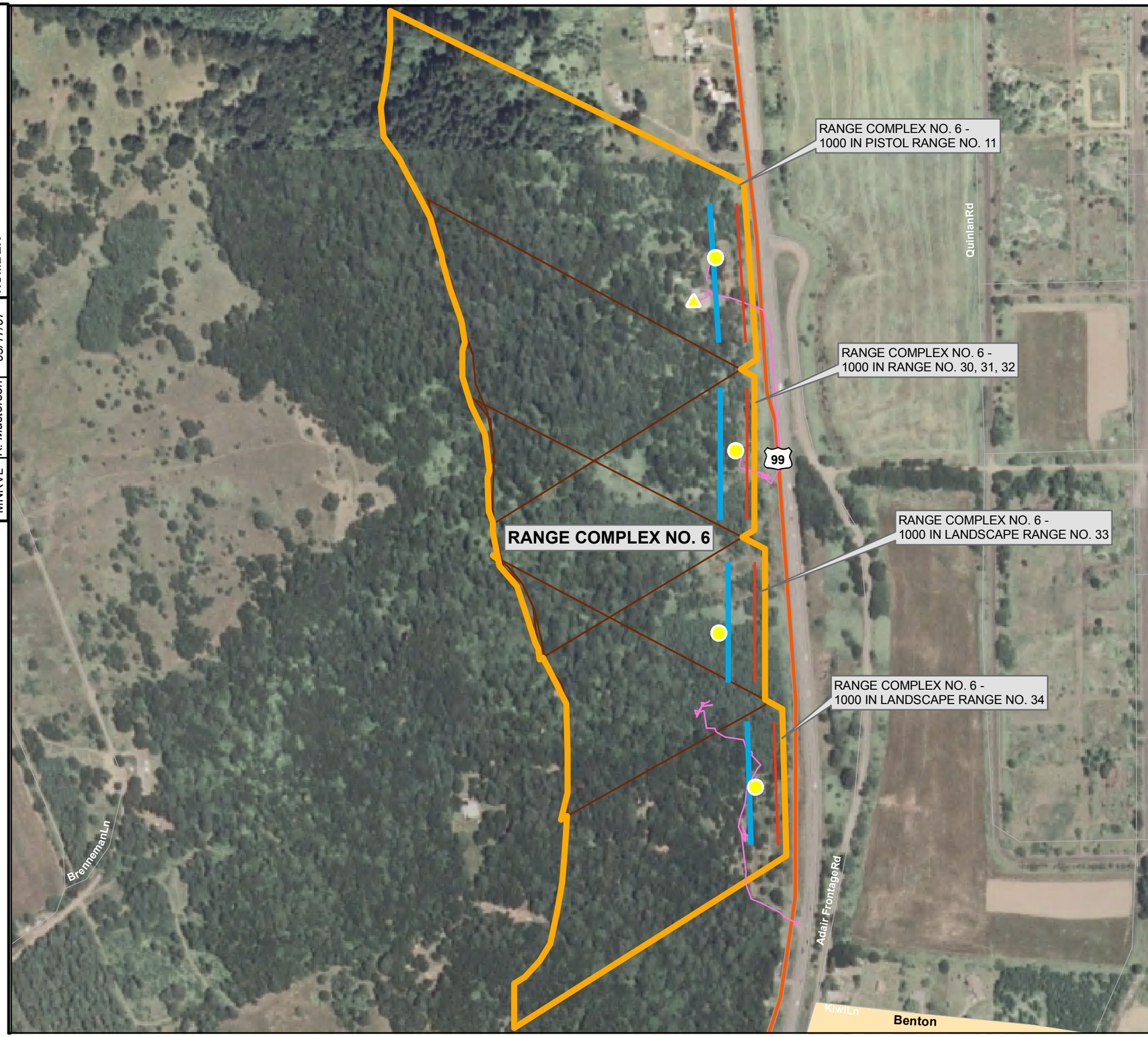
U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 5-5

SMALL ARMS RANGES
RANGE COMPLEX NO. 5
SAMPLE LOCATIONS AND METALS RESULTS

CAMP ADAIR

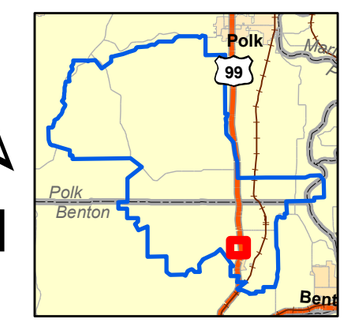
Shaw Environmental, Inc.



Legend

- Camp Adair FUDS Boundary
- Range Complex No. 6 AOC Boundary
- Subrange Boundary
- Groundwater Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Reconnaissance Pathway
- Probable Firing Line
- Target Line

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.



N

0 400 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 5-6

SMALL ARMS RANGES
RANGE COMPLEX NO. 6
SAMPLE LOCATIONS AND METALS RESULTS

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	03/17/07	CampAdair_099_fig5_6_RC6_METALS_SI

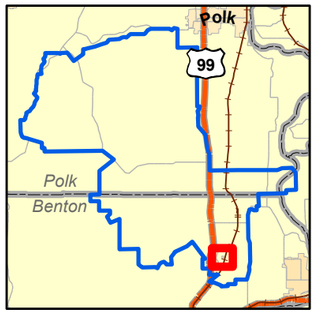
Legend

- Camp Adair FUDS Boundary
- Skeet Range No. 580 AOC Boundary
- Public Land (2003)
- Soil Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Greater than Background and Greater than Eco or Human Health Screening Values
- Reconnaissance Pathway
- Probable Firing Line

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 500 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

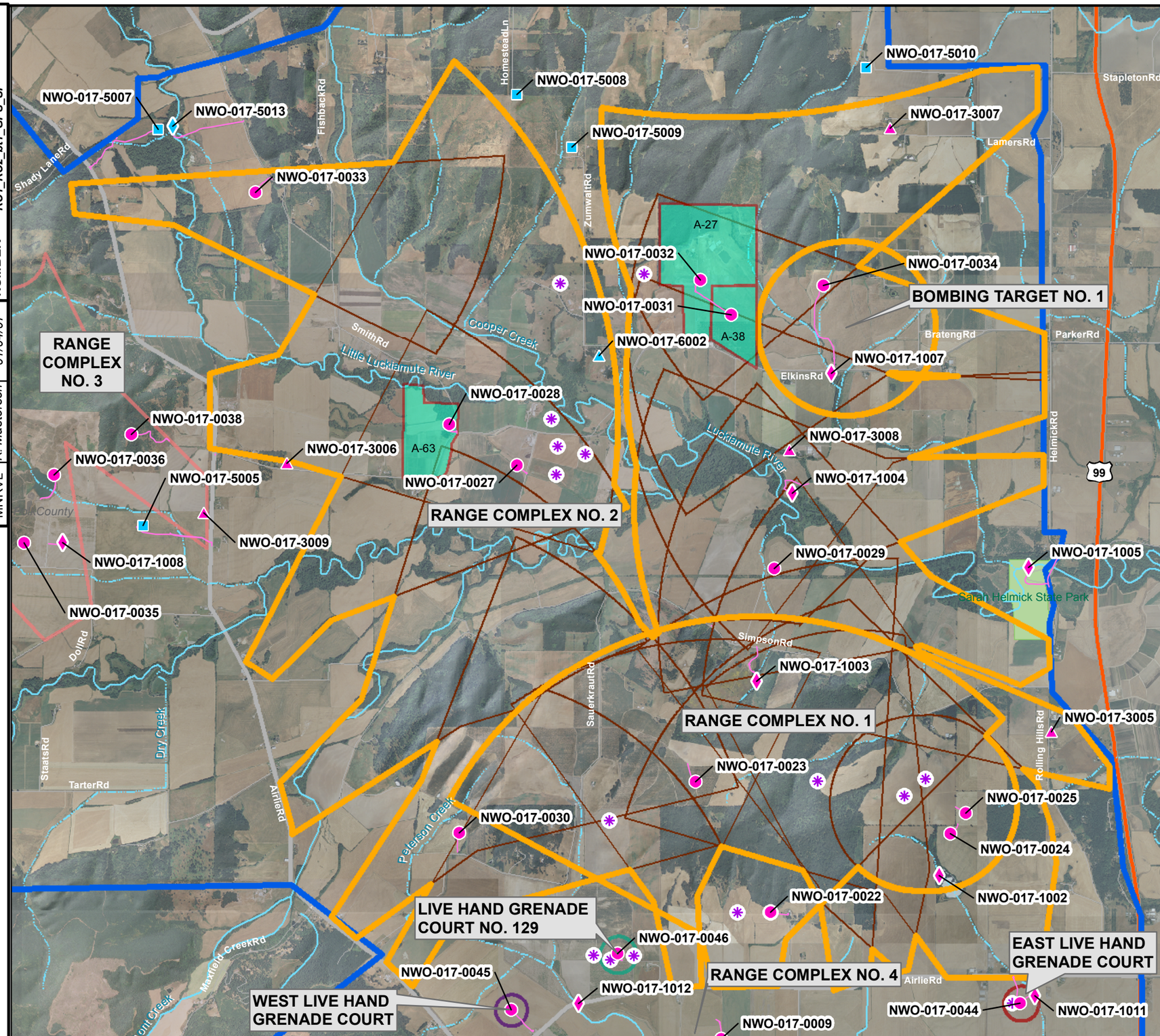
FIGURE 5-7

SMALL ARMS RANGES
SKEET RANGE NO. 580
SAMPLE LOCATIONS AND METALS RESULTS

CAMP ADAIR

Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	01/04/07	CampAdair_100_fig5_7_ SK580_METALS_SI

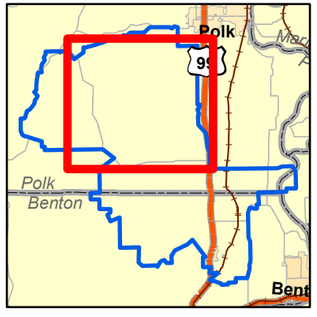


Legend

- Camp Adair FUDS Boundary
- Range Complexes No. 1 and No. 2 and Bombing Target Range No. 1 AOC Boundaries
- East Live Hand Grenade Court AOC Boundary
- Live Hand Grenade Court. 129 AOC Boundary
- Range Complex No. 3 AOC Boundary
- West Live Hand Grenade Court AOC Boundary
- Subrange Boundary
- Impact Areas
- Reported MEC Find
- Reconnaissance Pathway
- Background Groundwater Sample
- Background Sediment Sample
- Background Soil Sample
- Groundwater Sample
- Sediment Sample
- Soil Sample

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

0 3,500 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

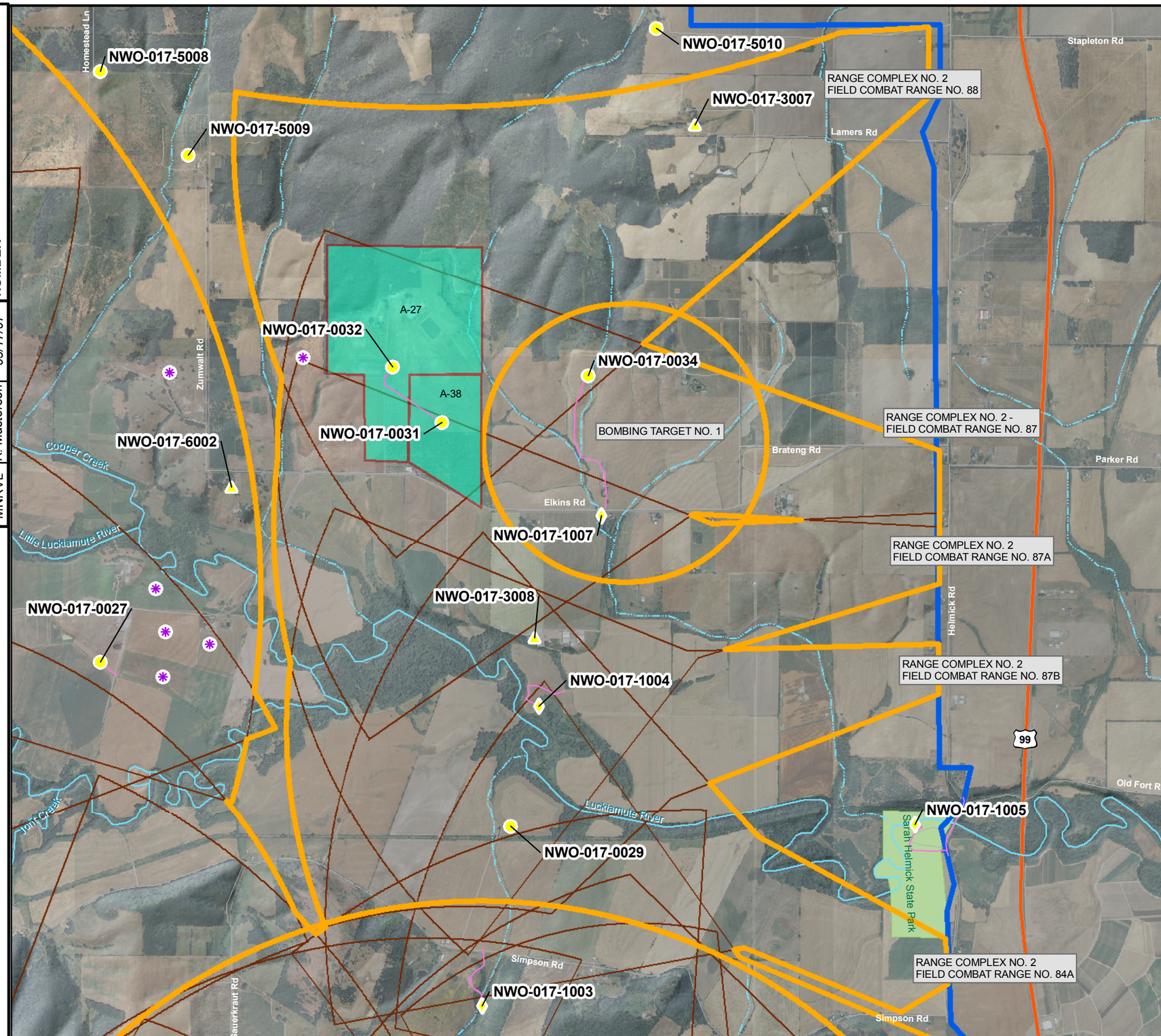
FIGURE 5-8

EXPLOSIVE MUNITION RANGES RANGE COMPLEXES NO. 1 and NO. 2 AND BOMBING TARGET NO. 1 SAMPLE POINTS

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	01/04/07	CampAdair_100_fig5_8_RC1_RC2_bt1_GPS_SI

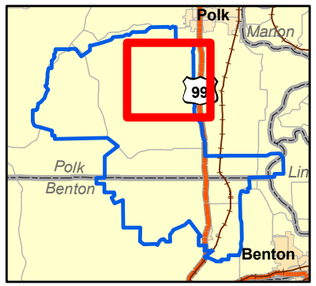


Legend

- Camp Adair FUDS Boundary
- Range Complexes No. 1 and No. 2 and Bombing Target No. 1 AOC Boundaries
- Subrange Boundary
- Impact Areas
- Reported MEC Find
- Groundwater Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Sediment Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Reconnaissance Pathway

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

0 2,200 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

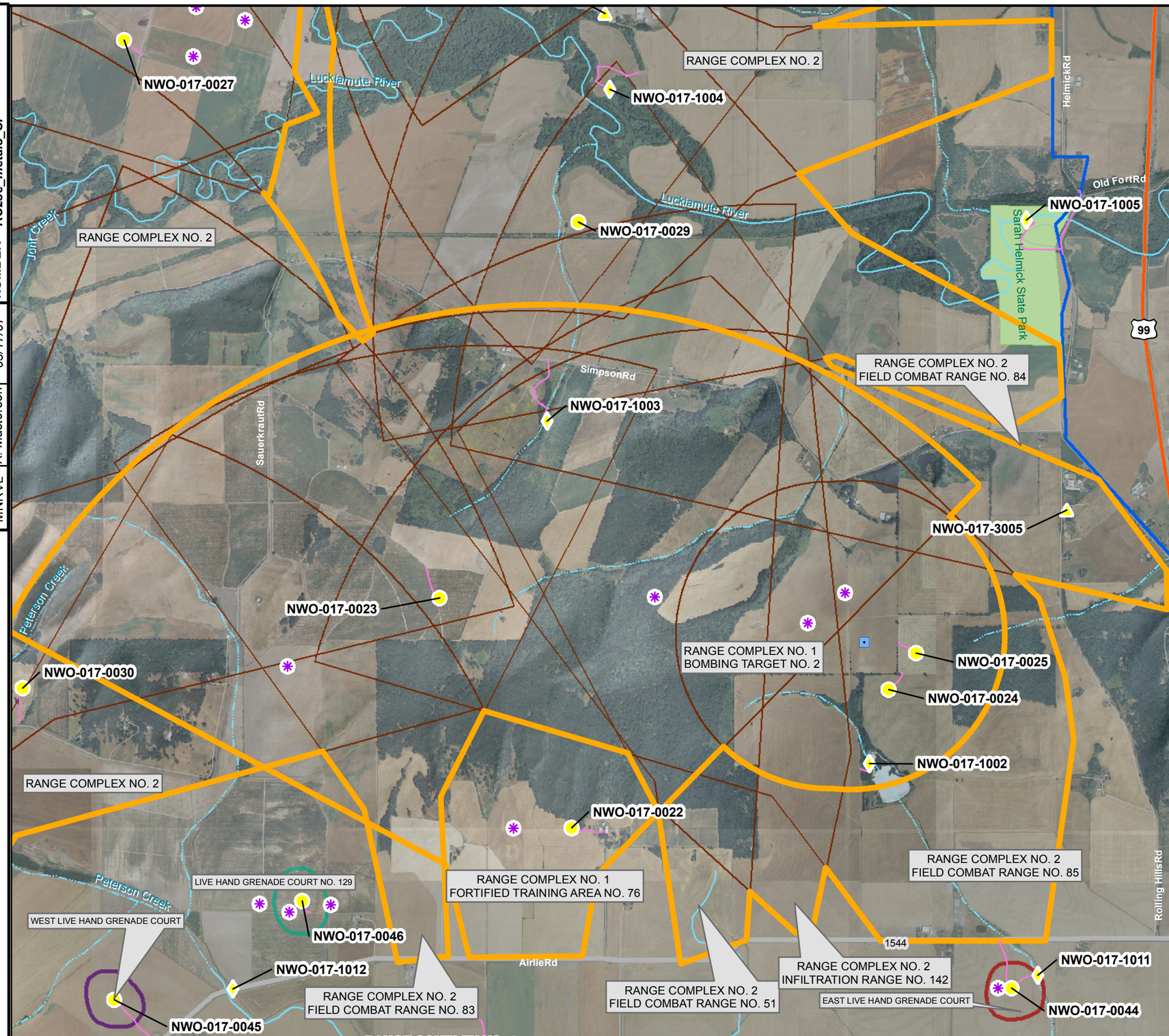
FIGURE 5-8A

EXPLOSIVE MUNITION RANGES
RANGE COMPLEXES NO. 1 and NO. 2
AND BOMBING TARGET NO. 1 (NORTHEAST)
SAMPLE LOCATIONS AND METALS RESULTS

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	03/17/07	CampAdair_102_RC1ne_metals_SI



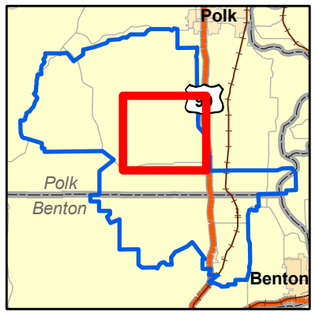
Legend

- Camp Adair FUDS Boundary
- Range Complexes No. 1 and No. 2 and Bombing Target No. 1 AOC Boundaries
- East Live Hand Grenade Court AOC Boundary
- Live Hand Grenade Court. 129 AOC Boundary
- West Live Hand Grenade Court AOC Boundary
- Subrange Boundary
- Target Center
- Reported MEC Find
- Groundwater Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Sediment Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Greater than Background and Greater than Eco or Human Health Screening Values
- Reconnaissance Pathway

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 2,000 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 5-8B

EXPLOSIVE MUNITIONS RANGES
RANGE COMPLEXES NO. 1 and 2
and BOMBING TARGET NO. 1 (SOUTHEAST)
SAMPLE LOCATIONS AND METALS RESULTS

CAMP ADAIR

Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	03/17/07	CampAdair_103_fig5_8b_RC2se_metals_SI

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	03/17/07	CampAdair_104_fig5_8c_RC2sw_metals_SI

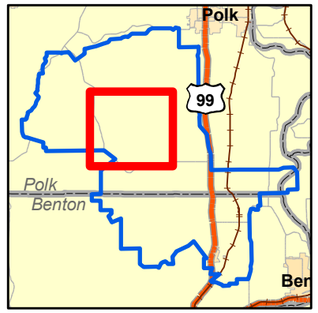
Legend

- Camp Adair FUDS Boundary
- Range Complexes No. 1 and No. 2 and Bombing Target No. 1 AOC Boundaries
- Live Hand Grenade Court. 129 AOC Boundary
- Range Complex No. 3 AOC Boundary
- West Live Hand Grenade Court AOC Boundary
- Subrange Boundary
- Impact Areas
- Reported MEC Find
- Groundwater Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Sediement Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Reconnaissance Pathway

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 2,000 Feet

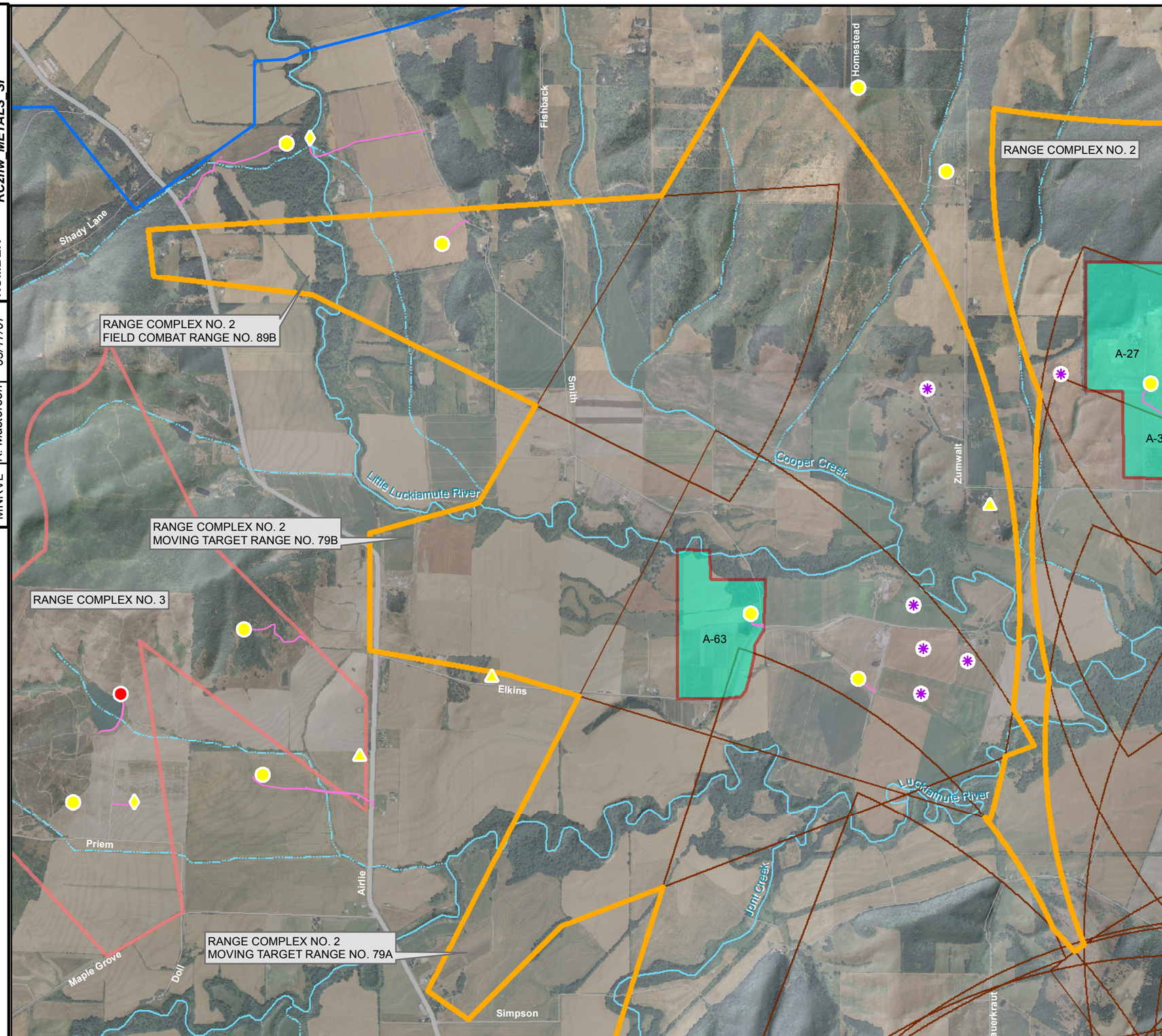


REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 5-8C
EXPLOSIVE MUNITIONS RANGES
RANGE COMPLEXES NO. 1 and 2
and BOMBING TARGET NO. 1 (SOUTHWEST)
SAMPLE LOCATIONS AND METALS RESULTS
CAMP ADAIR

Shaw® Shaw Environmental, Inc.



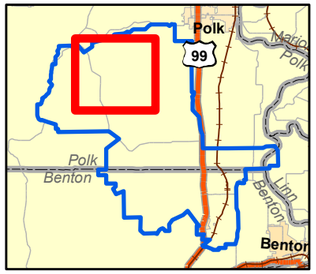
Legend

- Camp Adair FUDS Boundary
- Range Complexes No. 1 and No. 2 and Bombing Target No. 1 AOC Boundaries
- Impact Areas
- Range Complex No. 3 AOC Boundary
- Subrange Boundary
- Reported MEC Find
- Groundwater Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Sediment Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Greater than Background and Greater than Eco or Human Health Screening Values
- Reconnaissance Pathway

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 2,200 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

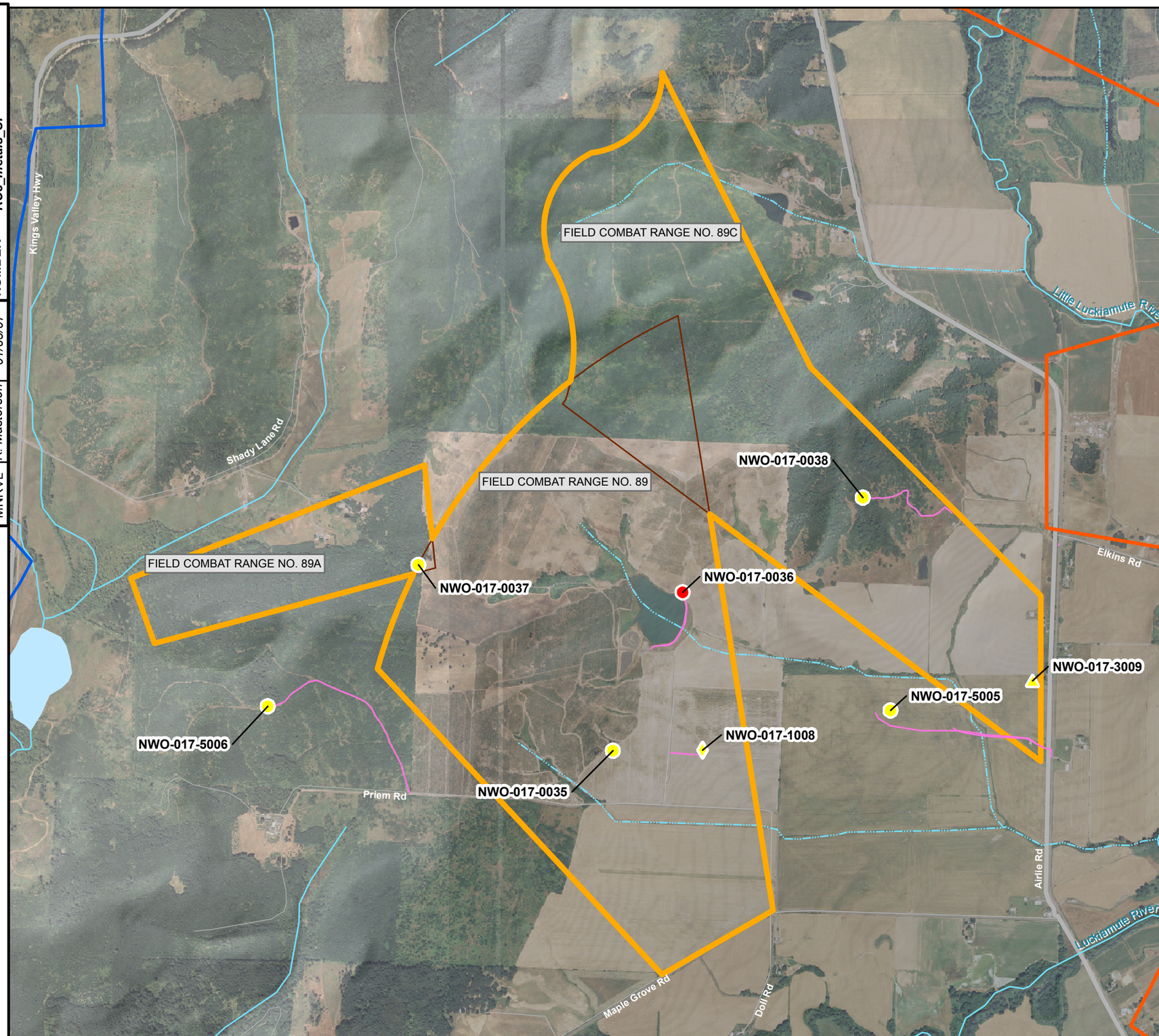
U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 5-8D
EXPLOSIVE MUNITIONS RANGES
RANGE COMPLEX NO. 1 and NO. 2 and
BOMBING TARGET NO. 1 (NORTHWEST)
SAMPLE LOCATIONS AND METALS RESULTS
CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	03/17/07	CampAdair_105_fig5_8d_RC2nw_METALS_SI

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	01/05/07	CampAdair_106_FIG5_9_RC3_metals_SI



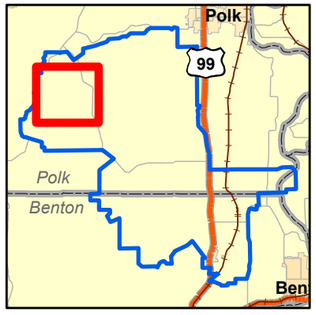
Legend

- Camp Adair FUDS Boundary
- Range Comple No. 3 AOC Boundary
- Range Complex No. 2 AOC Boundary
- Subrange Boundary
- Groundwater Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Sediment Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Greater than Background and Greater than Eco or Human Health Screening Values
- Reconnaissance Pathway

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 1,500 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

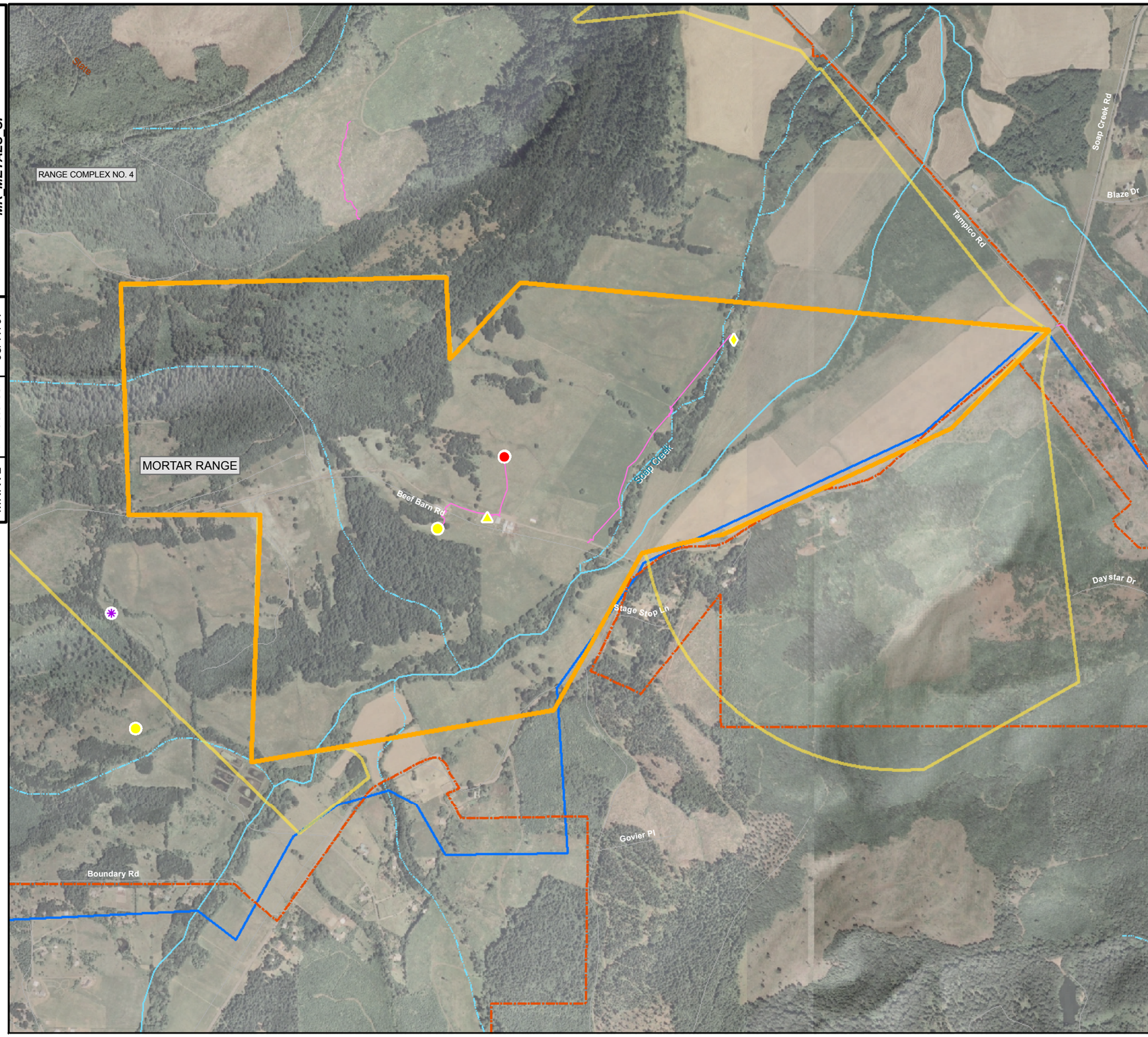
FIGURE 5-9

EXPLOSIVE MUNITIONS RANGES
RANGE COMPLEX NO. 3
SAMPLE LOCATIONS AND METALS RESULTS

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	03/17/07	CampAdair_107_FIG5_10_MR_METALS_SI



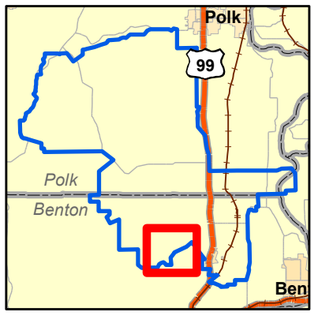
Legend

- Camp Adair FUDS Boundary
- Mortar Range AOC Boundary
- Range Complex No. 4 AOC Boundary
- Public Land (2003)
- Reported MEC Find
- Groundwater Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Sediment Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Greater than Background and Greater than Eco or Human Health Screening Values
- Reconnaissance Pathway

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 1,200 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

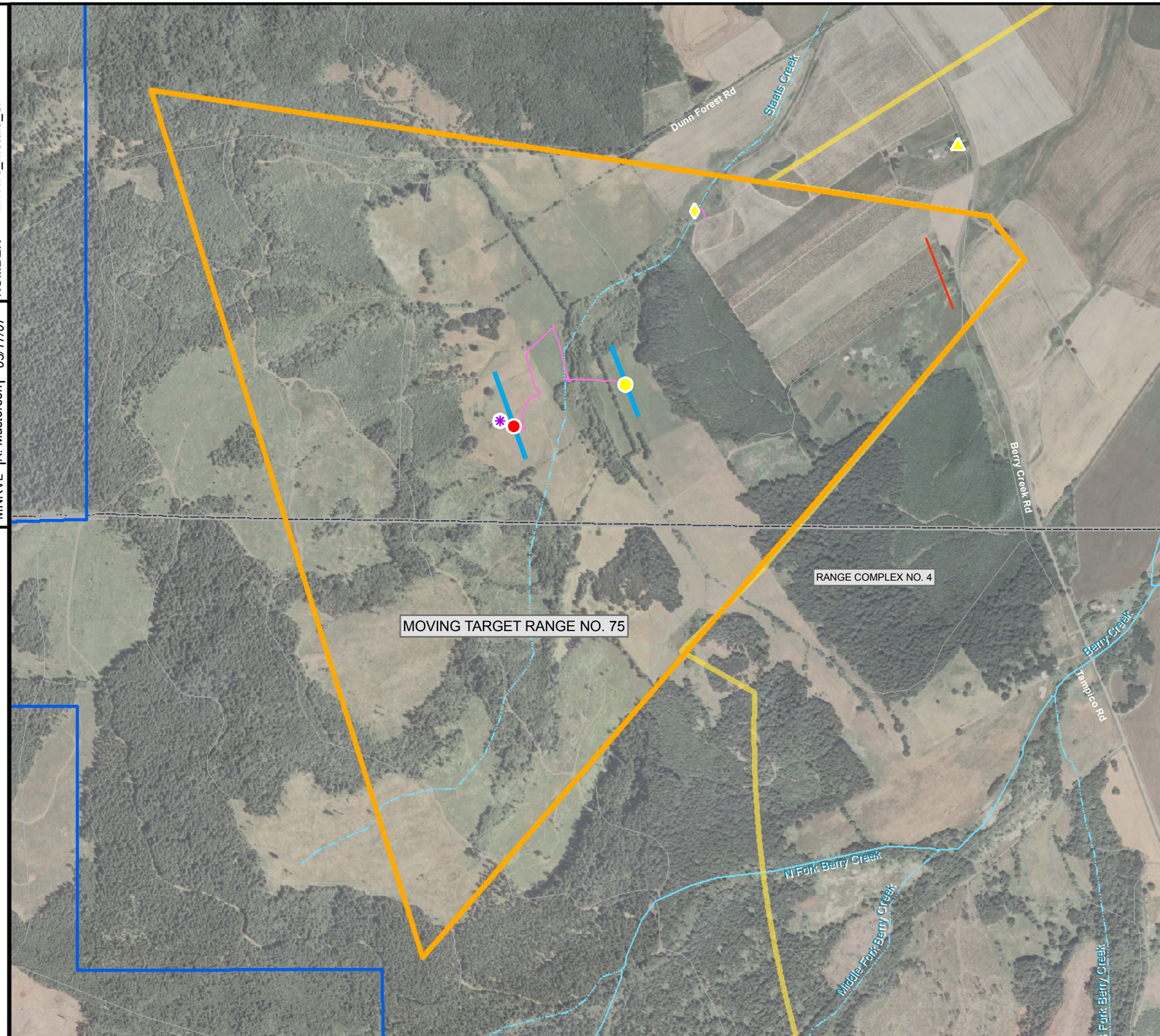
U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 5-10

EXPLOSIVE MUNITIONS RANGES
MORTAR RANGE
SAMPLE LOCATIONS AND METALS RESULTS

CAMP ADAIR

Shaw® Shaw Environmental, Inc.



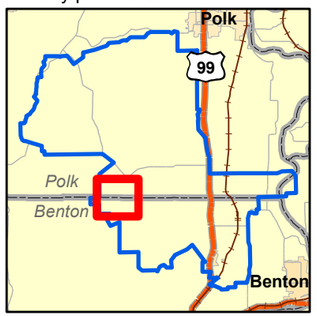
Legend

- Moving Target Range No. 75 AOC Boundary
- Range Complex No. 4 AOC Boundary
- Reported MEC Find
- Groundwater Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Sediment Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Greater than Background and Greater than Eco or Human Health Screening Values
- Reconnaissance Pathway
- Probable Firing Line
- Target Line

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 1,000 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

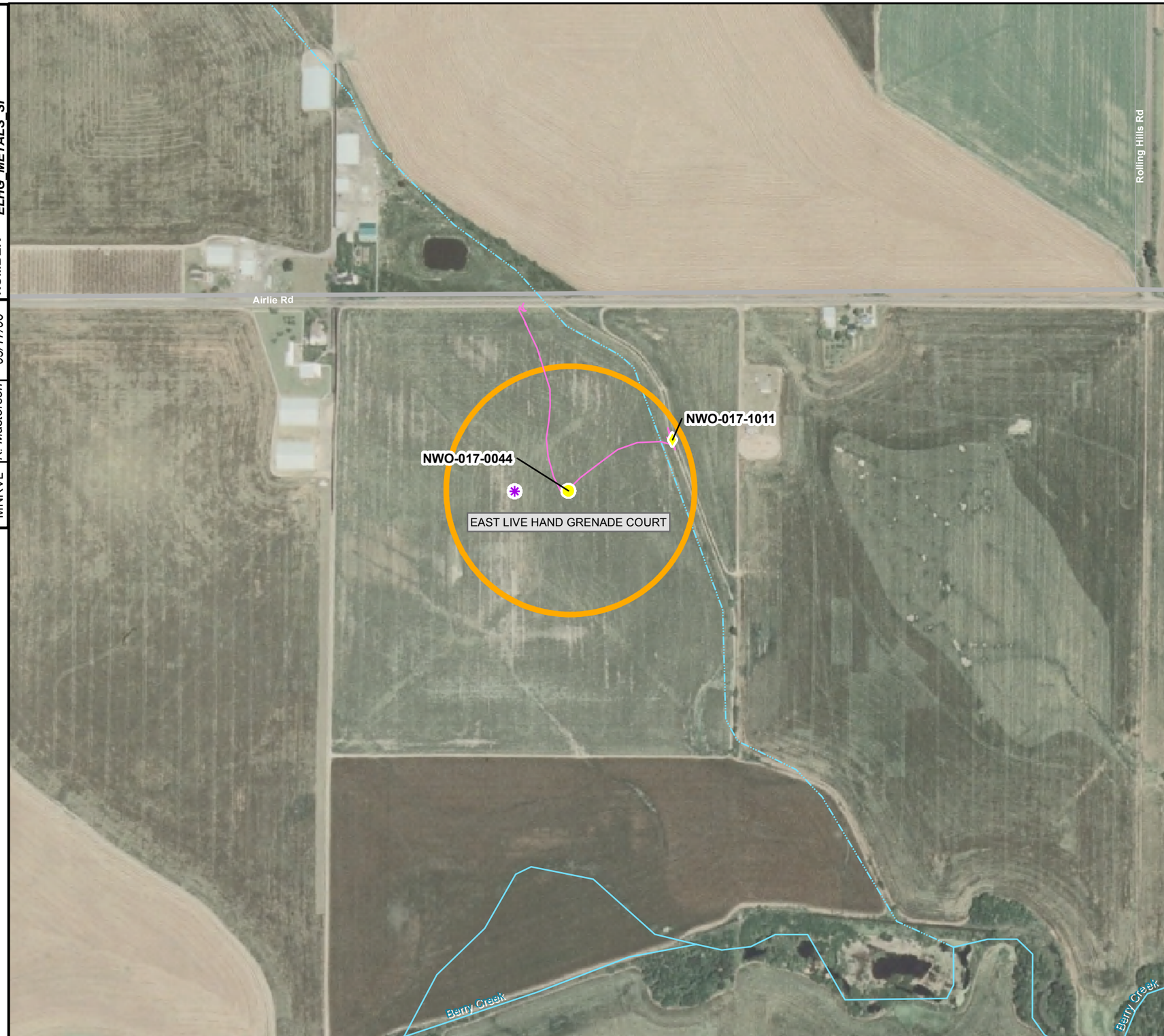
FIGURE 5-11

EXPLOSIVE MUNITIONS RANGES
MOVING TARGET RANGE NO. 75
SAMPLE LOCATIONS AND METALS RESULTS

CAMP ADAIR

Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	03/17/07	CampAdair_108_fig5_11_ MTR75_metals_SI



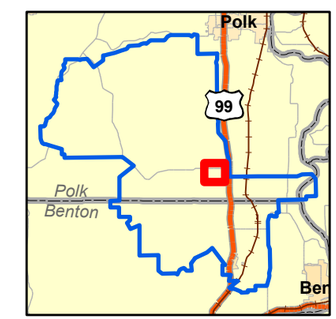
Legend

- Camp Adair FUDS Boundary
- East Live Hand Grenade Court AOC Boundary
- Reported MEC Find
- Soil Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Sediment Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Reconnaissance Pathway

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 500 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

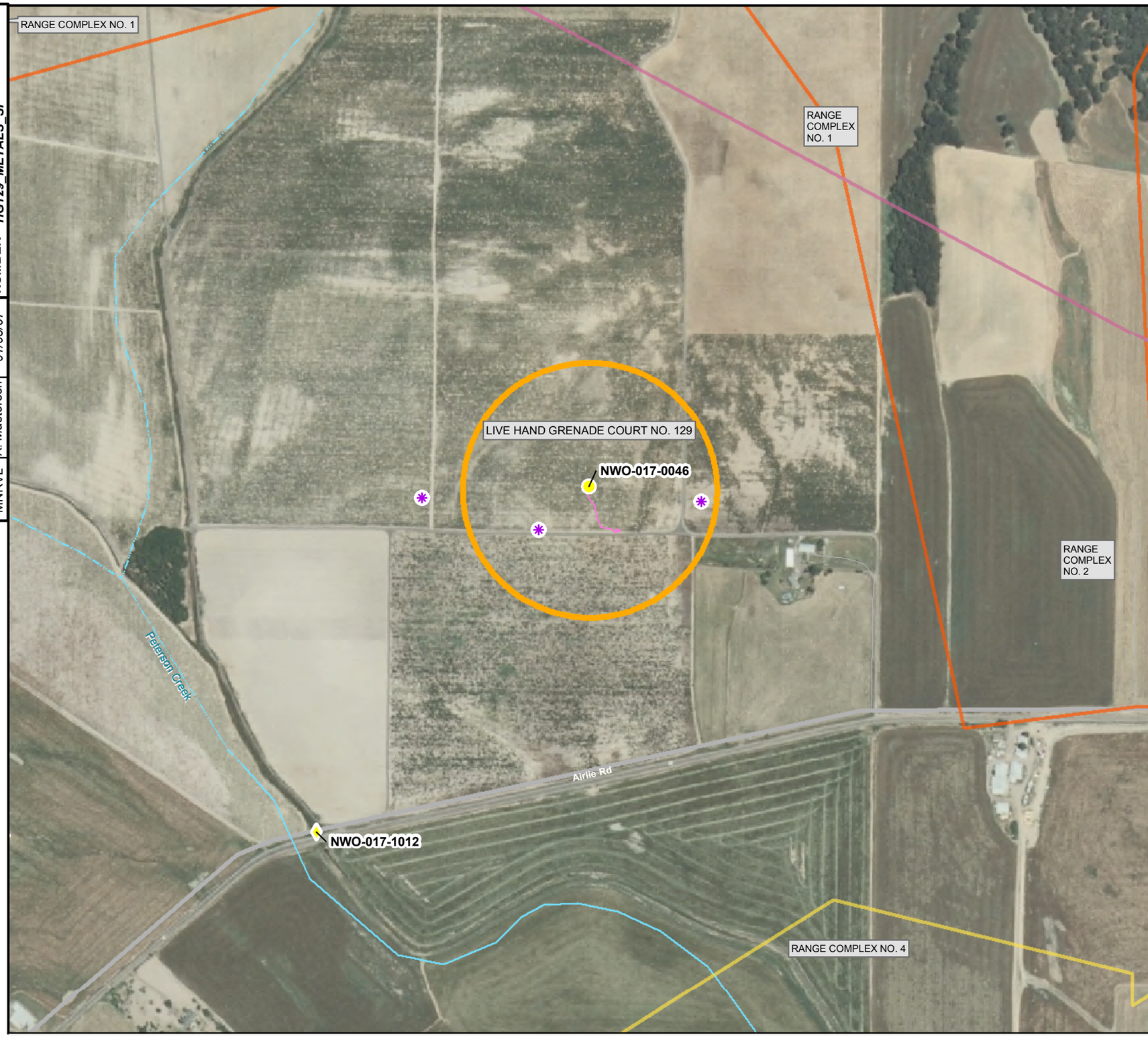
FIGURE 5-12

EAST LIVE HAND GRENADE COURT SAMPLE LOCATIONS AND METALS RESULTS

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	03/17/06	CampAdair_110_fig5_12_ELHG_METALS_SI



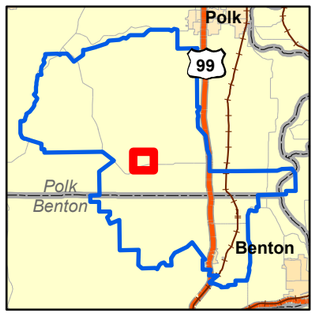
Legend

- Camp Adair FUDS Boundary
- Live Hand Grenade Court No. 129 AOC Boundary
- Range Comple No. 1 AOC Boundary
- Range Complex No. 2 AOC Boundary
- Range Complex No. 4 AOC Boundary
- Reported MEC Find
- Sediment Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Reconnaissance Pathway

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 500 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 5-13

LIVE HAND GRENADE COURT NO. 129
SAMPLE LOCATIONS AND METALS RESULTS

CAMP ADAIR

Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	01/05/07	CampAdair_110_fig5_13_HG129_METALS_SI

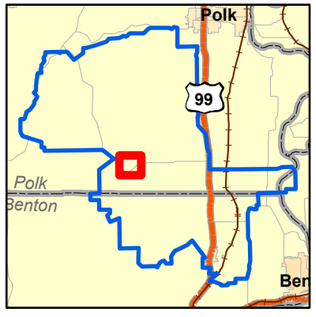
Legend

- Camp Adair FUDS Boundary
- West Live Hand Grenade Court AOC Boundary
- Range Complex No. 2 AOC Boundary
- Range Complex No. 4 AOC Boundary
- Reported MEC Find
- Sediment Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Soil Sample Results Less than Background and/or Less than Eco or Human Health Screening Values
- Reconnaissance Pathway

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 & 2006. The photo for Polk County was dated 2005 and the Benton County photo is 2006.

N

0 500 Feet



REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

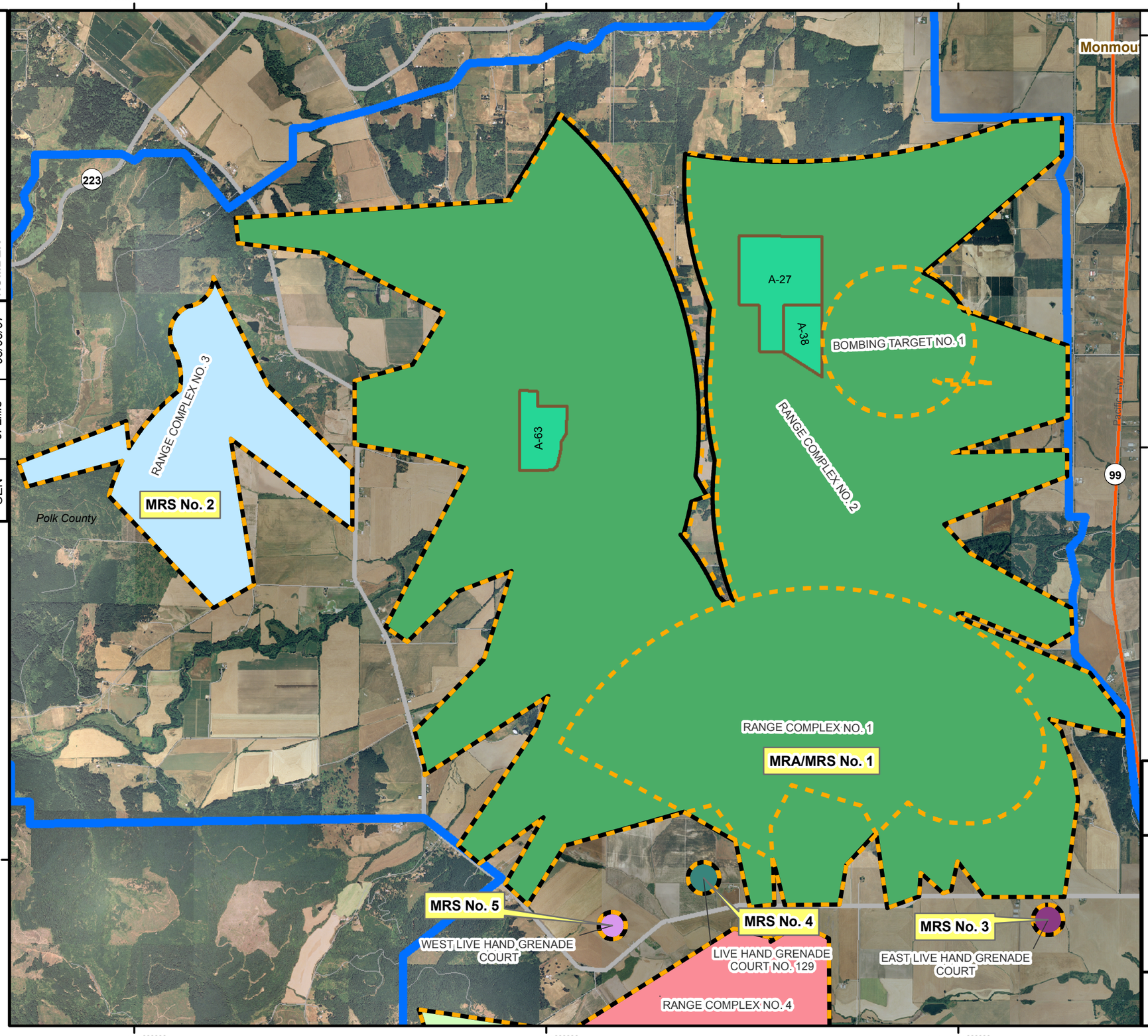
FIGURE 5-14

WEST LIVE HAND GRENADE COURT SAMPLE LOCATIONS AND METALS RESULTS

CAMP ADAIR

Shaw® Shaw Environmental, Inc.

OFFICE	DRAWN BY		DRAWING NUMBER
MNRVL	K. Masterson	01/05/07	CampAdair_112_fig5_14_ WLHG_METALS_SI

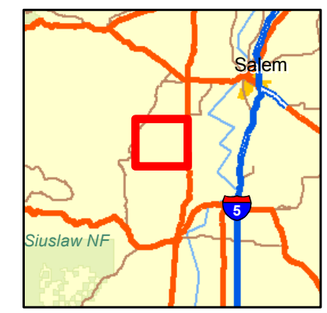


DRAWING NUMBER	DRAWN BY		OFFICE
CADA_115_fig7_1a_MRA_MRS	J. Lillis	03/08/07	CEN

Legend

- Camp Adair FUDS Property
- ASR Supplement Ranges
- MRA/MRS Boundaries
- Impact Areas

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 (Benton County) and 2006 (Polk County).



N

0 2,000 4,000 8,000 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

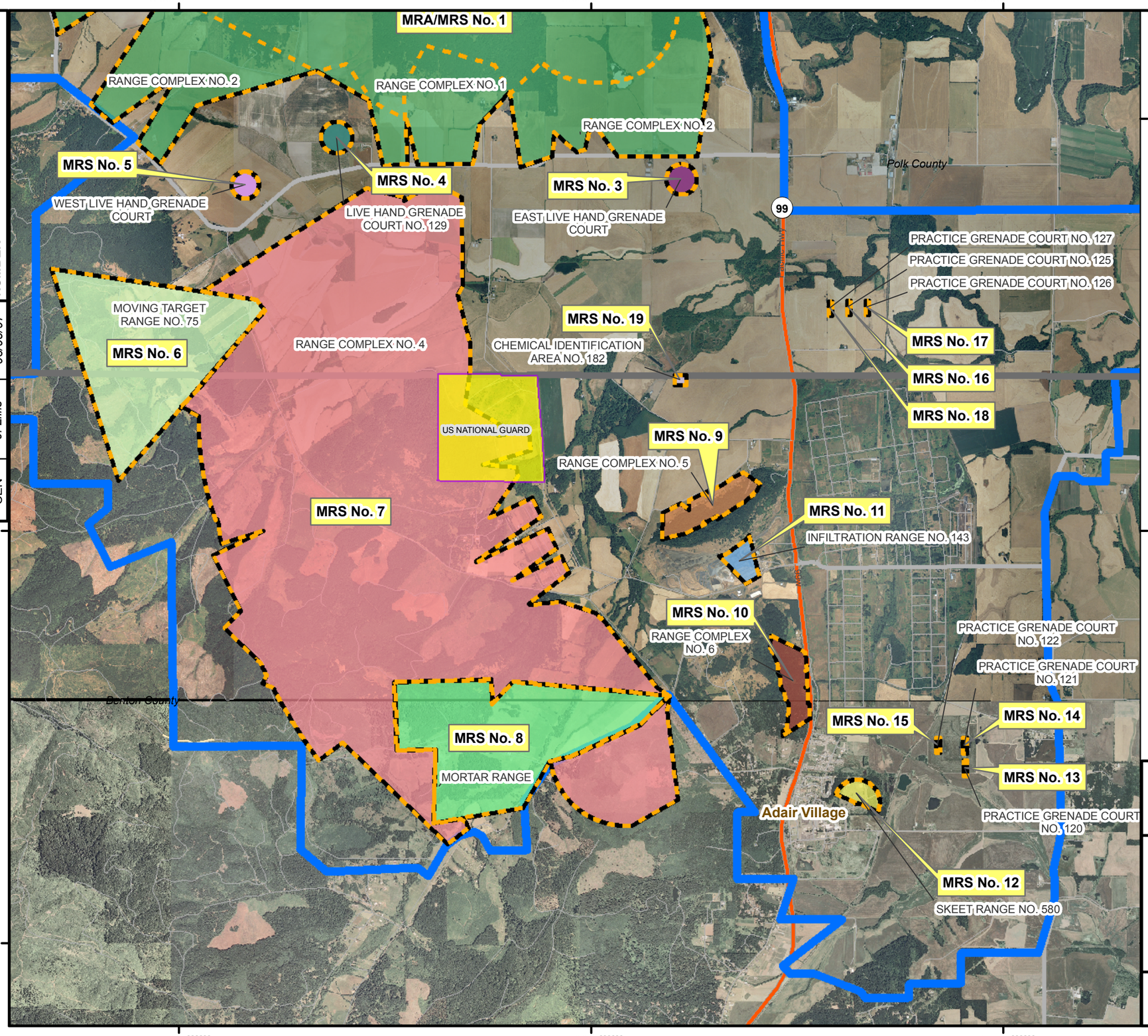
U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 7-1a

MRA/MRS BOUNDARIES NORTHERN RANGES

CAMP ADAIR

Shaw Environmental, Inc.



DRAWING NUMBER: CADA_116_fig7_1b_MRA_MRS

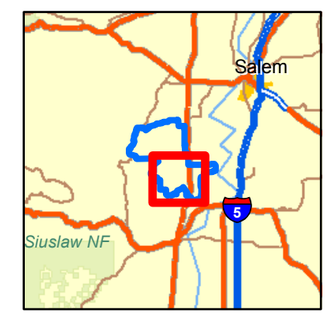
DRAWN BY: J. Lillis 03/05/07

OFFICE: CEN

Legend

- Camp Adair FUDS Property
- ASR Supplement Ranges
- MRA/MRS Boundaries
- Impact Areas

NOTES:
1) AOC boundaries were derived from the Camp Adair ASR Supplement.
2) Aerial photos were obtained from the U.S. Department of Agriculture, Service Center Agencies; photo is from the USDA-AFPO National Agricultural Inventory Project (NAIP), 2005 (Benton County) and 2006 (Polk County).



N

0 2,000 4,000 8,000 Feet

REFERENCE/PROJECTION: NAD 83 UTM Zone 10N

U.S. ARMY CORPS OF ENGINEERS
OMAHA DESIGN CENTER

FIGURE 7-1b

MRA/MRS BOUNDARIES SOUTHERN RANGES

CAMP ADAIR

Shaw Environmental, Inc.

Tables

Table 1-1
Ranges and Range IDs
Camp Adair

Range Type	Range Name	Sub-Range Name	Range ID	Approximate Area (acres)	UTM Coordinates (meters)
Small Arms Ranges	Skeet Range No. 580		F10OR002903R01	29	N 4946734.79 E 483365.00
	Infiltration Range No. 143		F10OR002903R05	34	N 4949645.55 E 481823.14
	Range Complex No. 4	Entire Range	F10OR002903R19	5391	N 4950504.85 E 477424.57
		Known Distance Range No. 1	F10OR002903R19 -SR01	561	N 4948430.22 E 477743.09
		Known Distance Range No. 2	F10OR002903R19 -SR02	551	N 4948776.45 E 477557.19
		Known Distance Range No. 3	F10OR002903R19 -SR03	544	N 4949159.78 E 477351.64
		Known Distance Range No. 4	F10OR002903R19 -SR04	551	N 4950642.19 E 476980.56
		Thompson Sub MG Range No. 50	F10OR002903R19 -SR05	519	N 4947098.43 E 480434.21
		Thompson Sub MG Range No. 50A	F10OR002903R19 -SR06	714	N 4952141.79 E 477865.89
		Mini A-A Range No. 60, 61, 62	F10OR002903R19 -SR07	275	N 4948388.37 E 479196.06
		Mini A-A Range No. 65, 66, 67	F10OR002903R19 -SR08	474	N 4948584.96 E 479473.73
		Anti Aircraft Range No. 70	F10OR002903R19 -SR09	1680	N 4952133.31 E 476765.89
		Field Combat Range No. 80	F10OR002903R19 -SR10	374	N 4948321.92 E 476948.07
		Field Combat Range No. 80A	F10OR002903R19 -SR11	1145	N 4948903.73 E 478235.56
		Field Combat Range No. 80B	F10OR002903R19 -SR12	945	N 4948438.96 E 477010.12
		Field Combat Range No. 81	F10OR002903R19 -SR13	450	N 4950228.90 E 479628.47
		Infiltration Range No. 141	F10OR002903R19 -SR14	1233	N 4951204.70 E 476720.74
		Transition Course No. 160	F10OR002903R19 -SR15	1133	N 4952433.68 E 477334.53
		Close Combat Course No. 170	F10OR002903R19 -SR16	1053	N 4949839.19 E 477188.97
	Range Complex No. 5	Entire Range	F10OR002903R20	64	N 4950325.53 E 481418.10
		1000-in MG Range No. 20, 21, 22, 23	F10OR002903R20 -SR01	28	N 4950122.91 E 481065.27

Table 1-1 (cont.)

Range Type	Range Name	Sub-Range Name	Range ID	Approximate Area (acres)	UTM Coordinates (meters)
Small Arms Ranges (Continued)	Range Complex No. 5 (continued)	1000-in Anti Tank Range No. 45, 46	F10OR002903R20 -SR02	27	N 4950260.94 E 481645.15
		1000-in Anti Tank Range No. 40, 41	F10OR002903R20 -SR03	27	N 4950368.32 E 481561.11
		1000-in Pistol Range No. 15	F10OR002903R20 -SR04	26	N 4950457.37 E 481715.40
		1000-in Range No. 35, 36, 37	F10OR002903R20 -SR05	23	N 4950454.03 E 481805.61
	Range Complex No. 6	Entire Range	F10OR002903R21	77	N 4948187.48 E 482428.79
		1000-in Pistol Range No. 11	F10OR002903R21 -SR01	36	N 4948452.99 E 448372.23
		1000-in Range No. 30, 31, 32	F10OR002903R21 -SR02	29	N 4948239.99 E 482406.92
		1000-in Landscape Range No. 33	F10OR002903R21 -SR03	24	N 4948036.25 E 482443.79
		1000-in Landscape Range No. 34	F10OR002903R21 -SR04	22	N 4947820.18 E 482470.82
Explosive Munitions Ranges	Bombing Target No. 1		F10OR002903R13	649	N 4961316.85 E 479285.73
	Mortar Range		F10OR002903R14	793	N 4947540.61 E 478953.06
	Moving Target Range No. 75		F10OR002903R15	802	N 4952193.89 E 474603.57
	Range Complex No. 1	Entire Range	F10OR002903R16	3354	N 4956623.96 E 478233.01
		Fortified Training Area No. 76	F10OR002903R16 -SR01	3043	N 4956677.12 E 478026.54
		Bombing Target No. 2	F10OR002903R16 -SR02	649	N 4956380.73 E 479975.59
	Range Complex No. 2	Entire Range	F10OR002903R17	11452	N 4959733.31 E 476744.90
		Field Combat Range No. 51	F10OR002903R17 -SR01	375	N 4955003.52 E 479320.43
		Moving Target Range No. 79A	F10OR002903R17 -SR02	1462	N 4959631.53 E 475078.91
		Moving Target Range No. 79B	F10OR002903R17 -SR03	3092	N 4961133.00 E 475170.39
		Field Combat Range No. 83	F10OR002903R17 -SR04	58	N 4954790.37 E 477542.92
		Field Combat Range No. 84	F10OR002903R17 -SR05	619	N 4958146.75 E 479642.59
		Field Combat Range No. 84A	F10OR002903R17 -SR06	1331	N 4958914.15 E 478968.14
		Field Combat Range No. 85	F10OR002903R17 -SR07	547	N 4955455.65 E 480792.88

Table 1-1 (cont.)

Range Type	Range Name	Sub-Range Name	Range ID	Approximate Area (acres)	UTM Coordinates (meters)
Explosive Munitions Ranges (continued)	Range Complex No. 2 (continued)	Field Combat Range No. 86	F10OR002903R17 -SR08	852	N 4957278.37 E 475575.40
		Field Combat Range No. 86A	F10OR002903R17 -SR09	1505	N 4958149.42 E 475339.13
		Field Combat Range No. 87	F10OR002903R17 -SR10	1173	N 4961105.82 E 4480669.08
		Field Combat Range No. 87A	F10OR002903R17 -SR11	1721	N 4959998.68 E 478523.44
		Field Combat Range No. 87B	F10OR002903R17 -SR12	1562	N 4959427.55 E 478609.44
		Field Combat Range No. 88	F10OR002903R17 -SR13	1853	N 4962670.61 E 478598.23
		Field Combat Range No. 89B	F10OR002903R17 -SR14	1184	N 4962326.36 E 474032.82
		Mortar Range No. 90	F10OR002903R17 -SR15	249	N 4955412.05 E 475443.01
		Infiltration Range No. 142	F10OR002903R17 -SR16	118	N 4955150.79 E 479582.57
	Range Complex No. 3	Entire Range	F10OR002903R18	1324	N 4959902.89 E 470791.63
		Field Combat Range No. 89	F10OR002903R18 -SR01	709	N 4959492.73 E 470665.89
		Field Combat Range No. 89A	F10OR002903R18 -SR02	103	N 4959933.89 E 469358.30
		Field Combat Range No. 89C	F10OR002903R18 -SR03	573	N 4960544.54 E 471441.86
Practice Grenade Courts	Practice Grenade Court No. 122		F10OR002903R02	2.1	N 4947420.78 E 484201.15
	Practice Grenade Court No. 120		F10OR002903R03	2.1	N 4947139.20 E 484528.50
	Practice Grenade Court No. 121		F10OR002903R04	2.1	N 4947423.09 E 484522.58
	Practice Grenade Court No. 127		F10OR002903R07	2.1	N 4952719.00 E 482885.47
	Practice Grenade Court No. 125		F10OR002903R08	2.1	N 4952730.73 E 483116.47
	Practice Grenade Court No. 126		F10OR002903R09	2.1	N 4952733.24 E 483340.85
Live Hand Grenade Courts	East Live Hand Grenade Court		F10OR002903R10	25	N 4954269.90 E 481088.45
	Live Hand Grenade Court No. 129		F10OR002903R11	25	N 4954780.25 E 476911.76
	West Live Hand Grenade Court		F10OR002903R12	25	N 4954201.13 E 4758801.27
Chemical Ident. Area	Chemical Ident. Area No. 182		F10OR002903R06	6	N 4951829.25 E 481063.68

UTM Zone No. 10
Datum NAD 83

Table 2-1
Munitions Information
Camp Adair

AOC	Munitions	Munitions Constituents
Range Complex No. 4	50-caliber Machine Gun	Lead, Single (nitrocellulose)- or double-base (nitrocellulose and nitroglycerin) propellant, Perchlorate
	Small Arms General	Lead, Single (nitrocellulose)- or double-base (nitrocellulose and nitroglycerin) propellant
Range Complex No. 5	50-caliber Machine Gun	Lead, Single (nitrocellulose)- or double-base (nitrocellulose and nitroglycerin) propellant, Perchlorate
	Small Arms General	Lead, Single (nitrocellulose)- or double-base (nitrocellulose and nitroglycerin) propellant
Range Complex No. 6	Small Arms General	Lead, Single (nitrocellulose)- or double-base (nitrocellulose and nitroglycerin) propellant
Skeet Range No. 580	Small Arms General	Lead, Single (nitrocellulose)- or double-base (nitrocellulose and nitroglycerin) propellant; PAH (from targets)
Infiltration Range No. 143	Small Arms General	Lead, Single (nitrocellulose)- or double-base (nitrocellulose and nitroglycerin) propellant
	Explosives Dynamite Commercial	Nitroglycerin (NG)
	Blasting Caps Electrical and Nonelectrical M6 & M7	Lead styphnate, smokeless powder, RDX
Range Complex No. 1	50-caliber Machine Gun	Lead, Single (nitrocellulose)- or double-base (nitrocellulose and nitroglycerin) propellant, Perchlorate
	Small Arms General	Lead, Single (nitrocellulose)- or double-base (nitrocellulose and nitroglycerin) propellant
	Mk II Hand Grenade Frag	TNT, flaked or granular, older models used E.C. Blankfire smokeless powder (nitrocellulose, potassium nitrate, barium nitrate, starch, diphenylalamine), M204 (fuze), Perchlorate, Iron
	M21 Practice Hand Grenade	Black powder (potassium nitrate, sulfur, charcoal), Perchlorate, Iron
	100-lb Bomb, GP Mk 1	TNT, steel (iron, chromium, cobalt, nickel., molybdenum)
	500-lb Bomb, GP, Mk 12	TNT, Amatol (TNT and ammonium nitrate), and Tritonal (TNT and aluminum powder), steel (iron, chromium, cobalt, nickel., molybdenum)
	AN-M30 General Purpose Bomb, 100-lb	TNT, steel (iron, chromium, cobalt, nickel., molybdenum)
	AN-Mk5, AN-Mk 23, AN-Mk43, Prac	Black powder (potassium nitrate, sulfur, charcoal), red phosphorus, cast iron
	M38A2, Practice bomb, 100-lb	3-lb Spotting charge (black powder), Single (nitrocellulose)- or double-base (nitrocellulose and nitroglycerin) propellant , steel (iron, chromium, cobalt, nickel., molybdenum)
	Signal, Practice Bomb Mk 4	Nitrocellulose, Red phosphorus. steel (iron, chromium, cobalt, nickel., molybdenum)
	Spotting Charge, M1A1	Black powder (potassium nitrate, sulfur, and charcoal)

Table 2-1 (Cont.)

AOC	Munitions	Munitions Constituents
Range Complex No. 1	M6A1 Rocket HEAT 2.36-inch	Pentolite (pentaerythritol tetranitrate [PETN) and TNT), Ballistite (nitrocellulose and nitroglycerin), M400 (fuze), sheet metal (iron, chromium, cobalt, nickel)
	M6A3 Rocket HEAT 2.36-inch	Pentolite (PETN and TNT), Ballistite (nitroglycerin and nitrocellulose), M400 (fuze), sheet metal (iron, chromium, cobalt, nickel)
	M7A1 Practice Rocket 2.36-inch	5 sticks of Ballistite (nitrocellulose and nitroglycerin), Perchlorate, sheet metal (iron, chromium, cobalt, nickel)
	M7A3 Practice Rocket 2.36-inch	5 sticks of Ballistite (nitrocellulose and nitroglycerin) , sheet metal (iron, chromium, cobalt, nickel), steel (iron, chromium, cobalt, cobalt, nickel, molybdenum)
	105-mm HE M1	Black powder (potassium nitrate, sulfur, charcoal), steel (iron, chromium, cobalt, cobalt, nickel, molybdenum)
	155-mm HE M107	TNT and Composition B (TNT and RDX), steel (iron, chromium, cobalt, cobalt, nickel, molybdenum)
	37-mm HE M54	FNH powder (nitrocellulose), steel (iron, chromium, cobalt, nickel, molybdenum)
	57-mm APC-T M86	FNH powder (nitrocellulose), steel (iron, chromium, cobalt, nickel, molybdenum)
	Large Caliber (37-mm and Larger) (Incendiary Smoke)	FNH powder (nitrocellulose) (propelling charge), white phosphorus, steel (iron, chromium, cobalt, nickel, molybdenum)
	60-mm HE M49	TNT, Ballistite (nitrocellulose and nitroglycerin), steel (iron, chromium, cobalt, nickel, molybdenum)
	81-mm HE M43	TNT, Ballistite (nitrocellulose and nitroglycerin), steel (iron, chromium, cobalt, nickel, molybdenum)
	Mortars (incendiary, illumination, smoke)	White phosphorus, steel (iron, chromium, cobalt, nickel, molybdenum)
	Explosives TNT	TNT
	Blasting Caps Electrical and Nonelectrical M6 & M7	Lead styphnate, smokeless powder, RDX
Range Complex No. 2	50-caliber Machine Gun	Lead, Single(nitrocellulose)- or double-base (nitrocellulose and nitroglycerin) propellant, Perchlorate
	Small Arms General	Lead, Single (nitrocellulose)- or double-base (nitrocellulose and nitroglycerin) propellant
	105-mm HE M1	TNT and Composition B (TNT and RDX), steel (iron, chromium, nickel, molybdenum)
	105-mm HEAT-T M622	Composition B (TNT and RTX), steel (iron, chromium, nickel, molybdenum)
	155-mm HE M107	TNT and Composition B (TNT and RDX), steel (iron, chromium, nickel, molybdenum)
	37-mm HE M54	FNH powder (nitrocellulose), steel (iron, chromium, nickel, molybdenum)

AOC	Munitions	Munitions Constituents
	57-mm APC-T M86	FNH powder (nitrocellulose), steel (iron, chromium, nickel, molybdenum), steel (iron, chromium, nickel, molybdenum)
	60-mm HE M49	TNT, Ballistite (nitrocellulose and nitroglycerin), steel (iron, chromium, cobalt, nickel, molybdenum)
	81-mm HE M43	TNT, Ballistite (nitrocellulose and nitroglycerin), steel (iron, chromium, cobalt, nickel, molybdenum)
	60-mm Illuminating M721	White phosphorus, steel (iron, chromium, cobalt, nickel, molybdenum)
	60-mm Practice M50A2	Inert with Black powder (potassium nitrate, sulfur, charcoal), steel (iron, chromium, cobalt, nickel, molybdenum)
	81-mm TP M43A1	Inert with Black powder (potassium nitrate, sulfur, charcoal), steel (iron, chromium, cobalt, nickel, molybdenum)
	Explosives-Commercial Dynamite	Nitroglycerin
	Blasting Caps Electrical and Nonelectrical M6 & M7	Lead styphnate, smokeless powder, RDX

Table 2-1 (Cont.)

AOC	Munitions	Munitions Constituents
Bombing Target No. 1	AN-M30 General Purpose Bomb, 100-lb	TNT, steel (iron, chromium, cobalt, nickel, molybdenum)
	100-lb Bomb, GP, Mk 1	TNT, steel (iron, chromium, cobalt, nickel, molybdenum)
	500-lb Bomb, GP, Mk 12	TNT, Amatol (TNT and ammonium nitrate), and Tritonal (TNT and aluminum powder)
	AN-Mk5, AN-Mk 23, AN-Mk43, Practice Bombs	Black powder (potassium nitrate, sulfur, charcoal), Red phosphorus, cast iron
	M38A2, Practice bomb, 100-lb	3-lb Spotting charge (black powder), Single (nitrocellulose)- or double-base (nitrocellulose and nitroglycerin) propellant, steel (iron, chromium, cobalt, nickel, molybdenum)
	105-mm, Fixed HE M38	Black powder (potassium nitrate, sulfur, charcoal), steel (iron, chromium, cobalt, nickel, molybdenum)
	155-mm HE MkI	TNT, steel (iron, chromium, cobalt, nickel, molybdenum)
Range Complex No. 3	50-caliber Machine Gun	Lead, Single (nitrocellulose)- or double-base (nitrocellulose and nitroglycerin) propellant, Perchlorate
	Small Arms General	Lead, Single (nitrocellulose)- or double-base (nitrocellulose and nitroglycerin) propellant;
	105-mm HE M1	TNT and Composition B (TNT and RDX), steel (iron, chromium, cobalt, nickel, molybdenum)
	155-mm HE M107	TNT and Composition B (TNT and RDX), steel (iron, chromium, cobalt, nickel, molybdenum)
	37-mm HE M54	FNH powder (nitrocellulose), steel (iron, chromium, cobalt, nickel, molybdenum)
	57-mm APC-T M86	FNH powder (nitrocellulose), steel (iron, chromium, cobalt, nickel, molybdenum)
	60-mm HE M49	TNT, Ballistite (nitrocellulose and nitroglycerin), steel (iron, chromium, cobalt, nickel, molybdenum)
	81-mm HE M43	TNT, Ballistite (nitrocellulose and nitroglycerin), steel (iron, chromium, cobalt, nickel, molybdenum)
	60-mm Practice M50A2	Inert with Black powder (potassium nitrate, sulfur, charcoal), steel (iron, chromium, cobalt, nickel, molybdenum)
	81-mm TP M43A1	Inert with Black powder (potassium nitrate, sulfur, charcoal), steel (iron, chromium, cobalt, nickel, molybdenum)
Mortar Range	Small Arms General	Lead, Single (nitrocellulose)- or double-base (nitrocellulose and nitroglycerin)
	60-mm HE M49	TNT, Ballistite (nitrocellulose and nitroglycerin)
Moving Target Range No. 75	75-mm Gun HE M48	TNT, FNH (nitrocellulose) powder, steel (iron, chromium, cobalt, nickel, molybdenum)
	37-mm AP M74	FNH (nitrocellulose) powder, steel (iron, chromium, cobalt, nickel, molybdenum)
East Live Hand Grenade Court	Mk II Hand Grenade Frag	TNT, flaked or granular, older models used E.C. Blankfire smokeless powder, M204 (fuze), Perchlorate, cast iron
	M21 Practice Hand Grenade	Black powder (potassium nitrate, sulfur, charcoal), Perchlorate, cast iron

AOC	Munitions	Munitions Constituents
West Live Hand Grenade Court	Mk II Hand Grenade Frag	TNT, flaked or granular, older models used E.C. Blankfire smokeless powder, M204 (Fuze), Perchlorate, cast iron
	M21 Practice Hand Grenade	Black powder (potassium nitrate, sulfur, charcoal), Perchlorate, cast iron
Live Hand Grenade Court No. 129	Mk II Hand Grenade Frag	TNT, flaked or granular, older models used E.C. Blankfire smokeless powder, Perchlorate, cast iron
	M21 Practice Hand Grenade	Black powder (potassium nitrate, sulfur, charcoal), Perchlorate, cast iron

Table 2-1 (Cont.)

AOC	Munitions	Munitions Constituents
Practice Grenade Court No. 120	M21 Practice Hand Grenade	Black powder (potassium nitrate, sulfur, charcoal), Perchlorate, cast iron
	Mk 1A1 Practice Hand Grenade	Inert, cast iron
Practice Grenade Court No. 121	M21 Practice Hand Grenade	Black powder (potassium nitrate, sulfur, charcoal), Perchlorate, cast iron
	Mk 1A1 Training Hand Grenade	Inert, cast iron
Practice Grenade Court No. 122	M21 Practice Hand Grenade	Black powder (potassium nitrate, sulfur, charcoal), Perchlorate, cast iron
	Mk 1A1 Practice Hand Grenade	Inert, cast iron
Practice Grenade Court No. 125	M21 Practice Hand Grenade	Black powder (potassium nitrate, sulfur, charcoal), Perchlorate, cast iron
	Mk 1A1 Practice Hand Grenade	Inert, cast iron
Practice Grenade Court No. 126	M21 Practice Hand Grenade	Black Powder (potassium nitrate, sulfur, charcoal), Perchlorate, cast iron
	Mk 1A1 Training Hand Grenade	Inert, cast iron
Practice Grenade Court No. 127	M21 Practice Hand Grenade	Black Powder (potassium nitrate, sulfur, charcoal), Perchlorate, cast iron
	Mk 1A1 Training Hand Grenade	Inert, cast iron
Chemical Identification Area No. 182	Pot Tear Gas M1	Chloracetophenone mixture
	Capsule Riot Control CS	2-chlorobenzalmalononitrile
	Chemical Agent Identification Set, Instructional M1	Mustard, Chlorpicrin, Lewisite, Adamsite, Chloracetophenone, Triphosgene
	Chemical Agent Identification Set, Detonation M1	Mustard, Lewisite, Chlorpicrin, and Phosgene
	Chemical ID, Toxic Gas Set M1 (K941)	24 bottles of 32 ounces of Mustard or Distilled Mustard
	Toxic Chemical Munitions	Mustard, distilled mustard

Table 2-2
Army Checklist for Important Ecological Places [a]
Camp Adair

		Yes / No	Comments
1	Locally important ecological place identified by the Integrated Natural Resource Management Plan, BRAC Cleanup Plan or Redevelopment Plan, or other official land management plans	☐ / ☒	
2	Critical habitat for Federal designated endangered or threatened species	☐ / ☒	
3	Marine Sanctuary	☐ / ☒	
4	National Park	☐ / ☒	
5	Designated Federal Wilderness Area	☐ / ☒	
6	Areas identified under the Coastal Zone Management Act	☐ / ☒	
7	Sensitive Areas identified under the National Estuary Program or Near Coastal Waters Program	☐ / ☒	
8	Critical areas identified under the Clean Lakes Program	☐ / ☒	
9	National Monument	☐ / ☒	
10	National Seashore Recreational Area	☐ / ☒	
11	National Lakeshore Recreational Area	☐ / ☒	
12	Habitat known to be used by Federal designated or proposed endangered or threatened species	☒ / ☐	Two federally listed plants grow at Camp Adair*: Sidalcea nelsoniana* (Nelson's checkermallow) and *Lupinus sulphureus ssp. kincaidii* (Kincaid's lupine). Seasonal use by bald eagles in winter when fields are flooded.
13	National preserve	☐ / ☒	
14	National or State Wildlife Refuge	☒ / ☐	State wildlife refuge within FUDS but outside of AOCs (E.E. Wilson Wildlife Refuge).
15	Unit of Coastal Barrier Resources System	☐ / ☒	
16	Coastal Barrier (undeveloped)	☐ / ☒	
17	Federal land designated for protection of natural ecosystems	☐ / ☒	
18	Administratively Proposed Federal Wilderness Area	☐ / ☒	
19	Spawning areas critical for the maintenance of fish/shellfish species within river, lake, or coastal tidal waters	☐ / ☒	
20	Migratory pathways and feeding areas critical for maintenance of anadromous fish species within river reaches or areas in lakes or coastal tidal waters in which fish spend extended periods of time	☒ / ☐	Luckiamute River flows through the site.

Table 2-2 (cont.)

		Yes / No	Comments
21	Terrestrial areas utilized for breeding by large or dense aggregations of animals	☐ / ☒	
22	National river reach designated as Recreational	☐ / ☒	
23	Habitat known to be used by state designated endangered or threatened species	☒ / ☐	Two state listed plants grow at Camp Adair: *Sidalcea nelsoniana* (Nelson's checkermallow) and *Lupinus sulphureus ssp. kincaidii* (Kincaid's lupine). Seasonal use by bald eagles in winter when fields are flooded.
24	Habitat known to be used by species under review as to its Federal endangered or threatened status	☐ / ☒	
25	Coastal Barrier (partially developed)	☐ / ☒	
26	Federally designated Scenic or Wild River	☐ / ☒	
27	State land designated for wildlife or game management	☒ / ☐	Oregon State University Forest. McDonald – Dunn Forest
28	State-designated Scenic or Wild River	☐ / ☒	
29	State-designated Natural Areas	☐ / ☒	
30	Particular areas, relatively small in size, important to maintenance of unique biotic communities	☐ / ☒	
31	State-designated areas for protection or maintenance of aquatic life	☐ / ☒	
32	Wetlands	☒ / ☐	Wetlands likely along Luckiamute River.
33	Fragile landscapes, land sensitive to degradation if vegetative habitat or cover diminishes	☐ / ☒	

a – Based on EPA, 1990, 55 FR 51624, Table 4-23 – Sensitive Environments Rating Values, Dec. 14, 1990; EPA, 1997, ERAGS, Exhibit 1-1 List of Sensitive Environments

Table 2-3
Reports of MEC Found at Camp Adair, Post-Clearance Ordnance Finds

MEC	Location	Comments	Reference
2.36-inch Anti-tank rocket	Found by local residents in area of Parade Field, N44 42' 48" W123 13' 24", central portion of Camp Adair adjacent to Highway 99		ASR, p. 44
Fuzed 81mm Mortar and several other duds	Found by Mr. Doughty, resident	22 August 1951, fuzed 81 mm mortar ("definitely dangerous") and several other duds ("harmless practice shells").	ASR, p. 44-45, 48, App. E, pg. E-138-140
81mm White phosphorous mortar	Found by Mr. Conley, resident	11 June 1986, 81mm white phosphorous mortar burned when unearthed by plow. Based on newspaper article dated 11 June, incident occurred on Monday, 9 June 1986.	ASR, p. 45, 48, App. G, pg. G-41.
MK I Illumination grenade	29175 Coffin Butte Rd, Landfill	15 Aug 1997	ASR, p. 61-62
Mortar round	N44 41' 43", W123 12' 32	Mortar round found when ponds dug in cantonment area	ASR, p. 78, Photo 3
Mortar round	Coffin Butte area	Found by Mr. Breniman, resident	ASR, p. 79-80
Duds	Impact area of Mortar Ranges No. 76 & 83	Duds found by farmers on land managed by Mr. Kennel	ASR, p. 81, Photo #29
60mm Mortar round	Range Complex No. 2	60mm mortar round found by ASR inspection team on fence. Several burned 81mm rounds found in burn pile.	ASR, p. 81, Photos 30-31
Duds	Range Complex No. 2	Mr. Kennel named another landowner who reportedly found several duds. ASR interviewed the next farm owner west on Seuver Rd from Mr. Kennel who gave locations of several duds he found.	ASR, App. H, pg. 81.
Smoke rounds	14080 Airlie Rd, Monmouth	Louis Hamilton, farmer/landowner found OE, mostly smoke rounds, also tracers set off when hit by tractor. EOD responded twice.	ASR, App. H, pg. H-13
OE nonspecific	Arnie Poppets, landowner	Reportedly found OE.	ASR, App. H, pg. H-13
OE non-specific	Ray Tarter, resident on Airlie Rd.	Reportedly found OE.	ASR, App. H, pg. H-13
Several 60mm mortars (practice)	EE Wilson Wildlife Area	Dave Budeau, manager of EE Wilson Wildlife Area excavating south of his house, Oregon State Police responded.	ASR, App. H, pg. H-14

Table 2-3 (cont.)

MEC	Location	Comments	Reference
105mm Howitzer shell	Earl Kennel (farmer near Seuver)	Newspaper article by Chuck Westlund. ASR incorrectly dates this 22 April 1973, but article described activity "since 1986." "Farmers have dug up Army munitions in fields surrounding Adair for years." Shell dug up in late 1970s or early 1980s.	ASR, App. G-14, pp. G-48-49
Mortar shell	Reported on state agricultural land, S9, T10S, R5W.		TPP meeting
White phosphorus in soil	Coffin Butte Landfill	White phosphorus dug up during excavation for landfill, soil allowed to burn	Emcon, 1994, Letter Report, Phosphorus Treatment and Disposal, letter to Mr. Bill Webber, Valley Landfills

Apparent "duds" summarized in ASR text, generally referring to Army maps dating to 1940s—i.e., duds found prior to or during Army clearance activities (p. 67):

1. ASR, p. 24. Dud 2.36 inch rocket found less than ½ mile from No. 40 1000-inch Anti-Tank Range and No. 41 1000-inch Anti-Tank Range at Coffin Butte.
2. ASR, p. 29. No. 79A-Moving Target Range. Several 105mm and duds were found on the impact area.
3. ASR, p. 29. No. 79B-Moving Target Range. Dud 105mm rounds were found on the impact area.
4. ASR, p. 31. No. 86-Field Combat Range. 60mm dud found (Map #1).
5. ASR, p. 31. No. 87-Field Combat Range (Pits). 105mm dud found (Map #1).
6. ASR, p. 31. No. 88-Field Combat Range (Pit). 105mm dud found in area (Map #1-other range fans intersect).
7. ASR, p. 32. No. 90 Mortar Range. 60mm dud found (Map #1).
8. ASR, p. 32. No. 91 Mortar Range. 60 mm dud (Map #1).
9. ASR, p. 36: "Hand grenade duds were found by local residents in this area [Live Hand Grenade Court No. 129]."
10. ASR, p. 47-48. Certificates of Clearance. 21 March 1947. Camp inspected/cleared. Tract A-38, S part Tract A-27, Tract A-63 restrictions recommended [impact areas]. 21 October 1948: cantonment cleared based on type of use. First inspection Aug-Oct 1944: 1397 duds found on artillery ranges. Second inspection Oct-Nov 1946 found additional duds/practice rounds (specifics listed, 72 total).

Table 5-A
Background Summary Statistics for Soil and Maximum Background Concentrations for Groundwater and Sediment
Camp Adair

Metal	Soil Background Concentration	Sediment Background Concentration	Groundwater Background Concentration
	95th UTL/95th Percentile [a] (Based on 10 Samples) (mg/kg)	Maximum Concentration from 3 Samples [b] (mg/kg)	Maximum Concentration from 2 Samples [b] ug/L
Aluminum	71,400	36900	65.1
Antimony	< 0.83	<0.14	<0.17
Arsenic	18.1	6	1.3
Barium	472	173	20
Beryllium	1.67	0.84	<0.028
Cadmium	0.996	0.85	<0.17
Calcium	7,920	8060	17800
Chromium	153	100	<1.3
Cobalt	108	45.8	0.28
Copper	203	134	9.7
Iron	119,000	76000	188
Lead	29.5	11.1	0.5
Magnesium	28,900	12000	6850
Manganese	4,100	1290	85.2
Mercury	0.060	0.049	<0.034
Molybdenum	1.36	0.56	1.8
Nickel	148	44.2	1.8
Potassium	3,810	1660	469
Selenium	< 4.7	1	<0.75
Silver	0.21	0.13	<0.029
Sodium	614	483	97900
Strontium	57.1	52.4	73.8
Thallium	0.33	0.22	<0.074
Titanium	19,900	4610	5.4
Vanadium	427	244	4.6
Zinc	141	92.4	45.3

Note: 95th UTLs are provided for analytes with normal or lognormal distributions. 95th percentiles are provided for analytes with distributions that are neither normal nor lognormal, or that have greater than 15 percent nondetects (per EPA, 1989)

mg/kg - milligrams per kilogram.

ug/L - micrograms per liter

UTL - Upper tolerance limit.

< - analytical result was less than value indicated (reporting limit)

[a] Supporting calculations for soil background values are provided in Appendix L

[b] Background sample analytical results provided in Appendix G

Table 5-1
Site Inspection Sampling Summary
Camp Adair

Location	Sample Number	UTM Northing	UTM Easting	Sample Purpose	Matrix	Sample Date	Start Depth (ft)	End Depth (ft)	Laboratory Sample Number	Lead by SW-846 6020A	Perchlorate by LC/MS *	PAHs by SW8270C (Low Level)	TAL Metals (Including Strontium and Titanium) by SW-846 6020A	Selected Metals ** by SW-846 6020A	Mercury by SW-846 7470A / 7471A	Explosives (Including Nitroglycerine & PETN by SW-846 8330A (Modified)
Range Complex No. 4																
017A001	NWO-017-0001	4949264.06	479262.19	REG	SS	24-Aug-06	0.08	0.5	608163-010	X						
017A002	NWO-017-0002	4949687.06	479048.26	REG	SS	31-Aug-06	0.08	0.5	609019-001	X						
017A003	NWO-017-0003	4950078.97	478856.67	REG	SS	31-Aug-06	0.08	0.5	609019-002	X						
017A004	NWO-017-0004	4950525.11	478673.70	REG	SS	31-Aug-06	0.08	0.5	609019-007	X						
017A005	NWO-017-0005	4952050.26	478198.20	REG	SS	31-Aug-06	0.08	0.5	609019-003	X						
017A006	NWO-017-0006	4951437.78	476879.62	REG	SS	31-Aug-06	0.08	0.5	609019-006	X						
	NWO-017-0007	4951437.78	476879.62	FD	SS	31-Aug-06	0.08	0.5	609019-005	X						
017A007	NWO-017-0008	4950308.61	476764.63	REG	SS	24-Aug-06	0	0.5	608163-011	X						
017A008	NWO-017-0009	4953898.38	477982.29	REG	SS	6-Sep-06	0.08	0.5	609053-006	X						
017A009	NWO-017-1001	4952743.53	478075.31	REG	SD	31-Aug-06	1	3	609019-004	X						
017A010	NWO-017-3001	4949629.00	478415.48	REG	GW	20-Sep-06	0	0	609118-007	X	X					
Range Complex No. 5																
017A011	NWO-017-0010	4950133.63	480922.09	REG	SS	31-Aug-06	0.08	0.5	609019-008	X						
017A012	NWO-017-0011	4950161.35	481490.64	REG	SS	6-Sep-06	0.08	0.5	609053-012	X						
017A013	NWO-017-0012	4950373.17	481553.40	REG	SS	31-Aug-06	0.08	0.5	609019-009	X						
017A014	NWO-017-0013	4950517.08	481832.46	REG	SS	7-Sep-06	0.08	0.5	609054-001	X						
017A015	NWO-017-3002	4950119.15	480984.27	REG	GW	14-Sep-06	0	0	609093-001	X	X					
Range Complex No. 6																
017A016	NWO-017-0015R	4947810.69	482609.44	REG	SS	11-Sep-06	0.08	0.5	609053-008	X						
017A017	NWO-017-0016R	4947995.52	482565.58	REG	SS	11-Sep-06	0.08	0.5	609053-009	X						
017A018	NWO-017-0017R	4948214.11	482585.69	REG	SS	11-Sep-06	0.08	0.5	609054-009	X						
017A019	NWO-017-0018FDR	4948445.43	482561.65	FD	SS	11-Sep-06	0.17	0.5	609054-008	X						
	NWO-017-0018R	4948445.43	482561.65	REG	SS	11-Sep-06	0.07	0.5	609054-007	X						
017A020	NWO-017-3003	4948393.80	482535.11	REG	GW	12-Sep-06	0	0	609089-001	X						
	NWO-017-3004	4948393.80	482535.11	FD	GW	12-Sep-06	0	0	609089-002	X						
Skeet Range No. 580																
017A021	NWO-017-0019	4946797.01	483237.82	REG	SS	22-Aug-06	0.08	0.5	608158-003	X		X				
017A022	NWO-017-0020	4946889.48	483330.87	REG	SS	22-Aug-06	0	0.5	608158-004	X		X				
017A023	NWO-017-0021	4946904.67	483184.52	REG	SS	22-Aug-06	0	0.5	608158-005	X		X				
Range Complex No. 1																
017A024	NWO-017-0022	4955215.59	478494.23	REG	SS	23-Aug-06	0.17	0.5	608156-001					X	X	X
017A025	NWO-017-0023	4956568.03	477716.90	REG	SS	23-Aug-06	0.08	0.5	608156-002					X	X	X
017A026	NWO-017-0024	4956028.36	480361.84	REG	SS	24-Aug-06	0.08	0.5	608163-008					X	X	X
017A027	NWO-017-0025	4956243.20	480523.65	REG	SS	24-Aug-06	0.08	0.5	608163-004					X	X	X
017A028	NWO-017-1002	4955592.48	480248.09	REG	SD	24-Aug-06	0.08	0.33	608163-003					X	X	X
017A029	NWO-017-1003	4957611.28	478349.28	REG	SD	23-Aug-06	0	0.5	608156-003					X	X	X
017A030	NWO-017-3005	4957086.19	481410.07	REG	GW	20-Sep-06	0	0	609118-001		X			X	X	X
Range Complex No. 2																
017A031	NWO-017-0027	4959854.13	475860.17	REG	SS	23-Aug-06	0.08	0.5	608156-004					X	X	X
017A032	NWO-017-0028	4960279.15	475158.24	REG	SS	23-Aug-06	0.08	0.5	608156-005					X	X	X
017A033	NWO-017-0029	4958782.08	478535.03	REG	SS	24-Aug-06	0.08	0.5	608163-007					X	X	X
017A034	NWO-017-0030	4956038.13	475261.48	REG	SS	23-Aug-06	0.17	0.5	608156-006					X	X	X
017A035	NWO-017-0031	4961417.15	478087.39	REG	SS	29-Aug-06	0.08	0.5	608187-008					X	X	X
017A036	NWO-017-0032	4961777.64	477765.73	REG	SS	29-Aug-06	0.08	0.5	608187-007					X	X	X
017A037	NWO-017-0033	4962688.25	473146.41	REG	SS	28-Aug-06	0.08	0.5	608187-013					X	X	X
017A038	NWO-017-1004	4959564.67	478719.39	REG	SD	25-Aug-06	0.08	0.5	608163-012					X	X	X
017A039	NWO-017-1005	4958794.36	481172.93	REG	SD	24-Aug-06	0.08	0.5	608163-005					X	X	X
	NWO-017-1006	4958794.36	481172.93	FD	SD	24-Aug-06	0.08	0.5	608163-006					X	X	X
017A040	NWO-017-3006	4959875.00	473471.03	REG	GW	19-Sep-06	0	0	609118-002		X			X	X	X
017A041	NWO-017-3007	4963356.42	479738.04	REG	GW	19-Sep-06	0	0	609118-003		X			X	X	X
Bombing Target No. 1																
017A042	NWO-017-0034	4961721.56	479042.80	REG	SS	25-Aug-06	0.08	0.5	608163-001					X	X	X
017A043	NWO-017-1007	4960808.54	479127.12	REG	SD	25-Aug-06	0.08	0.5	608163-002					X	X	X
017A044	NWO-017-3008	4960011.22	478691.14	REG	GW	13-Sep-06	0	0	609089-003		X			X	X	X
Range Complex No. 3																
017A045	NWO-017-0035	4959049.99	470742.77	REG	SS	28-Aug-06	0.08	0.5	608187-001					X	X	X
017A046	NWO-017-0036	4959755.17	471053.68	REG	SS	28-Aug-06	0.08	0.5	608187-002					X	X	X
017A047	NWO-017-0037	4959877.27	469876.02	REG	SS	29-Aug-06	0.08	0.5	608187-003					X	X	X
017A048	NWO-017-0038	4960176.40	471855.85	REG	SS	28-Aug-06	0.08	0.5	608187-004					X	X	X

Table 5-1
Site Inspection Sampling Summary
Camp Adair

Location	Sample Number	UTM Northing	UTM Easting	Sample Purpose	Matrix	Sample Date	Start Depth (ft)	End Depth (ft)	Laboratory Sample Number	Lead by SW-846 6020A	Perchlorate by LC/MS *	PAHs by SW8270C (Low Level)	TAL Metals (Including Strontium and Titanium) by SW-846 6020A	Selected Metals ** by SW-846 6020A	Mercury by SW-846 7470A / 7471A	Explosives (Including Nitroglycerine & PETN by SW-846 8330A (Modified)
017A049	NWO-017-1008	4959051.87	471141.51	REG	SD	28-Aug-06	0.08	0.5	608187-005					X	X	X
017A050	NWO-017-3009	4959360.38	472610.90	REG	GW	14-Sep-06	0	0	609093-004		X			X	X	X
Mortar Range																
017A051	NWO-017-0039R	4947296.55	478750.85	REG	SS	7-Sep-06	0.08	0.5	609054-004					X	X	X
017A052	NWO-017-0040R	4947556.31	478991.45	REG	SS	7-Sep-06	0.08	0.5	609054-005					X	X	X
	NWO-017-0040RR	4947554.59	478990.53	REG	SS	11-Sep-06	0.08	0.5	609053-011					X	X	X
	NWO-017-0040RR-ED	4947554.59	478990.53	FD	SS	11-Sep-06	0.08	0.5	609053-010					X	X	X
017A053	NWO-017-1009R	4947974.59	479814.27	REG	SD	7-Sep-06	0.08	0.52	609054-003					X	X	X
017A054	NWO-017-3010	4947337.56	478929.08	REG	GW	14-Sep-06	0	0	609093-002		X			X	X	X
Moving Target Range No. 75																
017A055	NWO-017-0041	4952187.53	474530.51	REG	SS	6-Sep-06	0.08	0.5	609053-003					X	X	X
017A056	NWO-017-0042	4952311.41	474861.13	REG	SS	6-Sep-06	0.08	0.5	609053-001					X	X	X
	NWO-017-0043	4952311.41	474861.13	FD	SS	6-Sep-06	0.08	0.5	609053-002					X	X	X
017A057	NWO-017-1010R	4952825.15	475066.23	REG	SD	7-Sep-06	0.08	0.33	609054-002					X	X	X
017A058	NWO-017-3011	4953023.32	475845.65	REG	GW	20-Sep-06	0	0	609118-005		X			X	X	X
	NWO-017-3011 FD	4953023.32	475845.65	FD	GW	20-Sep-06	0	0	609118-006		X			X	X	X
East Live Grenade Court																
017A059	NWO-017-0044	4954270.20	481085.66	REG	SS	22-Aug-06	0	0.5	608158-001					X	X	X
017A060	NWO-017-1011	4954345.61	481239.60	REG	SD	22-Aug-06	0	0.5	608158-002					X	X	X
West Live Hand Grenade Court																
017A061	NWO-017-0045	4954201.95	475801.07	REG	SS	23-Aug-06	0.17	0.5	608158-006					X	X	X
Live Hand Grenade Court No. 129																
017A062	NWO-017-0046	4954783.65	476908.26	REG	SS	22-Aug-06	0.08	0.5	608156-007					X	X	X
017A063	NWO-017-1012	4954265.98	476499.73	REG	SD	23-Aug-06	0.08	0.5	608156-008					X	X	X
	NWO-017-1013	4954265.98	476499.73	FD	SD	23-Aug-06	0.08	0.5	608156-009					X	X	X
Background Samples																
017A064	NWO-017-5001	4946578.21	477665.78	REG	SS	7-Sep-06	0.08	0.5	609054-006				X		X	
017A065	NWO-017-5002	4949016.15	482496.65	REG	SS	6-Aug-06	0.08	0.5	609053-004				X		X	
017A066	NWO-017-5003	4949268.43	482390.02	REG	SS	6-Sep-06	0.08	0.5	609053-005				X		X	
017A067	NWO-017-5004	4952017.00	482993.38	REG	SS	6-Sep-06	0.08	0.5	609053-007				X		X	
017A068	NWO-017-5005	4959228.86	471978.64	REG	SS	28-Aug-06	0.08	0.5	608187-010				X		X	
017A069	NWO-017-5006	4959247.72	469204.63	REG	SS	29-Aug-06	0.08	0.5	608187-006				X		X	
017A070	NWO-017-5007	4963342.44	472135.07	REG	SS	28-Aug-06	0.08	0.5	608187-011				X		X	
017A071	NWO-017-5008	4963706.28	475860.00	REG	SS	25-Aug-06	0.08	0.5	608163-013				X		X	
017A072	NWO-017-5009	4963159.70	476433.49	REG	SS	25-Aug-06	0.08	0.5	608163-014				X		X	
017A073	NWO-017-5010	4963986.52	479487.04	REG	SS	25-Aug-06	0.08	0.5	608163-015				X		X	
	NWO-017-5011	4963986.52	479487.04	FD	SS	25-Aug-06	0.08	0.5	608163-016				X		X	
017A074	NWO-017-5012	4950240.48	475396.19	REG	SD	24-Aug-06	0.08	0.33	608163-009				X		X	
017A075	NWO-017-5013	4963377.35	472286.56	REG	SD	28-Aug-06	0.08	0.5	608187-012				X		X	
017A076	NWO-017-5014	4952862.92	464965.27	REG	SD	29-Aug-06	0.08	0.25	608187-009				X		X	
017A077	NWO-017-6001	4952228.96	483059.31	REG	GW	14-Sep-06	0	0	609093-003		X		X		X	
017A078	NWO-017-6002	4960993.51	476715.62	REG	GW	19-Sep-06	0	0	609118-004		X			X	X	

Notes:

UTM--Universal Transverse Mercator coordinates, in meters, NAD 83, Zone 10

* DataChem internal standard operating procedure *"LC/MS-CLO4-Rev2"*

** Selected metals include aluminum, antimony, barium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, molybdenum, nickel, strontium, titanium, and zin

FD - field duplicate
MS - matrix spike
MSD - matrix spike duplicate
REG - regular field sample
SDG - sample delivery group
SS - surface soil (< 0.5ft bgs)
SD - sediment
SW - surface water
GW - groundwater

Table 5-2A
Range Complex No. 4
Groundwater Hits Comparison
Camp Adair

Location							**017A010**	
Sample Number							**NWO-017-3001**	
Sample Date							**20-Sep-06**	
Sample Purpose							**REG**	
Fraction	**Parameter**	**Filtered**	**Units**	**Maximum Concentration from Media Background Samples**	**EPA Region 9 PRGs - Tap Water**	**Federal Drinking Water Criteria MCLs**	**Result**	**VQ**
Metals	Lead	N	µg/L	0.5 J	No criteria	15	0.39	J

EPA - Environmenal Protection Agency
PRG - Preliminary Remediation Goal
MCL - Maximum Contaminant Level
REG - regular sample
µg/L - microgram per liter
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-2B
Range Complex No. 5
Groundwater Hits Comparison
Camp Adair

Location							**017A015**	
Sample Number							**NWO-017-3002**	
Sample Date							**14-Sep-06**	
Sample Purpose							**REG**	
Fraction	**Parameter**	**Filtered**	**Units**	**Maximum Concentration from Media Background Samples**	**EPA Region 9 PRGs - Tap Water**	**Federal Drinking Water Criteria MCLs**	**Result**	**VQ**
Metals	Lead	N	µg/L	0.5 J	No criteria	15	**0.51**	J

[**Bold Face**] - Result exceeds Maximum Concentration from media background samples

EPA - Environmenal Protection Agency
PRG - Preliminary Remediation Goal
MCL - Maximum Contaminant Level
REG - regular sample
µg/L - microgram per liter
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-2C
Range Complex No. 6
Groundwater Hits Comparison
Camp Adair

Location							017A020		017A020	
Sample Number							NWO-017-3003		NWO-017-3004	
Sample Date							12-Sep-06		12-Sep-06	
Sample Purpose							REG		FD	
Fraction	**Parameter**	**Filtered**	**Units**	**Maximum Concentration from Media Background Samples**	**EPA Region 9 PRGs - Tap Water**	**Federal Drinking Water Criteria MCLs**	**Result**	**VQ**	**Result**	**VQ**
Metals	Lead	N	µg/L	0.5 J	No criteria	15	0.46	J	0.36	J

EPA - Environmenal Protection Agency
PRG - Preliminary Remediation Goal
MCL - Maximum Contaminant Level
REG - regular sample
FD - field duplicate
µg/L - microgram per liter
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-3
Range Complex No. 4
Sediment Hits Comparison
Camp Adair

Location						**017A009**	
Sample Number						**NWO-017-1001**	
Sample Date						**31-Aug-06**	
Sample Depth (bgs) (ft)						**0 to 0.3**	
Sample Purpose						**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Sediment Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Maximum Concentration from Media Background Samples**	**Result**	**VQ**
Metals	Lead	mg/kg	35	400	11.1	7	

PRG - Preliminary Remediation Goals
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Table 5-4A
Range Complex No. 4
Soil Hits Comparison
Camp Adair

Location						**017A001**		**017A002**		**017A003**		**017A004**		**017A005**	
Sample Number						**NWO-017-0001**		**NWO-017-0002**		**NWO-017-0003**		**NWO-017-0004**		**NWO-017-0005**	
Sample Date						**24-Aug-06**		**31-Aug-06**		**31-Aug-06**		**31-Aug-06**		**31-Aug-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**		**0.08 to 0.5**		**0.08 to 0.5**		**0.08 to 0.5**		**0.08 to 0.5**	
Sample Purpose						**REG**		**REG**		**REG**		**REG**		**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Background 95th UTL / 95th Percentile**	**Site Inspection Soil Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Metals	Lead	mg/kg	29.5	16	400	***45.5***		13.4		***73.2***		4.5		*16.2*	

[**Bold**] - Result exceeds Site Inspection Background 95th UTL / 95th Percentile
[*Italicized*] - Result exceedsSite Inspection Soil Ecological Screening Levels

PRG - Preliminary Remediation Goals
REG - regular sample
FD - field duplicate
mg/kg - milligram per kilogram
VQ - validation qualifier

Table 5-4A
Range Complex No. 4
Soil Hits Comparison
Camp Adair

Location						**017A006**		**017A006**		**017A007**		**017A008**	
Sample Number						**NWO-017-0006**		**NWO-017-0007**		**NWO-017-0008**		**NWO-017-0009**	
Sample Date						**31-Aug-06**		**31-Aug-06**		**24-Aug-06**		**6-Sep-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**		**0.08 to 0.5**		**0 to 0.5**		**0.08 to 0.5**	
Sample Purpose						**REG**		**FD**		**REG**		**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Background 95th UTL / 95th Percentile**	**Site Inspection Soil Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Metals	Lead	mg/kg	29.5	16	400	10.4		10.3		6.4		*17*	

[**Bold**] - Result exceeds Site Inspection Background 95th UTL / 95th Percentile
[*Italicized*] - Result exceedsSite Inspection Soil Ecological Screening Levels

PRG - Preliminary Remediation Goals
REG - regular sample
FD - field duplicate
mg/kg - milligram per kilogram
VQ - validation qualifier

Table 5-4B
Range Complex No. 5
Soil Hits Comparison
Camp Adair

Location						**017A011**		**017A012**		**017A013**		**017A014**	
Sample Number						**NWO-017-0010**		**NWO-017-0011**		**NWO-017-0012**		**NWO-017-0013**	
Sample Date						**31-Aug-06**		**6-Sep-06**		**31-Aug-06**		**7-Sep-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**		**0.08 to 0.5**		**0.08 to 0.5**		**0.08 to 0.5**	
Sample Purpose						**REG**		**REG**		**REG**		**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Background 95th UTL / 95th Percentile**	**Site Inspection Soil Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Metals	Lead	mg/kg	29.5	16	400	11.1		*19.5*		*21.4*		10.7	

[*Italicized*] - Result exceedsSite Inspection Soil Ecological Screening Levels

PRG - Preliminary Remediation Goals
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Table 5-4C
Range Complex No. 6
Soil Hits Comparison
Camp Adair

Location						**017A016**		**017A017**		**017A018**		**017A019**		**017A019**	
Sample Number						**NWO-017-0015R**		**NWO-017-0016R**		**NWO-017-0017R**		**NWO-017-0018FDR**		**NWO-017-0018R**	
Sample Date						**11-Sep-06**		**11-Sep-06**		**11-Sep-06**		**11-Sep-06**		**11-Sep-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**		**0.08 to 0.5**		**0.08 to 0.5**		**0.17 to 0.5**		**0.07 to 0.5**	
Sample Purpose						**REG**		**REG**		**REG**		**FD**		**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Background 95th UTL / 95th Percentile**	**Site Inspection Soil Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Metals	Lead	mg/kg	29.5	16	400	11.8		8.6		*29.1*		13.8		13.5	

[*Italicized*] - Result exceedsSite Inspection Soil Ecological Screening Levels

PRG - Preliminary Remediation Goals
REG - regular sample
FD - field duplicate
mg/kg - milligram per kilogram
VQ - validation qualifier

Table 5-4D
Skeet Range No. 580
Soil Hits Comparison
Camp Adair

Location						**017A021**		**017A022**		**017A023**	
Sample Number						**NWO-017-0019**		**NWO-017-0020**		**NWO-017-0021**	
Sample Date						**22-Aug-06**		**22-Aug-06**		**22-Aug-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**		**0 to 0.5**		**0 to 0.5**	
Sample Purpose						**REG**		**REG**		**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Background 95th UTL / 95th Percentile**	**Site Inspection Soil Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Metals	Lead	mg/kg	29.5	16	400	*20.1*		***58.4***		***41.1***	
PAH	Acenaphthene	mg/kg	No criteria	20	3700	0.0055	J	-	-	-	-
PAH	Benzo(a)anthracene	mg/kg	No criteria	5.21	0.62	0.036		-	-	-	-
PAH	Benzo(a)pyrene	mg/kg	No criteria	125	0.062	0.06		-	-	-	-
PAH	Benzo(b)fluoranthene	mg/kg	No criteria	59.8	0.62	0.063		-	-	-	-
PAH	Benzo(ghi)perylene	mg/kg	No criteria	119	2300	0.051		-	-	-	-
PAH	Benzo(k)fluoranthene	mg/kg	No criteria	148	6.2	0.017		-	-	-	-
PAH	Chrysene	mg/kg	No criteria	4.73	62	0.042		-	-	-	-
PAH	Fluoranthene	mg/kg	No criteria	0.1	2300	0.038		0.0082		-	-
PAH	Indeno(1,2,3-cd)pyrene	mg/kg	No criteria	109	0.62	0.044		-	-	-	-
PAH	Phenanthrene	mg/kg	No criteria	0.1	2300	0.015		0.005	J	-	-
PAH	Pyrene	mg/kg	No criteria	0.1	2300	0.044		0.0068	J	-	-

[**Bold**] - Result exceeds Site Inspection Background 95th UTL / 95th Percentile
[*Italicized*] - Result exceedsSite Inspection Soil Ecological Screening Levels
- indicates analyte not detected above practical reporting limits

PRG - Preliminary Remediation Goals
PAH - Polycyclic Aromatic Hydrocarbons
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-5A
Range Complex No. 1
Groundwater Hits Comparison
Camp Adair

Location							**017A030**	
Sample Number							**NWO-017-3005**	
Sample Date							**20-Sep-06**	
Sample Purpose							**REG**	
Fraction	**Parameter**	**Filtered**	**Units**	**Maximum Concentration from Media Background Samples**	**EPA Region 9 PRGs - Tap Water**	**Federal Drinking Water Criteria MCLs**	**Result**	**VQ**
Explosives	1,3-Dinitrobenzene	N	µg/L	No criteria	3.6	No criteria	0.038	J
Explosives	2,4,6-Trinitrotoluene	N	µg/L	No criteria	2.2	No criteria	0.077	J
Explosives	2,4-Dinitrotoluene	N	µg/L	No criteria	0.099	No criteria	0.027	J
Explosives	2-Amino-4,6-dinitrotoluene	N	µg/L	No criteria	7.3	No criteria	0.072	J
Explosives	4-Amino-2,6-dinitrotoluene	N	µg/L	No criteria	7.3	No criteria	0.079	J
Explosives	HMX	N	µg/L	No criteria	1800	No criteria	0.14	J
Metals	Barium	N	µg/L	20	No criteria	No criteria	10	
Metals	Copper	N	µg/L	9.7	1500	1000	2.3	
Metals	Iron	N	µg/L	188	11000	300	36.9	J
Metals	Magnesium	N	µg/L	6850	No criteria	No criteria	**7500**	
Metals	Manganese	N	µg/L	85.2	880	50	32.1	
Metals	Molybdenum	N	µg/L	1.8 J	180	No criteria	0.45	J
Metals	Nickel	N	µg/L	1.8	730	No criteria	1	
Metals	Strontium	N	µg/L	73.8 J	22000	No criteria	**197**	J
Metals	Titanium	N	µg/L	5.4	150000	No criteria	0.9	J
Metals	Zinc	N	µg/L	45.3	11000	5000	13.8	

[**Bold Face**] - Result exceeds Maximum Concentration from media background samples

EPA - Environmenal Protection Agency
PRG - Preliminary Remediation Goal
MCL - Maximum Contaminant Level
REG - regular sample
µg/L - microgram per liter
HMX - octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-5B
Range Complex No. 2
Groundwater Hits Comparison
Camp Adair

Location							**017A040**		**017A041**	
Sample Number							**NWO-017-3006**		**NWO-017-3007**	
Sample Date							**19-Sep-06**		**19-Sep-06**	
Sample Purpose							**REG**		**REG**	
Fraction	**Parameter**	**Filtered**	**Units**	**Maximum Concentration from Media Background Samples**	**EPA Region 9 PRGs - Tap Water**	**Federal Drinking Water Criteria MCLs**	**Result**	**VQ**	**Result**	**VQ**
Metals	Antimony	N	µg/L	0.17 J	No criteria	No criteria	**0.21**	J	-	-
Metals	Barium	N	µg/L	20	No criteria	No criteria	**22**		**35.9**	
Metals	Cobalt	N	µg/L	0.28 J	730	No criteria	**0.61**	J	**1.2**	
Metals	Copper	N	µg/L	9.7	1500	1000	1.4	J	2.7	
Metals	Iron	N	µg/L	188	11000	300	***893***		32.3	J
Metals	Lead	N	µg/L	0.5 J	No criteria	15	0.21	J	0.38	J
Metals	Magnesium	N	µg/L	6850	No criteria	No criteria	1420		4180	
Metals	Manganese	N	µg/L	85.2	880	50	28.2		***310***	
Metals	Molybdenum	N	µg/L	1.8 J	180	No criteria	**5.8**		0.18	J
Metals	Nickel	N	µg/L	1.8	730	No criteria	**3.8**		**3.7**	
Metals	Strontium	N	µg/L	73.8 J	22000	No criteria	60.7	J	**83.5**	J
Metals	Titanium	N	µg/L	5.4	150000	No criteria	0.87	J	0.97	J
Metals	Zinc	N	µg/L	45.3	11000	5000	11.7		10.4	

[**Bold Face**] - Result exceeds Maximum Concentration from media background samples
[*Italicized*] - Result exceeds Federal Drinking Water Criteria MCLs
- indicates analyte not detected above practical quantitation limits

EPA - Environmenal Protection Agency
PRG - Preliminary Remediation Goal
MCL - Maximum Contaminant Level
REG - regular sample
µg/L - microgram per liter
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-5C
Bombing Target No. 1
Groundwater Hits Comparison
Camp Adair

Location							**017A044**	
Sample Number							**NWO-017-3008**	
Sample Date							**13-Sep-06**	
Sample Purpose							**REG**	
Fraction	**Parameter**	**Filtered**	**Units**	**Maximum Concentration from Media Background Samples**	**EPA Region 9 PRGs - Tap Water**	**Federal Drinking Water Criteria MCLs**	**Result**	**VQ**
Metals	Barium	N	µg/L	20	No criteria	No criteria	4	J
Metals	Cobalt	N	µg/L	0.28 J	730	No criteria	0.027	UJ
Metals	Copper	N	µg/L	9.7	1500	1000	1	J
Metals	Iron	N	µg/L	188	11000	300	22.9	J
Metals	Lead	N	µg/L	0.5 J	No criteria	15	**0.81**	J
Metals	Magnesium	N	µg/L	6850	No criteria	No criteria	1140	
Metals	Manganese	N	µg/L	85.2	880	50	3	
Metals	Molybdenum	N	µg/L	1.8 J	180	No criteria	0.57	J
Metals	Nickel	N	µg/L	1.8	730	No criteria	0.9	J
Metals	Strontium	N	µg/L	73.8 J	22000	No criteria	41	J
Metals	Titanium	N	µg/L	5.4	150000	No criteria	1	J

[**Bold Face**] - Result exceeds Maximum Concentration from media background samples

EPA - Environmenal Protection Agency
PRG - Preliminary Remediation Goal
MCL - Maximum Contaminant Level
REG - regular sample
µg/L - microgram per liter
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.
UJ - The compound/analyte was analyzed for, but not detected above the established reporting limit. However, review and evaluation of supporting QC data and/or sampling and analysis process have indicated that the reporting limit may be inaccurate or imprecise. The nondetect result should be estimated.

Table 5-5D
Range Complex No. 3
Groundwater Hits Comparison
Camp Adair

Location							**017A050**	
Sample Number							**NWO-017-3009**	
Sample Date							**14-Sep-06**	
Sample Purpose							**REG**	
Fraction	**Parameter**	**Filtered**	**Units**	**Maximum Concentration from Media Background Samples**	**EPA Region 9 PRGs - Tap Water**	**Federal Drinking Water Criteria MCLs**	**Result**	**VQ**
Metals	Barium	N	µg/L	20	No criteria	No criteria	14.7	
Metals	Cobalt	N	µg/L	0.28 J	730	No criteria	0.018	J
Metals	Copper	N	µg/L	9.7	1500	1000	4	
Metals	Iron	N	µg/L	188	11000	300	28.7	J
Metals	Lead	N	µg/L	0.5 J	No criteria	15	0.41	J
Metals	Magnesium	N	µg/L	6850	No criteria	No criteria	1760	
Metals	Manganese	N	µg/L	85.2	880	50	16.2	
Metals	Molybdenum	N	µg/L	1.8 J	180	No criteria	0.67	J
Metals	Nickel	N	µg/L	1.8	730	No criteria	1.1	
Metals	Strontium	N	µg/L	73.8 J	22000	No criteria	63.3	J
Metals	Titanium	N	µg/L	5.4	150000	No criteria	1	J

EPA - Environmenal Protection Agency
PRG - Preliminary Remediation Goal
MCL - Maximum Contaminant Level
REG - regular sample
µg/L - microgram per liter
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-5E
Mortar Range
Groundwater Hits Comparison
Camp Adair

Location							**017A054**	
Sample Number							**NWO-017-3010**	
Sample Date							**14-Sep-06**	
Sample Purpose							**REG**	
Fraction	**Parameter**	**Filtered**	**Units**	**Maximum Concentration from Media Background Samples**	**EPA Region 9 PRGs - Tap Water**	**Federal Drinking Water Criteria MCLs**	**Result**	**VQ**
Metals	Copper	N	µg/L	9.7	1500	1000	1.4	J
Metals	Iron	N	µg/L	188	11000	300	94.7	
Metals	Lead	N	µg/L	0.5 J	No criteria	15	0.4	J
Metals	Magnesium	N	µg/L	6850	No criteria	No criteria	**13000**	
Metals	Manganese	N	µg/L	85.2	880	50	39.2	
Metals	Molybdenum	N	µg/L	1.8 J	180	No criteria	0.33	J
Metals	Nickel	N	µg/L	1.8	730	No criteria	1.1	
Metals	Strontium	N	µg/L	73.8 J	22000	No criteria	**115**	J
Metals	Titanium	N	µg/L	5.4	150000	No criteria	2.3	

[**Bold Face**] - Result exceeds Maximum Concentration from media background samples

EPA - Environmenal Protection Agency
PRG - Preliminary Remediation Goal
MCL - Maximum Contaminant Level
REG - regular sample
µg/L - microgram per liter
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-5F
Moving Target Range No. 75
Groundwater Hits Comparison
Camp Adair

Location							**017A058**		**017A058**	
Sample Number							**NWO-017-3011 FD**		**NWO-017-3011**	
Sample Date							**20-Sep-06**		**20-Sep-06**	
Sample Purpose							**FD**		**REG**	
Fraction	**Parameter**	**Filtered**	**Units**	**Maximum Concentration from Media Background Samples**	**EPA Region 9 PRGs - Tap Water**	**Federal Drinking Water Criteria MCLs**	**Result**	**VQ**	**Result**	**VQ**
Metals	Aluminum	N	µg/L	65.1 J	36000	50	7.4	UJ	11.8	UJ
Metals	Barium	N	µg/L	20	No criteria	No criteria	19.6		**20.2**	
Metals	Copper	N	µg/L	9.7	1500	1000	1.6	J	1.4	J
Metals	Iron	N	µg/L	188	11000	300	30.1	J	16.3	J
Metals	Lead	N	µg/L	0.5 J	No criteria	15	0.25	J	0.24	J
Metals	Magnesium	N	µg/L	6850	No criteria	No criteria	1400		1410	
Metals	Manganese	N	µg/L	85.2	880	50	11.5		11.3	
Metals	Molybdenum	N	µg/L	1.8 J	180	No criteria	1.4	J	1.3	J
Metals	Nickel	N	µg/L	1.8	730	No criteria	1.1	J	0.29	J
Metals	Strontium	N	µg/L	73.8 J	22000	No criteria	**98.3**	J	**101**	J
Metals	Titanium	N	µg/L	5.4	150000	No criteria	0.79	J	0.85	J
Metals	Zinc	N	µg/L	45.3	11000	5000	9.2	J	18.2	J

[**Bold Face**] - Result exceeds Maximum Concentration from media background samples

EPA - Environmenal Protection Agency
PRG - Preliminary Remediation Goal
MCL - Maximum Contaminant Level
REG - regular sample
FD - field duplicate
µg/L - microgram per liter
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.
UJ - The compound/analyte was analyzed for, but not detected above the established reporting limit. However, review and evaluation of supporting QC data and/or sampling and analysis process have indicated that the reporting limit may be inaccurate or imprecise. The nondetect result should be estimated.

Table 5-6A
Range Complex No. 1
Sedmiment Hits Comparison
Camp Adair

Location						**017A028**		**017A029**	
Sample Number						**NWO-017-1002**		**NWO-017-1003**	
Sample Date						**24-Aug-06**		**23-Aug-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.33**		**0 to 0.5**	
Sample Purpose						**REG**		**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Sediment Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Maximum Concentration from Media Background Samples**	**Result**	**VQ**	**Result**	**VQ**
Metals	Aluminum	mg/kg	280	76000	36900	*16800*		*19200*	
Metals	Barium	mg/kg	48	No criteria	173	*163*		*142*	
Metals	Cadmium	mg/kg	0.003	37	0.85	*0.27*	J	*0.16*	J
Metals	Chromium	mg/kg	37	210	100	22		23.8	
Metals	Cobalt	mg/kg	230	900	45.8	12.2		12.4	
Metals	Copper	mg/kg	10	3100	134	*17.7*		*12.1*	
Metals	Iron	mg/kg	20	23000	76000	*18700*		*27800*	
Metals	Lead	mg/kg	35	400	11.1	**13.8**		**11.9**	
Metals	Magnesium	mg/kg	No criteria	No criteria	12000	2120		1730	
Metals	Manganese	mg/kg	1100	1800	1290	375		712	
Metals	Mercury	mg/kg	0.2	23	0.049	0.042		**0.058**	
Metals	Molybdenum	mg/kg	No criteria	390	0.56 J	0.3	J	0.36	J
Metals	Nickel	mg/kg	18	1600	44.2	12.7		10.6	
Metals	Strontium	mg/kg	1700	47000	52.4 J	22.4	J	39	
Metals	Titanium	mg/kg	98	100000	4610	*489*		*206*	
Metals	Zinc	mg/kg	3	23000	92.4	*41.1*		*34.3*	

[*Italicized*] - Result exceeds Site Inspection Sediment Ecological Screening Levels
[Underlined]- Result exceeds EPA Region 9 PRGs - Residential Soil
[**BOLD**] - Result exceeds Maximum Concentration from Media Background Samples

PRG - Preliminary Remediation Goals
REG - regular sample
FD - field duplicate
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed

Table 5-6B
Range Complex No. 2
Sediment Hits Comparison
Camp Adair

Location						**017A038**		**017A039**		**017A039**	
Sample Number						**NWO-017-1004**		**NWO-017-1005**		**NWO-017-1006**	
Sample Date						**25-Aug-06**		**24-Aug-06**		**24-Aug-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**		**0.08 to 0.5**		**0.08 to 0.5**	
Sample Purpose						**REG**		**REG**		**FD**	
Fraction	**Parameter**	**Units**	**Site Inspection Sediment Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Maximum Concentration from Media Background Samples**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Metals	Aluminum	mg/kg	280	76000	36900	*21500*		*14500*		*16000*	
Metals	Barium	mg/kg	48	No criteria	173	***177***		*125*		*135*	
Metals	Cadmium	mg/kg	0.003	37	0.85	*0.43*		*0.28*	J	*0.36*	J
Metals	Chromium	mg/kg	37	210	100	26.8		17.8		19.4	
Metals	Cobalt	mg/kg	230	900	45.8	11.5		11.4		12.5	
Metals	Copper	mg/kg	10	3100	134	*26.3*		*15.2*		*16.8*	
Metals	Iron	mg/kg	20	23000	76000	*37400*		*33000*		*34400*	
Metals	Lead	mg/kg	35	400	11.1	**11.2**		9.9		10.2	
Metals	Magnesium	mg/kg	No criteria	No criteria	12000	5080		3550		3850	
Metals	Manganese	mg/kg	1100	1800	1290	284		419		475	
Metals	Mercury	mg/kg	0.2	23	0.049	0.035		0.027		0.024	J
Metals	Molybdenum	mg/kg	No criteria	390	0.56 J	0.4	J	0.33	J	0.33	J
Metals	Nickel	mg/kg	18	1600	44.2	*20.8*		14.4		15.5	
Metals	Strontium	mg/kg	1700	47000	52.4 J	20.1	J	16.8	J	17.5	J
Metals	Titanium	mg/kg	98	100000	4610	*662*		*729*		*742*	
Metals	Zinc	mg/kg	3	23000	92.4	*82.4*		*67.2*		*68.3*	

[*Italicized*] - Result exceeds Site Inspection Sediment Ecological Screening Levels

[Underlined]- Result exceeds EPA Region 9 PRGs - Residential Soil

[**BOLD**] - Result exceeds Maximum Concentration from Media Background Samples

PRG - Preliminary Remediation Goals
REG - regular sample
FD - field duplicate
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed

Table 5-6C
Bombing Target No. 1
Sediment Hits Comparison
Camp Adair

Location						**017A043**	
Sample Number						**NWO-017-1007**	
Sample Date						**25-Aug-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**	
Sample Purpose						**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Sediment Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Maximum Concentration from Media Background Samples**	**Result**	**VQ**
Metals	Aluminum	mg/kg	280	76000	36900	*14400*	
Metals	Antimony	mg/kg	3	31	Not detected	**0.15**	J
Metals	Barium	mg/kg	48	No criteria	173	***202***	
Metals	Cadmium	mg/kg	0.003	37	0.85	*0.2*	J
Metals	Chromium	mg/kg	37	210	100	23.3	
Metals	Cobalt	mg/kg	230	900	45.8	21.2	
Metals	Copper	mg/kg	10	3100	134	*19.6*	
Metals	Iron	mg/kg	20	23000	76000	*32500*	
Metals	Lead	mg/kg	35	400	11.1	**15.7**	
Metals	Magnesium	mg/kg	No criteria	No criteria	12000	2390	
Metals	Manganese	mg/kg	1100	1800	1290	794	
Metals	Mercury	mg/kg	0.2	23	0.049	0.038	
Metals	Molybdenum	mg/kg	No criteria	390	0.56 J	**0.56**	J
Metals	Nickel	mg/kg	18	1600	44.2	13.3	
Metals	Strontium	mg/kg	1700	47000	52.4 J	30.1	J
Metals	Titanium	mg/kg	98	100000	4610	*434*	
Metals	Zinc	mg/kg	3	23000	92.4	*64.4*	

[*Italicized*] - Result exceeds Site Inspection Sediment Ecological Screening Levels
[Underlined]- Result exceeds EPA Region 9 PRGs - Residential Soil
[**BOLD**] - Result exceeds Maximum Concentration from Media Background Samples

PRG - Preliminary Remediation Goals
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-6D
Range Complex No. 3
Sediment Hits Comparison
Camp Adair

Location						**017A049**	
Sample Number						**NWO-017-1008**	
Sample Date						**28-Aug-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**	
Sample Purpose						**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Sediment Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Maximum Concentration from Media Background Samples**	**Result**	**VQ**
Metals	Aluminum	mg/kg	280	76000	36900	*25100*	
Metals	Antimony	mg/kg	3	31	Not detected	0.27	J
Metals	Barium	mg/kg	48	No criteria	173	*151*	
Metals	Cadmium	mg/kg	0.003	37	0.85	*0.23*	J
Metals	Chromium	mg/kg	37	210	100	35	J
Metals	Cobalt	mg/kg	230	900	45.8	18.4	
Metals	Copper	mg/kg	10	3100	134	*30.2*	
Metals	Iron	mg/kg	20	23000	76000	*42800*	
Metals	Lead	mg/kg	35	400	11.1	**17.5**	
Metals	Magnesium	mg/kg	No criteria	No criteria	12000	3830	
Metals	Manganese	mg/kg	1100	1800	1290	712	
Metals	Molybdenum	mg/kg	No criteria	390	0.56 J	**0.62**	J
Metals	Nickel	mg/kg	18	1600	44.2	*20.4*	
Metals	Strontium	mg/kg	1700	47000	52.4 J	25.8	J
Metals	Titanium	mg/kg	98	100000	4610	*318*	J
Metals	Zinc	mg/kg	3	23000	92.4	*62.5*	J

[*Italicized*] - Result exceeds Site Inspection Sediment Ecological Screening Levels
[Underlined]- Result exceeds EPA Region 9 PRGs - Residential Soil
[**BOLD**] - Result exceeds Maximum Concentration from Media Background Samples

PRG - Preliminary Remediation Goals
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-6E
Mortar Range
Sediment Hits Comparison
Camp Adair

Location						**017A053**	
Sample Number						**NWO-017-1009R**	
Sample Date						**7-Sep-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.52**	
Sample Purpose						**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Sediment Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Maximum Concentration from Media Background Samples**	**Result**	**VQ**
Explosives	Nitrobenzene	mg/kg	32	20	No criteria	0.025	J
Metals	Aluminum	mg/kg	280	76000	36900	***39300***	
Metals	Barium	mg/kg	48	No criteria	173	***181***	
Metals	Cadmium	mg/kg	0.003	37	0.85	*0.64*	
Metals	Chromium	mg/kg	37	210	100	***117***	
Metals	Cobalt	mg/kg	230	900	45.8	**76.5**	
Metals	Copper	mg/kg	10	3100	134	*86.8*	
Metals	Iron	mg/kg	20	23000	76000	*75600*	
Metals	Lead	mg/kg	35	400	11.1	1.6	
Metals	Magnesium	mg/kg	No criteria	No criteria	12000	**12900**	
Metals	Manganese	mg/kg	1100	1800	1290	***1800***	
Metals	Nickel	mg/kg	18	1600	44.2	***79.5***	
Metals	Strontium	mg/kg	1700	47000	52.4 J	**88**	J
Metals	Titanium	mg/kg	98	100000	4610	*4480*	
Metals	Zinc	mg/kg	3	23000	92.4	*66.5*	

[*Italicized*] - Result exceeds Site Inspection Sediment Ecological Screening Levels
[Underlined]- Result exceeds EPA Region 9 PRGs - Residential Soil
[**BOLD**] - Result exceeds Maximum Concentration from Media Background Samples

PRG - Preliminary Remediation Goals
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-6F
Moving Target Range No. 75
Sediment Hits Comparison
Camp Adair

Location						**017A057**	
Sample Number						**NWO-017-1010R**	
Sample Date						**7-Sep-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.33**	
Sample Purpose						**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Sediment Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Maximum Concentration from Media Background Samples**	**Result**	**VQ**
Metals	Aluminum	mg/kg	280	76000	36900	*34900*	
Metals	Barium	mg/kg	48	No criteria	173	***444***	
Metals	Cadmium	mg/kg	0.003	37	0.85	*0.42*	J
Metals	Chromium	mg/kg	37	210	100	*55.9*	
Metals	Cobalt	mg/kg	230	900	45.8	38.1	
Metals	Copper	mg/kg	10	3100	134	*67.5*	
Metals	Iron	mg/kg	20	23000	76000	*63500*	
Metals	Lead	mg/kg	35	400	11.1	**12**	
Metals	Magnesium	mg/kg	No criteria	No criteria	12000	5370	
Metals	Manganese	mg/kg	1100	1800	1290	***2320***	
Metals	Mercury	mg/kg	0.2	23	0.049	0.041	
Metals	Molybdenum	mg/kg	No criteria	390	0.56 J	**1.2**	J
Metals	Nickel	mg/kg	18	1600	44.2	*38.2*	
Metals	Strontium	mg/kg	1700	47000	52.4 J	**107**	J
Metals	Titanium	mg/kg	98	100000	4610	*1400*	
Metals	Zinc	mg/kg	3	23000	92.4	*78.8*	

[*Italicized*] - Result exceeds Site Inspection Sediment Ecological Screening Levels
[Underlined]- Result exceeds EPA Region 9 PRGs - Residential Soil
[**BOLD**] - Result exceeds Maximum Concentration from Media Background Samples

PRG - Preliminary Remediation Goals
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed

Table 5-7A
Range Complex No. 1
Soil Hits Comparison
Camp Adair

Location						**017A024**		**017A025**		**017A026**		**017A027**	
Sample Number						**NWO-017-0022**		**NWO-017-0023**		**NWO-017-0024**		**NWO-017-0025**	
Sample Date						**23-Aug-06**		**23-Aug-06**		**24-Aug-06**		**24-Aug-06**	
Sample Depth (bgs) (ft)						**0.17 to 0.5**		**0.08 to 0.5**		**0.08 to 0.5**		**0.08 to 0.5**	
Sample Purpose						**REG**		**REG**		**REG**		**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Background 95th UTL / 95th Percentile**	**Site Inspection Soil Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Metals	Aluminum	mg/kg	71400	50	76000	*22800*		*15200*		*13500*		*17100*	
Metals	Barium	mg/kg	472	85	No criteria	*146*		*96.1*		77.4		*123*	
Metals	Cadmium	mg/kg	0.996	4	37	0.22	J	0.13	J	0.18	J	0.34	J
Metals	Chromium	mg/kg	153	0.4	210	*29.2*		*23.6*		*20.4*		*25.8*	
Metals	Cobalt	mg/kg	108	20	900	*24.1*		8.8		12.1		14	
Metals	Copper	mg/kg	203	50	3100	28.8		11.9		10.2		17	
Metals	Iron	mg/kg	119000	200	23000	*31900*		*26400*		*19900*		*26700*	
Metals	Lead	mg/kg	29.5	16	400	13.6		7.9		9.1		9.8	
Metals	Magnesium	mg/kg	28900	No criteria	No criteria	3760		858		696		1460	
Metals	Manganese	mg/kg	4100	100	1800	*806*		*600*		*515*		*613*	
Metals	Mercury	mg/kg	0.06	0.1	23	**0.089**		0.034		0.028		0.035	
Metals	Molybdenum	mg/kg	1.36	2	390	0.6	J	0.34	J	0.29	J	0.35	J
Metals	Nickel	mg/kg	148	30	1600	13.8		7.4		7.6		11.4	
Metals	Strontium	mg/kg	57.1	32875	47000	41.4		6		3.5	J	5.8	J
Metals	Titanium	mg/kg	19900	1000	100000	539		360		317		341	
Metals	Zinc	mg/kg	141	50	23000	*52.1*		28.6		22.6		35.4	

[**Bold**] - Result exceeds Site Inspection Background 95th UTL / 95th Percentile
[*Italicized*] - Result exceedsSite Inspection Soil Ecological Screening Levels
[Underline] - Result exceeds EPA Region 9 PRGs - Residential Soil

PRG - Preliminary Remediation Goals
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-7B
Range Complex No. 2
Soil Hits Comparison
Camp Adair

Location						**017A031**		**017A032**		**017A033**		**017A034**	
Sample Number						**NWO-017-0027**		**NWO-017-0028**		**NWO-017-0029**		**NWO-017-0030**	
Sample Date						**23-Aug-06**		**23-Aug-06**		**24-Aug-06**		**23-Aug-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**		**0.08 to 0.5**		**.08 to 0.5**		**0.17 to 0.5**	
Sample Purpose						**REG**		**REG**		**REG**		**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Background 95th UTL / 95th Percentile**	**Site Inspection Soil Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Metals	Aluminum	mg/kg	71400	50	76000	*21500*		*24100*		*21800*		*21600*	
Metals	Antimony	mg/kg	0.83	5	31	0.19	J	0.16	J	-	-	0.16	J
Metals	Barium	mg/kg	472	85	No criteria	*179*		*168*		*182*		*141*	
Metals	Cadmium	mg/kg	0.996	4	37	0.3	J	0.31	J	0.39	J	0.24	J
Metals	Chromium	mg/kg	153	0.4	210	*27.5*		*29.1*		*32.2*		*31.6*	
Metals	Cobalt	mg/kg	108	20	900	14.9		16		16.4		*22.5*	
Metals	Copper	mg/kg	203	50	3100	39.6		18.6		17.3		36.7	
Metals	Iron	mg/kg	119000	200	23000	*32100*		*31300*		*30800*		*37100*	
Metals	Lead	mg/kg	29.5	16	400	13		14.9		15.1		*22.9*	
Metals	Magnesium	mg/kg	28900	No criteria	No criteria	4880		4590		4000		2890	
Metals	Manganese	mg/kg	4100	100	1800	*740*		*856*		*952*		*724*	
Metals	Mercury	mg/kg	0.06	0.1	23	0.041		-	-	0.026		**0.086**	
Metals	Molybdenum	mg/kg	1.36	2	390	0.61	J	0.48	J	-	-	0.55	J
Metals	Nickel	mg/kg	148	30	1600	18.8		17.8		17.9		13.5	
Metals	Strontium	mg/kg	57.1	32875	47000	41		23.4		25.3	J	27.9	
Metals	Titanium	mg/kg	19900	1000	100000	*1560*		*1680*		*1490*		312	
Metals	Zinc	mg/kg	141	50	23000	*82.3*		*71.9*		*63.3*		*59.5*	

[**Bold**] - Result exceeds Site Inspection Background 95th UTL / 95th Percentile
[*Italicized*] - Result exceedsSite Inspection Soil Ecological Screening Levels
[Underline] - Result exceeds EPA Region 9 PRGs - Residential Soil
- indicates analyte not detected above practical quantitation limits

PRG - Preliminary Remediation Goals
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
U - Not detected. The compound/analyte was analyzed for, but not detected above the associated reporting limit.
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed

Table 5-7B
Range Complex No. 2
Soil Hits Comparison
Camp Adair

Location						**017A035**		**017A036**		**017A037**	
Sample Number						**NWO-017-0031**		**NWO-017-0032**		**NWO-017-0033**	
Sample Date						**29-Aug-06**		**29-Aug-06**		**28-Aug-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**		**0.08 to 0.5**		**0.08 to 0.5**	
Sample Purpose						**REG**		**REG**		**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Background 95th UTL / 95th Percentile**	**Site Inspection Soil Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Metals	Aluminum	mg/kg	71400	50	76000	*23500*		*25200*		*2680*	
Metals	Antimony	mg/kg	0.83	5	31	-	-	-	-	-	-
Metals	Barium	mg/kg	472	85	No criteria	*139*		*112*		17.8	
Metals	Cadmium	mg/kg	0.996	4	37	0.19	J	0.16	J	0.032	J
Metals	Chromium	mg/kg	153	0.4	210	*26.1*		*24.9*		-	-
Metals	Cobalt	mg/kg	108	20	900	13.6		10.5		2.1	
Metals	Copper	mg/kg	203	50	3100	16.9		28.2		2	
Metals	Iron	mg/kg	119000	200	23000	*25700*		*28100*		*3350*	
Metals	Lead	mg/kg	29.5	16	400	12.8		10.1		1.6	
Metals	Magnesium	mg/kg	28900	No criteria	No criteria	2980		2270		419	
Metals	Manganese	mg/kg	4100	100	1800	*770*		*615*		*104*	
Metals	Mercury	mg/kg	0.06	0.1	23	0.043	U	-	-	0.024	J
Metals	Molybdenum	mg/kg	1.36	2	390	0.38	J	0.82	J	0.042	J
Metals	Nickel	mg/kg	148	30	1600	13		10.6		1.6	
Metals	Strontium	mg/kg	57.1	32875	47000	12.7	J	19.2	J	2.3	J
Metals	Titanium	mg/kg	19900	1000	100000	865		664		104	
Metals	Zinc	mg/kg	141	50	23000	42.8		*64.6*		5.6	

[**Bold**] - Result exceeds Site Inspection Background 95th UTL / 95th Percentile
[*Italicized*] - Result exceedsSite Inspection Soil Ecological Screening Levels
[Underline] - Result exceeds EPA Region 9 PRGs - Residential Soil
- indicates analyte not detected above practical quantitation limits

PRG - Preliminary Remediation Goals
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
U - Not detected. The compound/analyte was analyzed for, but not detected above the associated reporting limit.
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed

Table 5-7C
Bombing Target No. 1
Soil Hits Comparison
Camp Adair

Location						**017A042**	
Sample Number						**NWO-017-0034**	
Sample Date						**25-Aug-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**	
Sample Purpose						**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Background 95th UTL / 95th Percentile**	**Site Inspection Soil Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Result**	**VQ**
Metals	Aluminum	mg/kg	71400	50	76000	*19500*	
Metals	Antimony	mg/kg	0.83	5	31	0.19	J
Metals	Barium	mg/kg	472	85	No criteria	*154*	
Metals	Cadmium	mg/kg	0.996	4	37	0.23	J
Metals	Chromium	mg/kg	153	0.4	210	*25.4*	J
Metals	Cobalt	mg/kg	108	20	900	14.4	
Metals	Copper	mg/kg	203	50	3100	14.5	
Metals	Iron	mg/kg	119000	200	23000	*25200*	
Metals	Lead	mg/kg	29.5	16	400	14.3	
Metals	Magnesium	mg/kg	28900	No criteria	No criteria	3350	
Metals	Manganese	mg/kg	4100	100	1800	*833*	
Metals	Mercury	mg/kg	0.06	0.1	23	0.029	J
Metals	Molybdenum	mg/kg	1.36	2	390	0.26	J
Metals	Nickel	mg/kg	148	30	1600	13.5	
Metals	Strontium	mg/kg	57.1	32875	47000	17.7	J
Metals	Titanium	mg/kg	19900	1000	100000	800	
Metals	Zinc	mg/kg	141	50	23000	44.6	J

[*Italicized*] - Result exceedsSite Inspection Soil Ecological Screening Levels
[Underline] - Result exceeds EPA Region 9 PRGs - Residential Soil

PRG - Preliminary Remediation Goals
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed

Table 5-7D
Range Complex No. 3
Soil Hits Comparison
Camp Adair

Location						**017A045**		**017A046**		**017A047**		**017A048**	
Sample Number						**NWO-017-0035**		**NWO-017-0036**		**NWO-017-0037**		**NWO-017-0038**	
Sample Date						**28-Aug-06**		**28-Aug-06**		**29-Aug-06**		**28-Aug-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**		**0.08 to 0.5**		**0.08 to 0.5**		**0.08 to 0.5**	
Sample Purpose						**REG**		**REG**		**REG**		**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Background 95th UTL / 95th Percentile**	**Site Inspection Soil Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Explosives	2,6-Dinitrotoluene	mg/kg	No criteria	.0328	.72	-	-	0.021	J	0.02	J	-	-
Metals	Aluminum	mg/kg	71400	50	76000	*27800*		*33300*		*30300*		*26900*	
Metals	Antimony	mg/kg	0.83	5	31	0.27	J	0.26	J	0.26	J	0.18	J
Metals	Barium	mg/kg	472	85	No criteria	*168*		*257*		*258*		*200*	
Metals	Cadmium	mg/kg	0.996	4	37	0.21	J	0.21	J	0.18	J	0.19	J
Metals	Chromium	mg/kg	153	0.4	210	*40.6*		*73.6*		*36.4*		*31.2*	
Metals	Cobalt	mg/kg	108	20	900	17.9		15.1		19		*20.1*	
Metals	Copper	mg/kg	203	50	3100	36.4		43.7		40.5		43.2	
Metals	Iron	mg/kg	119000	200	23000	*43300*		*44100*		*46000*		*45000*	
Metals	Lead	mg/kg	29.5	16	400	*16.5*		15.4		*17*		13.5	
Metals	Magnesium	mg/kg	28900	No criteria	No criteria	4820		4950		3980		3710	
Metals	Manganese	mg/kg	4100	100	1800	*529*		*559*		*1100*		*793*	
Metals	Molybdenum	mg/kg	1.36	2	390	0.73	J	***5.7***		0.86	J	0.71	J
Metals	Nickel	mg/kg	148	30	1600	26.8		*47.9*		20.5		16.4	
Metals	Strontium	mg/kg	57.1	32875	47000	27.8	J	55	J	35.1	J	33.5	J
Metals	Titanium	mg/kg	19900	1000	100000	320		262		332		314	
Metals	Zinc	mg/kg	141	50	23000	*75.1*		*88.2*		*72.6*		*54.8*	

[**Bold**] - Result exceeds Site Inspection Background 95th UTL / 95th Percentile
[*Italicized*] - Result exceedsSite Inspection Soil Ecological Screening Levels
[Underline] - Result exceeds EPA Region 9 PRGs - Residential Soil
- indicates analyte not detected above practical quantitation limits

PRG - Preliminary Remediation Goals
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-7E
Mortar Range
Soil Hits Comparison
Camp Adair

Location						**017A051**		**017A052**		**017A052**		**017A052**	
Sample Number						**NWO-017-0039R**		**NWO-017-0040R**		**NWO-017-0040RR**		**NWO-017-0040RR-ED**	
Sample Date						**7-Sep-06**		**7-Sep-06**		**11-Sep-06**		**11-Sep-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**		**0.08 to 0.5**		**0.08 to 0.5**		**0.08 to 0.5**	
Sample Purpose						**REG**		**REG**		**REG**		**FD**	
Fraction	**Parameter**	**Units**	**Site Inspection Background 95th UTL / 95th Percentile**	**Site Inspection Soil Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Metals	Aluminum	mg/kg	71400	50	76000	*50000*		*51300*		*49700*		*53200*	
Metals	Barium	mg/kg	472	85	No criteria	*183*		*172*		*169*		*182*	
Metals	Cadmium	mg/kg	0.996	4	37	0.68		**1**		0.8		0.74	
Metals	Chromium	mg/kg	153	0.4	210	*147*		***175***		*147*		***155***	
Metals	Cobalt	mg/kg	108	20	900	*65.3*		*62.7*		*62*		*65.5*	
Metals	Copper	mg/kg	203	50	3100	*133*		*156*		*131*		*129*	
Metals	Iron	mg/kg	119000	200	23000	*74200*		*89200*		*73600*		*78100*	
Metals	Lead	mg/kg	29.5	16	400	3.9		5.7		4.2		4.5	
Metals	Magnesium	mg/kg	28900	No criteria	No criteria	13200		11100		13000		13600	
Metals	Manganese	mg/kg	4100	100	1800	*2300*		*2260*		*2090*		*2290*	
Metals	Mercury	mg/kg	0.06	0.1	23	0.023	J	0.023	J	0.021	J	0.022	J
Metals	Molybdenum	mg/kg	1.36	2	390	0.24	J	0.4	J	0.31		0.24	
Metals	Nickel	mg/kg	148	30	1600	*73.9*		*73.5*		*71.9*		*77.3*	
Metals	Strontium	mg/kg	57.1	32875	47000	**78.4**	J	50.4	J	**86.3**	J	**89.3**	J
Metals	Titanium	mg/kg	19900	1000	100000	*4900*		*7490*		*4900*		*4750*	
Metals	Zinc	mg/kg	141	50	23000	*73.7*		*95.8*		*75.4*		*78.2*	

[**Bold**] - Result exceeds Site Inspection Background 95th UTL / 95th Percentile
[*Italicized*] - Result exceedsSite Inspection Soil Ecological Screening Levels
[Underline] - Result exceeds EPA Region 9 PRGs - Residential Soil

PRG - Preliminary Remediation Goals
REG - regular sample
FD - field duplicate
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed

Table 5-7F
Moving Target Range No. 75
Soil Hits Comparison
Camp Adair

Location						**017A055**		**017A056**		**017A056**	
Sample Number						**NWO-017-0041**		**NWO-017-0042**		**NWO-017-0043**	
Sample Date						**6-Sep-06**		**6-Sep-06**		**6-Sep-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**		**0.08 to 0.5**		**0.08 to 0.5**	
Sample Purpose						**REG**		**REG**		**FD**	
Fraction	**Parameter**	**Units**	**Site Inspection Background 95th UTL / 95th Percentile**	**Site Inspection Soil Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Result**	**VQ**	**Result**	**VQ**	**Result**	**VQ**
Explosives	Nitrobenzene	mg/kg	No criteria	8	20	0.021	J	-	-	0.024	J
Metals	Aluminum	mg/kg	71400	50	76000	*52700*		*30500*		*31000*	
Metals	Antimony	mg/kg	0.83	5	31	-	-	0.23		0.25	
Metals	Barium	mg/kg	472	85	No criteria	***646***		*302*		*315*	
Metals	Cadmium	mg/kg	0.996	4	37	0.79		0.35		0.44	
Metals	Chromium	mg/kg	153	0.4	210	*57*		*55.8*		*57.4*	
Metals	Cobalt	mg/kg	108	20	900	*39.3*		*34*		*33.2*	
Metals	Copper	mg/kg	203	50	3100	*116*		39.3		39.5	
Metals	Iron	mg/kg	119000	200	23000	*66600*		*42800*		*44100*	
Metals	Lead	mg/kg	29.5	16	400	9.7		15.4		*16.4*	
Metals	Magnesium	mg/kg	28900	No criteria	No criteria	11400		4860		4990	
Metals	Manganese	mg/kg	4100	100	1800	*2830*		*1570*		*1650*	
Metals	Mercury	mg/kg	0.06	0.1	23	0.025	J	0.04		0.037	
Metals	Molybdenum	mg/kg	1.36	2	390	0.32		0.62		0.63	
Metals	Nickel	mg/kg	148	30	1600	*50.4*		*31.7*		*32*	
Metals	Strontium	mg/kg	57.1	32875	47000	**131**	J	**61.4**	J	**62.6**	J
Metals	Titanium	mg/kg	19900	1000	100000	*2910*		649		663	
Metals	Zinc	mg/kg	141	50	23000	*80.2*		*58.5*		*62.3*	

[**Bold**] - Result exceeds Site Inspection Background 95th UTL / 95th Percentile
[*Italicized*] - Result exceedsSite Inspection Soil Ecological Screening Levels
[Underline] - Result exceeds EPA Region 9 PRGs - Residential Soil
- indicates analyte not detected above practical quantitation limits

PRG - Preliminary Remediation Goals
REG - regular sample
FD - field duplicate
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-8A
East Live Hand Grenade Court
Sediment Hits Comparison
Camp Adair

Location						**017A060**	
Sample Number						**NWO-017-1011**	
Sample Date						**22-Aug-06**	
Sample Depth (bgs) (ft)						**0 to 0.5**	
Sample Purpose						**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Sediment Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Maximum Concentration from Media Background Samples**	**Result**	**VQ**
Metals	Aluminum	mg/kg	280	76000	36900	*19000*	
Metals	Barium	mg/kg	48	No criteria	173	***188***	
Metals	Cadmium	mg/kg	0.003	37	0.85	*0.29*	J
Metals	Chromium	mg/kg	37	210	100	26.6	
Metals	Cobalt	mg/kg	230	900	45.8	18.3	
Metals	Copper	mg/kg	10	3100	134	*18.8*	
Metals	Iron	mg/kg	20	23000	76000	*27900*	
Metals	Lead	mg/kg	35	400	11.1	**11.6**	
Metals	Magnesium	mg/kg	No criteria	No criteria	12000	3040	
Metals	Manganese	mg/kg	1100	1800	1290	***1460***	
Metals	Mercury	mg/kg	0.2	23	0.049	0.041	
Metals	Molybdenum	mg/kg	No criteria	390	0.56 J	0.3	J
Metals	Nickel	mg/kg	18	1600	44.2	15.2	
Metals	Strontium	mg/kg	1700	47000	52.4 J	38.9	
Metals	Titanium	mg/kg	98	100000	4610	*577*	
Metals	Zinc	mg/kg	3	23000	92.4	*72.6*	

[*Italicized*] - Result exceeds Site Inspection Sediment Ecological Screening Levels

[Underlined]- Result exceeds EPA Region 9 PRGs - Residential Soil

[**BOLD**] - Result exceeds Maximum Concentration from Media Background Samples

PRG - Preliminary Remediation Goals
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-8B
Live Hand Grenade Court No. 129
Sediment Hits Comparison
Camp Adair

Location						**017A063**		**017A063**	
Sample Number						**NWO-017-1012**		**NWO-017-1013**	
Sample Date						**23-Aug-06**		**23-Aug-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**		**0.08 to 0.5**	
Sample Purpose						**REG**		**FD**	
Fraction	**Parameter**	**Units**	**Site Inspection Sediment Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Maximum Concentration from Media Background Samples**	**Result**	**VQ**	**Result**	**VQ**
Metals	Aluminum	mg/kg	280	76000	36900	*12300*		*16100*	
Metals	Barium	mg/kg	48	No criteria	173	*76*		*104*	
Metals	Cadmium	mg/kg	0.003	37	0.85	*0.18*	J	*0.18*	J
Metals	Chromium	mg/kg	37	210	100	19.9		24.2	
Metals	Cobalt	mg/kg	230	900	45.8	17.2		17.7	
Metals	Copper	mg/kg	10	3100	134	*14.1*		*18.4*	
Metals	Iron	mg/kg	20	23000	76000	*21200*		*25000*	
Metals	Lead	mg/kg	35	400	11.1	5		5.9	
Metals	Magnesium	mg/kg	No criteria	No criteria	12000	1920		2580	
Metals	Manganese	mg/kg	1100	1800	1290	939		1090	
Metals	Mercury	mg/kg	0.2	23	0.049	0.034		0.048	
Metals	Molybdenum	mg/kg	No criteria	390	0.56 J	-	-	0.24	J
Metals	Nickel	mg/kg	18	1600	44.2	6.2		8.3	
Metals	Strontium	mg/kg	1700	47000	52.4 J	19.7		30.1	
Metals	Titanium	mg/kg	98	100000	4610	*379*		*510*	
Metals	Zinc	mg/kg	3	23000	92.4	*27.8*		*38.5*	

[*Italicized*] - Result exceeds Site Inspection Sediment Ecological Screening Levels
[Underlined]- Result exceeds EPA Region 9 PRGs - Residential Soil
- indicates analyte not detected above practical quantitation limits

PRG - Preliminary Remediation Goals
REG - regular sample
FD - field duplicate
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed.

Table 5-9A
East Live Hand Grenade Court
Soil Hits Comparison
Camp Adair

Location						**017A059**	
Sample Number						**NWO-017-0044**	
Sample Date						**22-Aug-06**	
Sample Depth (bgs) (ft)						**0 to 0.5**	
Sample Purpose						**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Background 95th UTL / 95th Percentile**	**Site Inspection Soil Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Result**	**VQ**
Metals	Aluminum	mg/kg	71400	50	76000	*21200*	
Metals	Antimony	mg/kg	0.83	5	31	0.17	J
Metals	Barium	mg/kg	472	85	No criteria	*164*	
Metals	Cadmium	mg/kg	0.996	4	37	0.43	
Metals	Chromium	mg/kg	153	0.4	210	*30.2*	
Metals	Cobalt	mg/kg	108	20	900	17.2	
Metals	Copper	mg/kg	203	50	3100	18	
Metals	Iron	mg/kg	119000	200	23000	*30200*	
Metals	Lead	mg/kg	29.5	16	400	14.7	
Metals	Magnesium	mg/kg	28900	No criteria	No criteria	4100	
Metals	Manganese	mg/kg	4100	100	1800	*924*	
Metals	Mercury	mg/kg	0.06	0.1	23	0.035	
Metals	Molybdenum	mg/kg	1.36	2	390	0.46	J
Metals	Nickel	mg/kg	148	30	1600	17	
Metals	Strontium	mg/kg	57.1	32875	47000	30.4	
Metals	Titanium	mg/kg	19900	1000	100000	*1770*	
Metals	Zinc	mg/kg	141	50	23000	*67.4*	

[*Italicized*] - Result exceedsSite Inspection Soil Ecological Screening Levels
[Underline] - Result exceeds EPA Region 9 PRGs - Residential Soil

PRG - Preliminary Remediation Goals
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed

Table 5-9B
West Live Hand Grenade Court
Soil Hits Comparison
Camp Adair

Location						**017A061**	
Sample Number						**NWO-017-0045**	
Sample Date						**23-Aug-06**	
Sample Depth (bgs) (ft)						**0.17 to 0.5**	
Sample Purpose						**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Background 95th UTL / 95th Percentile**	**Site Inspection Soil Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Result**	**VQ**
Metals	Aluminum	mg/kg	71400	50	76000	*20600*	
Metals	Antimony	mg/kg	0.83	5	31	0.15	J
Metals	Barium	mg/kg	472	85	No criteria	*161*	
Metals	Cadmium	mg/kg	0.996	4	37	0.3	J
Metals	Chromium	mg/kg	153	0.4	210	*26.8*	
Metals	Cobalt	mg/kg	108	20	900	14.6	
Metals	Copper	mg/kg	203	50	3100	14.9	
Metals	Iron	mg/kg	119000	200	23000	*26600*	
Metals	Lead	mg/kg	29.5	16	400	13.7	
Metals	Magnesium	mg/kg	28900	No criteria	No criteria	3990	
Metals	Manganese	mg/kg	4100	100	1800	*758*	
Metals	Molybdenum	mg/kg	1.36	2	390	0.38	J
Metals	Nickel	mg/kg	148	30	1600	15.4	
Metals	Strontium	mg/kg	57.1	32875	47000	19.1	
Metals	Titanium	mg/kg	19900	1000	100000	*1380*	
Metals	Zinc	mg/kg	141	50	23000	*59.2*	

[*Italicized*] - Result exceedsSite Inspection Soil Ecological Screening Levels
[Underline] - Result exceeds EPA Region 9 PRGs - Residential Soil

PRG - Preliminary Remediation Goals
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed

Table 5-9C
Live Hand Grenade Court No. 129
Soil Hits Comparison
Camp Adair

Location						**017A062**	
Sample Number						**NWO-017-0046**	
Sample Date						**22-Aug-06**	
Sample Depth (bgs) (ft)						**0.08 to 0.5**	
Sample Purpose						**REG**	
Fraction	**Parameter**	**Units**	**Site Inspection Background 95th UTL / 95th Percentile**	**Site Inspection Soil Ecological Screening Levels**	**EPA Region 9 PRGs - Residential Soil**	**Result**	**VQ**
Metals	Aluminum	mg/kg	71400	50	76000	*25000*	
Metals	Barium	mg/kg	472	85	No criteria	*157*	
Metals	Cadmium	mg/kg	0.996	4	37	0.27	J
Metals	Chromium	mg/kg	153	0.4	210	*31.8*	
Metals	Cobalt	mg/kg	108	20	900	17.8	
Metals	Copper	mg/kg	203	50	3100	20.4	
Metals	Iron	mg/kg	119000	200	23000	*32800*	
Metals	Lead	mg/kg	29.5	16	400	11.6	
Metals	Magnesium	mg/kg	28900	No criteria	No criteria	4410	
Metals	Manganese	mg/kg	4100	100	1800	*830*	
Metals	Mercury	mg/kg	0.06	0.1	23	0.038	
Metals	Molybdenum	mg/kg	1.36	2	390	0.28	J
Metals	Nickel	mg/kg	148	30	1600	14.3	
Metals	Strontium	mg/kg	57.1	32875	47000	25.4	
Metals	Titanium	mg/kg	19900	1000	100000	*1010*	
Metals	Zinc	mg/kg	141	50	23000	*53*	

[*Italicized*] - Result exceedsSite Inspection Soil Ecological Screening Levels
[Underline] - Result exceeds EPA Region 9 PRGs - Residential Soil

PRG - Preliminary Remediation Goals
REG - regular sample
mg/kg - milligram per kilogram
VQ - validation qualifier

Validation Qualifier Definitions
J - The compound/analyte was positively identified; the reported value is the estimated concentration of the constituent detected in the sample analyzed