

Final
Supplement to the
Engineering Evaluation / Cost Analysis
for Former Southwestern Proving Ground
Hope, Arkansas



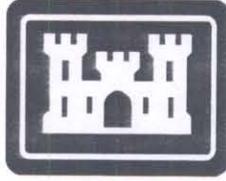
U.S. Army Corps of Engineers
Little Rock District
and
U.S. Army Engineering and Support Center,
Huntsville

Contract Number DACA87 - 00- D - 0038
FUDS Project Number K06AR005101
Delivery Order 0008

Prepared by

Parsons
Norcross, Georgia

August 2004



FINAL

**SUPPLEMENT TO THE
ENGINEERING EVALUATION / COST ANALYSIS
FOR FORMER SOUTHWESTERN PROVING GROUND
HOPE, ARKANSAS**

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and
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PARSONS
Norcross, Georgia 30092

August 2004

Michael E. Short
Project Manager

Donald Silkebakken, P.E.
QC Reviewer

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LIST OF ACRONYMS

ADOP	Arkansas Digital Ortho Program
AE	Architect/Engineer
AP	Armor Piercing
AR	Arkansas
ARAR	Applicable or Relevant and Appropriate Requirement
ASR	Archives Search Report
AT	Anti-Tank
BGS	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESWL	U.S. Army Corps of Engineers, Little Rock
CRP	Community Relations Plan
DA	Department of Army
DGM	Digital Geophysical Mapping
DGPS	Differential Global Position System
DoD	Department of Defense
DP	Dreyer Property
EE/CA	Engineering Evaluation/Cost Analysis
EP	Engineer Pamphlet
EM	Electromagnetic
EOD	Explosive and Ordnance Disposal
EODT	EOD Technology, Inc.
ESE	Environmental Science and Engineering, Inc.
FUDS	Formerly Used Defense Sites
FDEM	Frequency-Domain Electromagnetic
GAP	Gap Analysis Program
GPR	Ground Penetrating Radar
HE	High Explosive
HH	Hand Held

**LIST OF ACRONYMS
(CONTINUED)**

IA	Institutional Analysis
JPG	Jefferson Proving Ground
L	Light (Wendell Light Property)
lb	Pound
mm	Millimeter
MPM	Most Probable Munition
MSD	Minimum Separation Distance
MTADS	Multi-Towed Array Detector System
NAPP	National Aerial Photography Program
NCP	National Contingency Plan
NDAI	No DoD Action Indicated
NDOP	National Digital Ortho Program
NRCS	Natural Resource Conservation Service
OE	Ordnance and Explosives
ODDS	Ordnance Detection and Discrimination Study
OERIA	OE Risk Impact Assessment
ORA	Ordnance Removal Action
OOU	Ordnance Operable Units
Parsons	Parsons, Inc.
RAC	Risk Assessment Code
SARA	Superfund Amendments and Reauthorization Act
SOW	Statement of Work
SPR	Site Prioritization Report
SWPG	Southwestern Proving Ground
TCRA	Time-Critical Removal Action
TDEM	Time-Domain Electromagnetic
TDMD	Time Domain Metal Detector
TM	Thematic Mapper
TNT	2,4,6-Trinitrotoluene

**LIST OF ACRONYMS
(CONTINUED)**

TODS	Teleoperated Ordnance Disposal System
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering and Support Center, Huntsville
UXO	Unexploded Ordnance
VLF	Very Low Frequency
WMA	Wildlife Management Area
WP	White Phosphorous
WW	World War
Y	Young Property

EXECUTIVE SUMMARY

ES-1 The former Southwestern Proving Ground (SWPG) is located in rural Hempstead County, 2 miles north of Hope, Arkansas. It was approximately 5 miles wide (east-west) by 19 miles long (north-south), and was used by the U. S. Army between 1942 and 1945 to test both explosive and nonexplosive ordnance. The Archives Search Report (ASR) confirmed that a variety of ordnance items were tested at the former SWPG (USACE 1993). Ordnance used at the former SWPG included small arms ammunition, 20-millimeter (mm) to 155mm projectiles, mortars, rockets, grenades, and up to 500-pound bombs. After facility closure, the impact areas were cleared of surface ordnance. The majority of the former SWPG lands were later sold with a "surface use only" deed restriction.

ES-2 The ASR subdivided the former SWPG into the four areas: 1) the Firing Line/Administrative Area, 2) the Impact Area/Danger Zone located downrange of the firing line, 3) the Airport Area that supported aircraft ordnance testing, and 4) the Buffer Zone that surrounded the Impact Area/Danger Zone. The ASR concluded that the Impact Area, which is comprised of approximately 35,985 acres of the total 50,078 acres, was contaminated with ordnance almost in its entirety. Another ASR finding referred to the populations' cavalier attitude as a result of the numerous historical ordnance discoveries since the former SWPG closure in 1945.

ES-3 In 1994, a Site Prioritization Report (SPR) was prepared for the SWPG site by Environmental Science and Engineering (ESE 1994). The report presented demographic information, defined sampling sites for the follow-on Engineering Evaluation/Cost Analysis (EE/CA), identified locations for time-critical removal actions (TCRAs), and presented results from a qualitative risk evaluation. The SPR recommended remedial measures to reduce or eliminate explosive hazards from ordnance and explosives (OE) remaining at the site. The ordnance risk assessment code (RAC) for the former SWPG included a hazard severity code rated "Catastrophic" and a hazard probability code rated "Probable." The RAC score for the former SWPG was ranked as a "1," on a scale of 1 to 5, with 1 being the highest. RAC scoring is the current tool used by USACE to prioritize the funding of Defense Environmental Restoration Program Formerly Used Defense Sites (DERP-FUDS)-eligible projects. A project which is scored a RAC 1 receives greater consideration for funding than does a project which has a RAC 2 score.

ES-4 A Final EE/CA Report was submitted for the site in 1997 (ESE). The former SWPG was subdivided into six ordnance operable units (OOUs) to facilitate evaluation of the site, as follows:

- OOU-1 Airport/Building Area;
- OOU-2 Wildlife Management Area (WMA);
- OOU-3 Short Distance Impact Area;

ES-1

- OOU-4 Long Distance Artillery Range;
- OOU-5 Bombing Ranges; and
- OOU-6 Buffer Area.

ES-5 The EE/CA characterized the type, location, and distribution of OE, and evaluated response action alternatives for mitigating the explosive safety risk. The 1997 Final EE/CA Report presented the results of the field investigation; an evaluation of risk reduction alternatives; a prioritized response action implementation program; and an estimate of the costs for implementing the recommended actions.

ES-6 In the Final EE/CA Report, five risk reduction alternatives (No Further Action, Institutional Controls (ICs), Government Buyback, Surface Clearance, and Clearance to Depth) were identified and evaluated for their effectiveness, implementability, and cost. Although implementing removal alternatives was determined to be the most effective method of reducing risk, extensive removal of ordnance was determined to be prohibitively expensive and not a cost-effective risk reduction strategy because of the low probability of exposure to OE. The following five priority actions were established to achieve cost-effective risk reduction:

- Priority 1 Action – Implementation of ICs across the former facility, plus clearance of highly contaminated ranges and housing areas adjacent to these ranges;
- Priority 2 Action – Clearance of creeks and known stockpile areas;
- Priority 3 Action – Clearance of known contaminated areas and selected sites near county roads;
- Priority 4 Action – Implementation of additional sampling; and
- Priority 5 Action – Investigation of existing fence lines and hedgerows.

ES-7 The total cost of implementing the five priority actions listed above was estimated to be \$41,060,000. An Action Memorandum was signed in August 1997 and serves as the primary decision document regarding the selected risk reduction alternatives for the former SWPG. The Action Memorandum restated the prioritized risk reduction alternatives recommended in the Final EE/CA Report.

ES-8 Initiation of OE removal action items contained in the Action Memorandum began in 1997. Ordnance removal action fieldwork was conducted between January 1998 and April 2000 by EOD Technology, Inc. (EODT) (1999, 2000a, 2000b). These ordnance removal actions (ORAs) resulted in approximately 455 acres being cleared of ordnance at depths ranging from 0 to 4 feet below ground surface (bgs) in various areas throughout the former SWPG.

ES-9 This Supplement to the EE/CA incorporates new information obtained during implementation of the ORAs at the former SWPG. No additional OE sampling was conducted as part of this EE/CA Supplement.

ES-10 An updated qualitative risk assessment using OE Risk Impact Assessment (OERIA) is presented based on updated land use information, site activities, and the site characterization

results obtained during the removal actions. As part of this evaluation, local landowners and timber company representatives were contacted in order to determine the depth of intrusive land use activities in the former proving grounds. The risk evaluation was then used to evaluate the potential explosive safety risk at the site. An evaluation of OE clearance technologies was also performed to aid in the identification and selection of response alternatives.

ES-11 In evaluating OE response action alternatives, the goal was to identify alternatives which, when implemented, would reduce the threat posed by UXO at the site to an acceptable level. An initial screening of alternatives was conducted to ensure the response alternatives met the response action objectives and the minimum requirements for overall effectiveness and implementability. Three alternatives, ICs, Surface Clearance, and Clearance to Depth were retained for a comparative analysis and were evaluated against each other within the categories of effectiveness, implementability, and cost.

ES-12 For the most part, the results of this EE/CA Supplement concur with the 1997 Final EE/CA Report recommendations and Action Memorandum. The exceptions are:

- The Supplement recommends that the need for multilingual communications be assessed during the implementation of IC measures.
- Less repair of perimeter fencing around OOU-2 is required than previously estimated.
- The Supplement recommends that OE removal actions at the old TCRA sites (predominantly residences) that were identified in the SPR (ESE 1994) be included for future action. These sites were not included in the EE/CA recommendations.
- The Supplement recommends specific clearance depths for various project areas. A clearance depth of two feet is recommended in areas where the predominant land use is agriculture and forestry. Clearance to four feet is recommended at residences.
- The Supplement recommends that OE construction support be included as a Priority 1 action at OOU-3, OOU-4, OOU-5, and OOU-6. This shall be provided during selected construction activities at the site.

ES-13 The estimated cost-to-complete the recommended Priority actions is \$51,357,876.

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND

1.1.1 The former Southwestern Proving Ground (SWPG) is a 50,078-acre site located approximately 2 miles north of Hope, Arkansas (AR), in Hempstead County, AR (Figure 1.1). The former SWPG was approximately 5 miles wide (east-west) by 19 miles long (north-south). Between 1942 and 1945, SWPG was used to test small arms ammunition, 20 to 155 mm projectiles, mortars, rockets, grenades, and up to 500-pound bombs. Major activity areas included: 1) the Firing Line/Administrative Area; 2) the Impact Area/Danger Zone located downrange of the firing lines; 3) the Airport Area that supported aircraft ordnance testing; 4) and the Buffer Zone that surrounded the Impact Area/Danger Zone. Following World War II, the proving ground was closed, a surface clearance was performed, and the property was conveyed to state, municipal, and private owners.

1.1.2 An EE/CA evaluation was completed in 1997 by Environmental Science and Engineering, Inc. (ESE). The purpose of the EE/CA was to characterize the nature and extent of residual ordnance and explosives (OE), analyze risk management alternatives, and recommend and prioritize feasible OE exposure reduction alternatives for the six identified ordnance operable units (OOU). An Action Memorandum documenting the U.S. Army's decision regarding the selected risk reduction alternatives was signed in August 1997. The Action Memorandum documents those actions to be taken by the Government which would reduce, as much as practical, the risk to the public from unexploded ordnance (UXO). The remedial actions contained in the Action Memorandum were estimated to cost in excess of \$40 million. Since signing the Action Memorandum, the U.S. Army has implemented institutional controls and has completed four OE removal actions.

1.1.3 This EE/CA Supplement incorporates new information obtained since the Final EE/CA Report was published. The elements of the Final EE/CA Report that have been updated include: 1) current and future land use designations; 2) OE site characterization; 3) OE risk evaluation; and 4) cost-to-complete estimates. OE risk reduction alternatives and management actions have also been reviewed.

1.2 PROJECT AUTHORIZATION

Parsons received Contract No. DACA87-00-D-0038, Delivery Order No. 0008, from the U.S. Army Engineering and Support Center, Huntsville (USAESCH) to prepare a Supplement to the EE/CA at the former SWPG, Hope, Arkansas. This Supplement has been prepared in a manner consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); Executive Order 12580; and the National Contingency Plan (NCP). The Supplement is a

Figure 1.1

Former Southwestern Proving Ground
Hempstead County, Arkansas

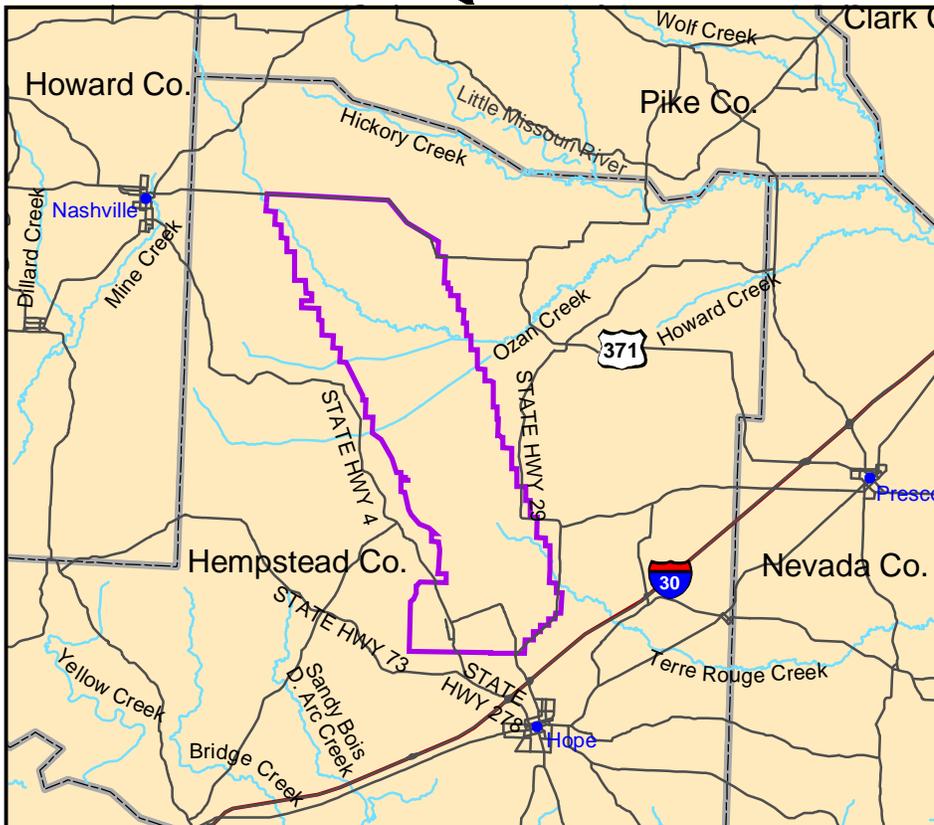
General Location Map

Legend

- Major City
- Interstate Highway
- Other Road
- River
- Former Southwestern Proving Ground
- Major Water
- Arkansas County Boundary
- Arkansas State Boundary



1 inch equals 70 miles



1 inch equals 7 miles



PARSONS

U.S. ARMY ENGINEERING
AND SUPPORT CENTER,
HUNTSVILLE

DESIGNED BY: BT	Figure 1.1 General Location Map	
DRAWN BY: BT		
CHECKED BY: MS	SCALE: As Shown	PROJECT NUMBER: 740168
SUBMITTED BY: MS	DATE: August 2004	PAGE NUMBER:
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“desktop” study; as such, no field activities such as geophysical mapping or intrusive investigation work were included during the study.

1.3 PURPOSE AND SCOPE

The overall purpose of the Supplement is as follows:

- Incorporate new data and knowledge that has been obtained since the EE/CA was finalized and update the UXO site characterization;
- Update current and future land use;
- Evaluate the effectiveness of existing ICs;
- Assess explosive safety risk to the public;
- Evaluate OE response alternatives;
- Determine specific clearance depths based on future land use;
- Determine if improved technology or techniques could increase cost efficiencies for cleanup of the former SWPG; and
- Update the cost-to-complete estimate.

1.4 PROJECT TEAM

The technical project team consists of the U.S. Army Corps of Engineers, Little Rock (CESWL), USAESCH, and Parsons. The roles of these team members are described below. A detailed description of the project team members is provided in Section 3 of the approved Work Plan (Parsons 2002a). Many local landowners and other members of the public have also been involved in this project and their participation is further described in Chapter 4.

1.4.1 U.S. Army Corps of Engineers, Little Rock

The CESWL is the life-cycle project manager and funding agency for this project. The CESWL responsibilities include: review of project plans and documents; working with the news media and the public; and coordinating with State and local regulatory agencies on issues pertaining to protection of ecological and cultural resources.

1.4.2 U.S. Army Engineering and Support Center, Huntsville

USAESCH is the lead technical agency for this project. USAESCH responsibilities include: procurement of architect/engineer (AE) services; direction of the contractor; review and coordination of project plans and documents; and working with the news media and the public. As the technical project manager, USAESCH is responsible for directing the contractor and controlling the budget and schedule.

1.4.3 Parsons

Parsons is the prime contractor to USAESCH and provides overall engineering support services and quality control for the Supplement. Parsons is responsible for performance of the activities detailed in the statement of work (SOW) and is responsible for schedule and budget control. The SOW is included in Appendix A.

CHAPTER 2 SITE DESCRIPTION AND HISTORY

2.1 LOCATION

The former SWPG consists of approximately 50,078 acres and is located approximately 2 miles north of Hope, Arkansas, in Hempstead County. The southern boundary of the site is situated to the north of Interstate 30, and the eastern boundary of the site is adjacent to State Highway 4. Figure 1.1 depicts the location of the former SWPG.

2.2 PHYSICAL DESCRIPTION

A physical description of the site (topography, soils, meteorology, and natural and cultural resources) is contained in the Final EE/CA Report and the Supplement to the EE/CA Work Plan (Parsons 2002a).

2.3 HISTORY

The operational history of the former SWPG is described in the Final EE/CA Report and Supplement to the EE/CA Work Plan.

2.4 DEMOGRAPHIC PROFILE

2.4.1 The SWPG area is rural and sparsely populated. A summary of the 1990 and 2000 census for towns and cities in the vicinity of the former SWPG indicates a moderate growth in population (Table 2.1). The 2000 census (U.S. Census Bureau) estimates the population of Hempstead County at 23,587 persons. This represents a population increase of 9.1% compared to the 1990 census.

Table 2.1 Census Results for 1990 and 2000

Location	1990 Census	2000 Census	Percent Difference
McCaskill	75	84	+12.0
Blevins	253	365	+44.3
Ozan	69	81	+17.4
Washington	148	148	0.0
Oakhaven	35	54	+54.2
City of Hope	9643	10,161	+5.4
Hempstead County	21,621	23,587	+9.1

2.4.2 The population density within and near the former facility is low and typical of rural land use. Approximately 37 occupied residences and 16 unoccupied farms or hunting clubs were

identified within the former facility boundaries during an abbreviated survey in 1994 (ESE 1997). The location of residential areas was a major factor in determining the prioritization of removal actions. The locations of these residences are contained in the Site Prioritization Report (ESE 1994). The population residing within the former SWPG is estimated to be 599 based on the 2000 census. This population estimate may be biased high because of the methodology used to derive the value. Further discussion on the population distribution and methodology is contained in Chapter 5, paragraph 5.2.4.3 and 5.3.4.2.

2.4.3 The majority of the land that reverted to private ownership after the facility's decommissioning contained a deed restriction limiting property development to "surface use only". Limited residential and agricultural land development has occurred despite these restrictions. A factor that may limit the residential population growth within former SWPG boundaries is that forestry products firms have purchased much of the area, limiting the land use.

2.5 CURRENT AND FUTURE LAND USE

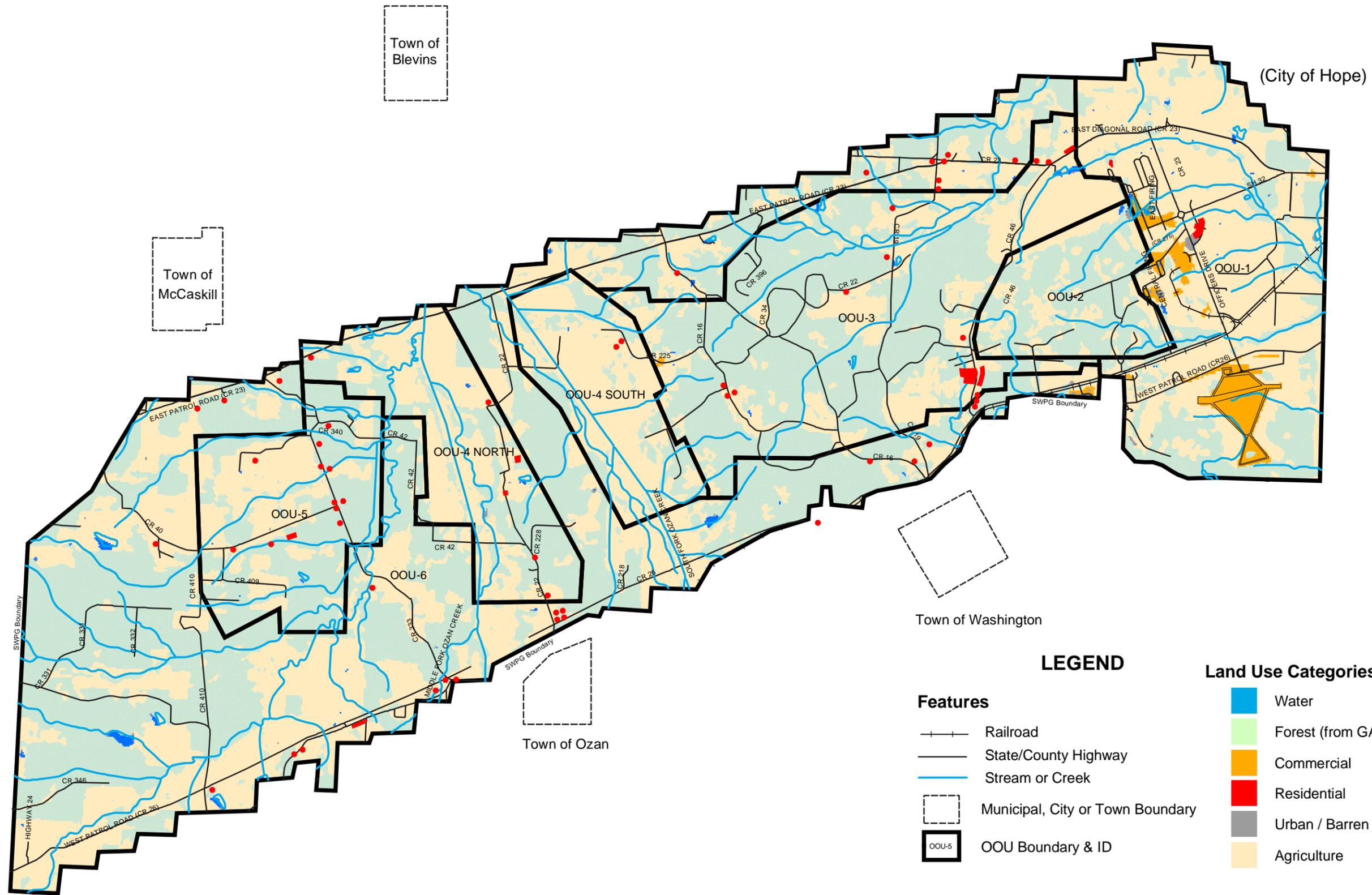
2.5.1 Current land use information for the former SWPG was obtained from the following sources:

- Land Use Database - Center for Spatial Technologies at University of AR, Fall 1999.
- USGS Topographical Maps (Washington, Nashville, McNab, Hope, Pisgah, Blevins, McCaskill, Sheppard, Columbus). Maps edited 1978.
- Aerial Photographs - (2000) AR Digital Ortho Program (ADOP) (provided by Pixxures).

2.5.2 Figure 2.1 provides a graphic depiction of the land use data obtained from the Center for Spatial Technologies (1999). Land use type designation and distribution were calculated based on the database provided by the Center for Spatial Technologies. Other sources were evaluated qualitatively for differences or variations in land use over time and among sources.

2.5.3 Future land use is expected to remain essentially unchanged based on interviews with city, town, and county officials. Appendix B provides detailed land use information obtained for the former SWPG. This section summarizes information provided in the Final EE/CA Report and updated information collected for this report.

2.5.4 Table 2.2 presents a breakdown of areas, by land use, within the former SWPG. The table shows slight differences between the land use acreage reported in the Final EE/CA Report (data is from the early 1990s) and current data (1999). The sources for data employed slightly different methods to categorize and calculate areas of land use, which may account for the differences observed. For example, the area surrounding the airport within the City of Hope is classified as agriculture and forest by the Center for Spatial Technologies. Land use analysis in the Final EE/CA Report classified this area as commercial. The number of residences within the former SWPG is assumed to remain the same based on land use analysis and discussions with local residents and officials (Appendix B).



LEGEND

Features

- Railroad
- State/County Highway
- Stream or Creek
- Municipal, City or Town Boundary
- OOU Boundary & ID

Land Use Categories

- Water
- Forest (from GAP)
- Commercial
- Residential
- Urban / Barren Land
- Agriculture



Land Use Data:
 Source: Center for Advanced Spatial Technologies, Univ. of Arkansas
 Description: This coverage depicts land cover types for the State of Arkansas, which were derived from a digital classification of Landsat Thematic Mapper (TM) imagery, mostly from 1999. The data were prepared and compiled in compliance with the National GAP effort.
 Date: 1999

Note: Locations of residences are based on land use data presented in the Final EE/CA (ESE 1997) and have not been field verified.

PARSONS		U.S. ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE	
DESIGNED BY:	BT	Figure 2.1 General Land Use Map for the Former Southwestern Proving Ground, Hope, Arkansas	
DRAWN BY:	BT		
CHECKED BY:	MS	SCALE: 1 inch equals 7,000 feet	PROJECT NUMBER: 740168
SUBMITTED BY:	MS	DATE: August 2004	
		FILE: x:\gis\740168\maps\eeeca_final\figure2_1.mxd	

Table 2.2 Land Use within the Former SWPG

Land Use Category	Percent of Total Acreage in Final EE/CA Report	Percent of Total Acreage Center for Spatial Technologies (1999)
Forests	55	51
Agricultural/Pasture	40	47
Commercial	4	1.3
Roads	2	Category not included
Water/Wetlands	0.3	0.5
Residential	0.2	Category not included
Urban/ Barren Land/Unknown	Category not included	0.2
Site Total	100	100

2.5.5 Based upon our evaluation, the primary land use distribution at the site has not changed significantly since the Final EE/CA Report was written. The primary land use remains forestry and agriculture. The various land use types found at the former SWPG are described below in Sections 2.5.7 through 2.5.12. These sections include the land use distribution for each OOU based on the published data in the Final EE/CA Report.

2.5.1 Residential/Commercial Land Use

2.5.1.1 According to the Final EE/CA Report, approximately 37 occupied residences are located within the former facility, most near the eastern or western boundaries. Intrusive activities related to residences are confined to construction, excavation, and gardening (ESE 1997).

2.5.1.2 Commercial (or light industrial) land uses are also limited. Most commercial land use is located in the area of the former administrative and firing line areas, and in the area of the Hope Municipal Airport (formerly the SWPG Airport). Both of these areas are outside of historical ordnance use areas.

2.5.2 Agricultural and Pasture Land Use

Agricultural and pasture uses are extensive throughout the site. There are also approximately 16 unoccupied farms and/or hunting clubs. The agricultural land classification used in this report refers to land used for cultivating crops, poultry production, and livestock. Pasture uses include cattle, horse grazing, or hay production. Plowing and planting of row crops was reportedly more widespread on agricultural lands in the recent past. Many of the former row crop farms have converted to tree farming. Currently, plowing or discing of soils is conducted in limited areas of OOU-2 and on a few farms in OOU-5.

2.5.3 Forestry Land Use

Forestry is the primary land use within the former SWPG facility boundaries. Much of the forested land is now owned by timber and paper companies and is commercially harvested. Remaining forested land is in individual private ownership, with commercial harvesting being a major industry on these tracts as well. The number of persons typically associated with logging operations on the former SWPG is relatively small.

2.5.4 Recreational Land Use

Hunting occurs on many portions (primarily forest and pastureland) of the former SWPG. As previously mentioned, there are approximately 16 unoccupied farms and/or hunting clubs at the site. The 2,115-acre Wildlife Management Area (WMA), designated as OOU-2, located in the southern portion of the former SWPG, is managed by the Arkansas Game and Fish Commission (AG&FC) to provide habitat for game fowl, including quail, and is used for hunting. About 30 people per day visit the WMA at the peak time between October and November; the rest of the year the estimated visitor population is 10 people per day.

2.5.5 Water-Based Land Use

Only a small fraction of land use in the former facility can be categorized as water-based. These uses include manmade reservoirs, stock ponds, natural bogs, and streams or creeks.

2.5.6 Future Land Use

2.5.6.1 Projected future land use at the former SWPG has not changed significantly since the Final EE/CA Report. Members of the local Restoration Advisory Board (RAB), town officials and the general public were questioned with regard to potential changes to the land use within the boundaries of the former SWPG (Appendix B). Based on the results of these interviews, there are no new or expanding residential areas in or near the site. Development of the Hope Industrial Park near the airport and the area south of the former firing lines is ongoing. The Natural Resource Conservation Service (NRCS) has been conducting flood control structure projects along the north end of the site. Timber harvesting will likely continue in the upland areas, and agricultural use is expected to continue. Hunting continues as a popular activity in forests and pasturelands. Future land use within the boundaries of the former SWPG is expected to remain essentially unchanged.

2.5.6.2 The former SWPG was subdivided into six OOUs to facilitate evaluation of the site in the Final EE/CA Report. These same OOUs were used during the EE/CA Supplement, as follows:

- OOU-1 Airport/Building Area (8,700 acres);
- OOU-2 Wildlife Management Area (WMA) (2,115 acres);
- OOU-3 Short Distance Impact Area (8,200 acres);
- OOU-4 Long Distance Artillery Range (5,800 acres);
- OOU-5 Bombing Ranges (3,335 acres); and
- OOU-6 Buffer Area (22,000 acres).

2.5.7 OOU-1 - Airport/Building Area

The OOU-1 - Airport/Building Area (OOU-1) includes all the area south of the firing lines and all the former facility airport area. The city of Hope, AR, owns a significant part of the land within OOU-1, mostly land associated with the Hope Municipal Airport. Private parties own the remaining land. The topography throughout OOU-1 is relatively flat. OOU-1 contains numerous creeks, streams, and similar drainage features. There are no residences located within OOU-1. The approximate amount of land devoted to the various land uses based on data published in the Final EE/CA Report is shown in Table 2.3.

Table 2.3 Land Use within OOU-1 - Airport/Building Area

Land Use	Acreage	Percent of Total Acreage
Pasture	5345	61
Commercial	1545	18
Agriculture	890	10
Forestry	660	8
Roadways	220	3

2.5.8 OOU-2 - Wildlife Management Area

Ordnance Operable Unit 2 is a wildlife management area and is owned and maintained by the AG&FC. The area is utilized as a wildlife preserve that consists primarily of forested land interspersed with a large food plot system. Approximately 500 acres of the total 2,115 acres is comprised of food plots and fire lanes and is disced each Spring and Fall to a depth of approximately 6 inches. The topography throughout the unit is relatively flat. OOU-2 contains several perennial streams and similar drainage features. The approximate amount of land devoted to the various land uses based on data published in the Final EE/CA Report is shown in Table 2.4.

Table 2.4 Land Use within OOU-2 - Wildlife Management Area

Land Use	Acreage	Percent of Total Acreage
Forestry	1640	77
Pasture	230	11
Agriculture	210	10
Roadways	35	2

The AG&FC has no plans to relinquish control or sell this area. There are no residences or commercial properties located within OOU-2. At the time of conveyance, a restriction for "surface use only" was placed on the deed.

2.5.9 OOU-3 - Short Distance Impact Area

The OOU-3 - Short Distance Impact Area (OOU-3) includes the portion of the former Impact Area immediately north of the former Firing Line. During the 1947 through 1949 clearance action, the area was determined to be contaminated with ordnance and sold to private individuals with “surface use only” deed restrictions. Twelve residences were identified in this unit during the Final EE/CA Report. The topography within OOU-3 ranges from < 1 percent to 2 to 5 percent relief. OOU-3 contains numerous perennial streams and similar drainage features. The approximate amount of land devoted to the various land uses based on data published in the Final EE/CA Report is shown in Table 2.5.

Table 2.5 Land Use within OOU-3 - Short Distance Impact Area

Land Use	Acreage	Percent of Total Acreage
Forestry	7030	86
Pasture	840	10
Agriculture	160	2
Roadways	115	2
Commercial	20	<1
Residential	3	<1

2.5.10 OOU-4 - Long Distance Artillery Range

During the 1947 through 1949 clearance actions, OOU-4 (Long Distance Artillery Range) was determined to be contaminated with ordnance and sold to private individuals and companies with a “surface use only” deed restriction. Five residences were identified in this unit during the Final EE/CA Report. The topography in the unit ranges from very flat, river-bottom land to higher land with 1 to 5 percent relief. OOU-4 contains numerous perennial streams and two large creeks. The two large creeks are the South Fork Ozan Creek located within OOU-4 South and the Middle Fork Ozan Creek within OOU-4 North. Both of these creeks have been highly channelized and no longer meander. The approximate amount of land devoted to the various land uses based on data published in the Final EE/CA Report is shown in Table 2.6.

Table 2.6 Land Use Within OOU-4 - Long Distance Artillery Range

Land Use	Acreage	Percent of Total Acreage
Agriculture	3400	59
Forestry	1700	29
Pasture	490	9
Roadways	165	3
Residential	1	<1

2.5.11 OOU-5 - Bombing Range

The OOU-5 - Bombing Range (OOU-5) includes the two bombing ranges that were part of the former facility and other nearby portions of the Impact Area. During the 1947 through 1949 clearance action, these areas were determined to be contaminated with ordnance and sold to private individuals and companies with a "surface use only" deed restriction. Eight residences were identified within OOU-5 during the Final EE/CA Report. The topography within OOU-5 is 1 to 5 percent relief with numerous creeks, streams, and similar drainage features. The approximate amount of land devoted to the various land uses based on data published in the Final EE/CA Report is shown in Table 2.7.

Table 2.7 Land Use within OOU-5 - Bombing Range

Land Use	Acreage	Percent of Total Acreage
Forestry	1960	59
Pasture	1240	37
Roadways	70	2
Agriculture	60	2
Residential	2	<1

2.5.12 OOU-6 - Buffer Area

The OOU-6 - Buffer Area (OOU-6) includes all other areas within the facility boundaries that are not included in other OOU's. Twelve residences were identified within OOU-6 during the Final EE/CA Report. The topography within OOU-6 varies from flat, bottomland to land with mostly moderate relief. OOU-6 contains parts of major creeks, perennial streams, and similar drainage features. One large water impoundment is located in the buffer area. The approximate amount of land devoted to the various land uses based on data published in the Final EE/CA Report is shown in Table 2.8.

Table 2.8 Land Use within OOU-6 - Buffer Area

Land Use	Acreage	Percent of Total Acreage
Forestry	14,630	67
Pasture	3760	17
Agriculture	3170	14
Roadways	160	<1
Commercial	130	<1
Water	100	<1
Residential	50	<1

2.6 ANALYSIS OF HISTORICAL RECORDS

2.6.1 The 1993 Archives Search Report (ASR) was conducted by the Corps of Engineers, Rock Island to evaluate the potential for OE (USACE 1993). The ASR subdivided the facility into the four areas: the Impact Area/Danger Zone, Firing Line/Building Area, Airport Area, and Buffer Zone. The Impact Area/Danger Zone encompasses approximately 35,985 acres and included the area currently reserved as the Wildlife Management Area (WMA) by the AG&FC. The Firing Line/Building Area included the 10 former firing positions, support facilities for these firing positions, and the area occupied by various buildings servicing the former facility. The Airport Area included the former facility Airport, which is currently used by small private airplanes. The Buffer Zone included all areas outside the fenced Impact Area/Danger Zone to the boundary of the former facility.

2.6.2 The ASR confirmed that a variety of ordnance items were tested at the former SWPG. This included small arms ammunition through 155mm artillery shells, bombs, mines, grenades, mortars, and rockets. Fillers within the various rounds included inert fills, high explosive (HE), and pyrotechnics, i.e., smokes. The ASR documentation indicates that the Impact Area is contaminated almost in its entirety. Another important finding relates to the populations' attitude as a result of the numerous ordnance discoveries since the former SWPG closure. The ASR states that, "Over the years, so much ordnance has been found that the prevailing attitude borders on the cavalier" (USACE 1993).

2.6.3 According to the ASR, the Certificates of Clearance for the former SWPG indicated that the majority of the Impact Area was swept and cleared of surface ordnance between 1947 and 1949. The area now occupied by the WMA was excluded in the early sweep procedures because it was not considered economically feasible to clear the area, given the terrain and the extent of UXO. This decision was ultimately revised and the WMA was cleared of surface ordnance in the early to mid 1950s (ESE 1997). Further analysis of the historical records is described in the Final EE/CA Report and Supplement Work Plan (Parsons 2002a).

2.7 PREVIOUS INVESTIGATIONS

2.7.1 Preliminary Assessment of Wildlife Management Area

This investigation consisted of a site visit of the 2,115-acre WMA by the CESWL in 1987 and did not result in any risk reduction measures being undertaken. The preliminary assessment is further described in the Final EE/CA Report and Supplement Work Plan.

2.7.2 Preliminary Site Inspection

The U.S. Army Corps of Engineers, Fort Worth District conducted a preliminary Site Inspection (SI) in 1989 to evaluate chemical contamination in groundwater at a location within the former SWPG. The ASR contains a copy of this investigative report (USACE 1993), and results are further discussed in the Final EE/CA Report.

2.7.3 Preliminary Assessment

In 1992, CESWL conducted a preliminary assessment of the former SWPG that included an assessment of the risk to the public from residual ordnance. The risk assessment code, or RAC, is performed on all Formerly Used Defense Sites (FUDS) ordnance projects and is used by USACE to prioritize the funding of FUDS-eligible projects. RAC scores may range from “1” to “5”, with “1” being the most critical and “5” being no further action by the Government. A project which is scored a “RAC 1” receives greater consideration for funding than does a project which has a “RAC 2” score, etc. The risk assessment for the former SWPG concluded that the hazard severity was "catastrophic" due to the types and quantity of ordnance remaining at the site. The hazard probability was rated "probable" based on the potential for human contact with the ordnance. The overall RAC score for the former SWPG was “1”.

2.7.4 Site Prioritization

2.7.4.1 ESE conducted a site prioritization study at the former SWPG in 1994. The objectives of this study included the following:

- Determine residential population and land use;
- Collect additional information pertaining to the presence of OE and conduct an OE risk assessment;
- Determine if any time critical removal actions (TCRAs) are necessary prior to conducting the EE/CA; and
- Determine sampling sites for the follow-on EE/CA.

2.7.4.2 The site prioritization study recommended 37 TCRA sites. For various reasons, none of the TCRA contract actions were initiated. Therefore, this EE/CA Supplement includes OE clearance recommendations for each of those TCRA sites. The list of TCRA locations is contained in Appendix F of the Site Prioritization Report (ESE 1994).

2.7.5 Final EE/CA Report

2.7.5.1 The objective of the 1997 EE/CA was to characterize the type, location, and distribution of UXO and evaluate response action alternatives for mitigating the explosive risk at the former SWPG. The Final EE/CA Report presents results of the field investigation, evaluation of risk reduction alternatives, a prioritized implementation program, and an estimate of the costs for implementing the recommended actions.

2.7.5.2 The EE/CA field investigation at SWPG was conducted using an analog geophysical mapping technique, “mag and flag” or “mag and dig”. Mapping and clearance was conducted using a Schonstedt 52CX magnetometer at 106 grid locations. The recovered ordnance included: 60mm and 81mm mortar rounds; rockets up to 5 inches in diameter; butterfly bombs; 20-pound fragmentation bombs; and various projectiles. Recovered projectiles were 20mm, 37mm, 40mm, 57mm, 75mm, 76mm, 90mm, 105mm, and 155mm. Approximately seven percent of the ordnance items found were high explosive (HE) filled rounds. The UXO findings from the EE/CA field investigation are further described in Chapter 3.

2.7.5.3 Five risk reduction alternatives (No Further Action, Institutional Controls, Government Buyback, Surface Clearance, and Clearance to Depth) were identified and evaluated for effectiveness, implementability, and cost. The following five priority actions were recommended to achieve cost effective risk reduction:

- Priority 1 Actions -Implementation of Institutional Controls across the former facility, plus clearance of highly contaminated ranges and housing areas adjacent to these ranges;
- Priority 2 Actions -Clearance of creeks and known stockpile areas;
- Priority 3 Actions -Clearance of known contaminated areas and selected sites near county roads;
- Priority 4 Actions -Implementation of additional sampling; and
- Priority 5 Actions -Investigation of existing fence lines and hedgerows.

The 1997 Final EE/CA Report estimated costs of implementing these five priority actions at \$41,060,000.

2.7.5.4 Recommended Priority 1 actions included:

- Conduct an Information/Education Program for all units;
- Install warning signs on the existing perimeter fence around OOU-2 and the WMA;
- Clearance to depth in the area in and around Range 6 (located north of the WMA in OOU-3), Range 14 in OOU-4; and
- Clearance to depth for selected residential areas within OOU-3 located near Range 6 and the WMA.

The estimated cost of implementing these actions was \$7,840,000.

2.7.5.5 Recommended Priority 2 actions included:

- Clearance to depth in and around Ranges 10 and 12 and the creek bed that traverses these two Ranges in OOU-3.
- Clearance to depth in and around the Old Dry Target Lake in OOU-5 and along South and Middle Fork Ozan Creek in OOU-4.

The estimated cost of implementing these actions was \$9,510,000.

2.7.5.6 Recommended Priority 3 actions included:

- Clearance to depth of known contaminated areas in and around Ranges 8, 18, and 19, and areas near county roads, which sampling showed to be highly contaminated.

The estimated cost of implementing these actions was \$11,890,000.

2.7.5.7 Recommended Priority 4 actions included:

- Supplemental OE sampling and selective implementation of Alternatives 4 (Surface Clearance) and 5 (Clearance to Depth) in selected residential areas. These areas should include the residential area northwest of the WMA that was not cleared as a Priority 1 activity and the residential area on the east side of OOU-3.

The estimated cost of implementing these actions was \$3,890,000.

2.7.5.8 Recommended Priority 5 actions included:

- Supplemental OE sampling and selective implementation of Alternative 4 (Surface Clearance) along fence lines and hedgerows within OOU-3, -4, and -5. The purpose of this recommendation was to remove those ordnance items that have been discarded by farmers and residents along fence lines and hedgerows.

The estimated cost of implementing these actions was \$7,930,000.

2.7.5.9 Portions of the recommended Priority Actions 1, 2, and 4 have been implemented and are discussed in Chapter 2.8 and Chapter 3. The recommended Priority Actions 3 and 5 have not been implemented to date.

2.7.5.10 Parsons has reviewed the findings and recommendations from the Final EE/CA Report. An analysis of the Final EE/CA Report indicates that the study was comprehensive and that the recommendations were appropriate, with the following exceptions; 1) TCRA sites were not included in the Final EE/CA Report recommendations, and 2) the EE/CA should have stipulated specific clearance depths for particular project areas. At the time the Final EE/CA Report was written, the authors thought that the land in the vicinity of the 37 residences would be cleared under the TCRA process. Therefore, the sites were not included in the EE/CA study or recommendations.

2.7.6 Action Memorandum

An Action Memorandum was signed in August 1997 and serves as the primary decision document regarding the selected risk reduction alternatives for the former SWPG. The Action Memorandum restated the prioritized risk reduction alternatives identified in the Final EE/CA Report.

2.8 PREVIOUS REMOVAL ACTIONS

2.8.1 Initial Ordnance Removal Actions

Between 1947 and 1949, the majority of the former SWPG facility range was visually inspected and cleared of surface ordnance. The area that is now the WMA was cleared of surface ordnance in the early to mid 1950s.

2.8.2 Ordnance Removal Action Report (1999)

2.8.2.1 Removal actions, as recommended in the Action Memorandum, were initiated by EOD Technology, Inc. (EODT) under USAESCH Contract DACA87-97-D-0005, Delivery Order 0002 dated June 25, 1997. This delivery order received seven different modifications to the original contract. The 1999 Ordnance Removal Action (ORA) Report documents the work performed from the original delivery order and Modifications 1 through 5. The objective of the removal action was to locate, identify, and render safe surface and subsurface OE to a depth of 4 feet from selected areas. The fieldwork for these activities was conducted between January and October 1998 using a Schonstedt 52/Cx magnetometer.

2.8.2.2 Ordnance removal was completed on 203 acres at depths ranging from 0 to 4 feet at the areas shown in Table 2.9.

Table 2.9 Summary of Ordnance Removal Action (EODT 1999)

Location	Acreage
NW of WMA	68
Range 10	66
Range 11	<1
Range 14	23
Old Dry Target Lake	16
South Fork Ozan Creek	15
Middle Fork Ozan Creek	15

2.8.3 Ordnance Removal Action Report (2000)

The 2000 ORA report (Volumes I and II) was prepared under Modifications 6 and 7 of EODT's contract with USAESCH (DACA87-97-D-0005, Delivery Order 0002). Volume I of the 2000 ORA report summarizes the removal action conducted at Range 11, Range 14 and the Old Dry Lake Target in accordance with Modification 6. The fieldwork for these activities was conducted between April 1999 and August 1999 using a Schonstedt 52/Cx magnetometer. Volume II summarizes the removal action conducted at Range 6 and Northwest of the WMA, in accordance with Modification 7. The fieldwork for these activities was conducted between August 1999 and April 2000 using a Schonstedt 52/Cx magnetometer.

2.8.3.1 Volume I

The scope of Modification 6 (March 1999) included a surface clearance of all visible ordnance and investigation of magnetic anomalies to a depth not-to-exceed three inches over a total of 172 acres. The Volume 1 ORA report (EODT 2000a) describes the removal action completed on 172 acres, of which 54 acres were located in Range 11, 54 acres in Range 14, and 64 acres in the Old Dry Lake Target Area.

2.8.3.2 Volume II

2.8.3.2.1 The scope of Modification 7 (June 1999) included inspection and ordnance clearance on a portion of Range 6 (Doyle Faulk and Wendell Light Properties) and Northwest of the WMA (Young Property). The Volume II ORA report (EODT 2000b) describes the removal action completed on 80 acres at depths ranging from 0 to 4 feet of which 18 acres were located in Range 6 and 62 acres Northwest of WMA. The Doyle Faulk property portion of Range 6 was not cleared because a previously signed right-of-entry was revoked after mobilization.

2.8.4 Variance in Clearance Depths Between Action Memorandum and Removal Actions

2.8.4.1 Although the Action Memorandum stipulated “clearance to depth”, the first SOW (Basic task order) required that all areas be cleared to 4-foot depths, except creek beds. The creek beds were to be surface-cleared only. The Explosives Safety Submission (ESS) was prepared after task order award and reflected the requirements of the SOW (not the Action Memorandum). As a result, discrepancies existed between the Action Memorandum and the Removal Action (RA) fieldwork/ESS from the beginning. When combined with the large amount of UXO and OE fragmentation found throughout the former SWPG, the corresponding funding requirements for clearance of the site, and the future land use of project areas, it soon became obvious that judgments should be made with regard to how the RA fieldwork should proceed.

2.8.4.2 It was decided that the immediate UXO hazards should be removed, as efficiently as practical. It was also decided that there needed to be a re-analysis of each area’s future land use and corresponding OE clearance depth so that clearances to 4 feet or “to depth” not be performed in areas isolated from the public and saturated with OE fragmentation. That is one of the main reasons this Supplemental EE/CA was initiated. When finalized, the project Action Memorandum and ESS will also be revised to reflect Supplemental EE/CA recommendations.

CHAPTER 3 SITE CHARACTERIZATION

3.1 SITE INVESTIGATION

3.1.1 Introduction

This section presents an update of information for each OOU, based on the 1997 Final EE/CA Report findings and subsequent removal actions. No new intrusive site investigations were conducted as part of this Supplement.

3.1.2 Anomaly Identification

The EE/CA investigation and ORAs were conducted using a Schonstedt GA-52/Cx magnetometer in a “mag & flag” or “mag & dig” mode. The Schonstedt is a flux-gate gradiometer with two coil windings separated by a fixed distance. Each coil winding generates a voltage signal that is proportional to the magnetic field passing through it. Electronic circuitry measures the difference between voltage outputs of the two coil windings and converts that difference into an audible tone. Sensitivity settings allow the operator to amplify small variations in the response measured by the instrument, as well as reduce the audio fluctuations in areas with large magnetic gradient variations. The disadvantage of the Schonstedt is that it is not capable of recording data, i.e., there is no opportunity to review or analyze the data at a later time and anomaly selection is solely dependent on the detection of audible tones by the operator.

3.1.3 Intrusive Findings

3.1.3.1 Due to the large number of anomalies identified during the EE/CA field investigation, the software GridStats was employed for selected grids to identify a portion of the anomalies for excavation. GridStats is a statistical-based program that directs sequential random sampling within grids, with a tradeoff of uncertainty in characterization results in exchange for substantial savings in excavation costs. The software was used in the EE/CA investigation by ESE (1997) to determine which anomalies to excavate, when the investigation of a grid was completed, and provide an estimate of the density of UXO within a grid.

3.1.3.2 The results from the Final EE/CA Report and the ORA reports (EODT 1999, 2000a, 2000b) were provided to Parsons by USAESCH and were the sources of information used in this EE/CA Supplement evaluation. For the removal action reports, the ordnance accountability or tracking logs were compiled into a spreadsheet and tabulated.

3.2 SOURCE, NATURE, AND EXTENT OF ORDNANCE

This section describes each OOU within the former SWPG with regard to source, nature, and extent of ordnance and explosives (OE).

3.2.1 OOU-1 - Airport/Building Area

3.2.1.1 OOU-1 includes all the area south of the firing lines and all the former facility airport area. The boundaries of the OOU-1 unit coincide with the boundaries of the Airport/Building Area Sampling Sector and encompass approximately 8,700 acres. The city of Hope, Arkansas, owns a significant part of the land within the OOU-1 unit, mostly land associated with the Hope Municipal Airport. Private parties own the remaining land. Property ownership maps indicate that the OOU-1 unit contains several hundred separate land parcels.

3.2.1.2 OOU-1 was used during the operation of the former SWPG for buildings, housing, and an airport. A large part of the OOU-1 unit is currently used as an industrial park and as a municipal airport. Historical information regarding this portion of the former SWPG indicates that, although ordnance may have been stored in the area, it was not used for disposal or as a target range.

3.2.1.3 Approximately 1.8 acres of OOU-1 were geophysically surveyed and sampled during the 1997 EE/CA investigation. This acreage represents 0.02% of the total acreage of the unit. A total of 133 anomalies were identified from the geophysical data and 40% or 53 anomalies were intrusively investigated. None of the anomalies sampled during the EE/CA field investigation were found to be ordnance.

3.2.1.4 No Further Action was the recommended alternative for OOU-1 in the Final EE/CA Report, based on the ASR and EE/CA findings. No removal actions have been conducted in OOU-1 and no additional new information is available to warrant re-evaluation of this area. The OOU-1 unit is not considered further in this Supplement.

3.2.2 OOU-2 - Wildlife Management Area

3.2.2.1 OOU-2 includes all the area occupied by the WMA administered by the AG&FC. The WMA encompasses approximately 2,115 acres. Historical information regarding OOU-2 indicates that it was used extensively as an Impact Area for mortars, artillery of varying sizes, and small arms. During the clearance actions of 1947 through 1949, the area was reportedly too contaminated with ordnance to warrant clearance, considering the land's value. The area was surface cleared of ordnance items in the mid 1950s, but was recommended for "surface use only" prior to being turned over to the General Services Administration and ultimately to the State of Arkansas (USACE 1993).

3.2.2.2 OOU-2 was included in the Impact Area of the former SWPG, and several ranges are located within this area. The State of Arkansas currently owns OOU-2, and it is unlikely that the area will be sold to private parties in the future. The area is currently utilized as a wildlife preserve and consists primarily of forested land interspersed with food plots.

3.2.2.3 Approximately 6.44 acres of OOU-2 were geophysically surveyed and intrusively sampled during the 1997 EE/CA investigation. This acreage represents 0.30% of the total acreage of the unit. A total of 3,459 anomalies were identified from the geophysical data and 55% or 1,914 anomalies were intrusively investigated. Sampling conducted during the EE/CA field investigation recovered the following ordnance:

- Several 60mm fuzed inert-filled mortars,
- Three 2.36-inch inert (practice) rockets,
- Thirty 81mm mortar bodies with tail assemblies and white phosphorous (WP) residue fill (29 of them fuzed),
- Twenty-five 76mm (expended) smoke-filled projectiles,
- Three fuzed 60mm HE-filled mortars,
- Two fuzed 60mm WP-filled mortars,
- Twenty-seven 20mm mostly tracer-filled projectiles,
- Two 105mm projectiles (one inert filled, other not indicated),
- Two 105mm smoke-filled (expended) canisters, and
- Two empty 5-inch rocket motors.

Most of the ordnance recovered during the EE/CA sampling was inert. Thirty-four items were HE-filled and fuzed. The EE/CA sampling confirmed that a high density of ordnance items is likely to exist over much of the unit. The density of UXO items encountered during the EE/CA in OOU-2 based on 34 UXO items identified in 6.4 acres is 5.3 UXO per acre. This density estimate may be biased low because only 55% of the geophysical anomalies were intrusively investigated. Furthermore the UXO density is not expected to be uniform throughout the OOU's. Portions of an OOU may be expected to have a higher UXO density while some portions will be of lower density. No information is available on the depth distribution of the ordnance identified during the EE/CA investigation. No removal actions were conducted in OOU-2 following completion of the Final EE/CA Report. Therefore, no supplemental information on the source, nature, and extent of OE is available.

3.2.3 OOU-3 - Short Distance Impact Area

3.2.3.1 OOU-3 consists of 8,200 acres and includes the portion of the former Impact Area immediately north of the old Firing Line. Several ranges are located in this unit. Historical information regarding this portion of the former SWPG indicates that it was used extensively as an Impact Area for mortars and artillery of varying sizes. The land within OOU-3 is privately owned. The unit contains several hundred separate land parcels ranging in size from less than 20 acres to nearly 600 acres. Timber interests own most of the larger parcels. During the 1947 through 1949 clearance action, the area was determined to contain ordnance and was sold to private individuals with "surface use only" deed restrictions.

3.2.3.2 Approximately 15.64 acres of OOU-3 were geophysically surveyed and intrusively sampled during the 1997 EE/CA investigation. This acreage represents 0.19% of the total acreage of the unit. A total of 13,895 anomalies were identified from the geophysical data and 14% or 1,919 anomalies were intrusively investigated. A total of 209 ordnance items were identified during the EE/CA, of which 136 (65%) were found on the ground surface. Sampling conducted during the EE/CA field investigation recovered the following ordnance:

- Numerous inert tracer filled projectiles (from 20mm to 155mm),
- One HE-filled projectile base fuze,

- One fuzed 60mm HE-filled mortar,
- Nineteen fuzed armor-piercing and non-armor piercing HE-filled projectiles (from 40mm to 105mm),
- Two 60mm mortars (filler not indicated),
- One 5-inch inert rocket motor, and
- Fifty-five 81mm and six 60mm mortars.

3.2.3.3 Removal actions implemented since the Final EE/CA Report have included partial clearance of residential areas near Range 6, Range 10, Range 11, and Northwest of the WMA (EODT 1999, 2000a, 2000b). A large quantity of ordnance was recovered ranging in size from 20mm to 155mm projectiles. Clearance actions completed to date for the former SWPG are depicted on Figures 3.1a and 3.1b. The following paragraphs discuss the results from the removal actions conducted at OOU-3.

3.2.3.4 Approximately 21.5 acres were cleared in the vicinity of Range 6 at OOU-3 and included the Wendell Light property (L Grids - 17.9 acres) and Brad Dreyer Property (DP Grids – 3.6 acres EODT, 1999, 2000b). This represents approximately 9% of the Priority 1 acreage (240 acres) associated with the Range 6 area. The clearance depths in the L grids ranged between 0 and 1 foot (Table 3.1). The DP grids were cleared to a depth of four feet. A total of 163 ordnance items (including fuzes) were recovered. Most of the items recovered were inert 105mm projectiles. The density of UXO items encountered in the removal area based on 17 UXO items identified in 21.5 acres was 0.8 UXO per acre.

3.2.3.5 A 55-acre surface clearance was conducted in the western half of Range 11 and the adjacent area (within OOU-3) (EODT 1999, 2000a). A total of 118 ordnance items (including 1 bomb burster assembly) were recovered (Table 3.2). HE-filled projectiles were recovered ranging from 37mm to 105mm. The most common projectile recovered was a 105mm. The density of UXO items encountered on the surface of the removal area was 0.6 UXO per acre (32 UXO in 55 acres).

3.2.3.6 Approximately 66 acres of Priority 2 acreage near Range 10 were cleared at OOU-3 (EODT 1999). The removal action began as a subsurface clearance to a depth of four feet, but was modified to a surface clearance because the costs to clear the ordnance to a depth of 4 feet were excessive. A total of 1,783 ordnance items (including fuzes and smoke canisters) were identified on Range 10 (Table 3.3). HE-filled projectiles were recovered ranging in size from 40mm to 105mm. The 105mm projectile was the principal recovered ordnance item, with 1,200 being recovered. Of these recovered 105mm shells, 32% were designated as UXO. The density of UXO items encountered in the removal area was 9.4 UXO per acre (623 UXO items identified in 66 acres).

Figure 3.1a Completed Removal Action Summary (South Portion)

Former Southwestern Proving Ground
Hope, Arkansas

Removal Action Summary for Range 10 Area											
Item	Item Description			Depth in inches bgs							Not Specified
	HE	Inert	% HE	0 - 6	7 - 12	13 - 24	25 - 36	37 - 48			
37mm	0	1	0		1						
40mm	38	17	69	48	4	3					
57mm	30	17	64	38	1	3	4			1	
75mm	161	296	35	318	63	50	15	8		3	
90mm	0	3	0	3							
105mm	389	811	32	896	76	115	75	23		15	
120mm	0	1	0	1							
155mm	0	8	0	6		1	1				
Fuzes	5	2	71	7							
Smoke Canister	0	4		0	4						
Total	623	1160	35								

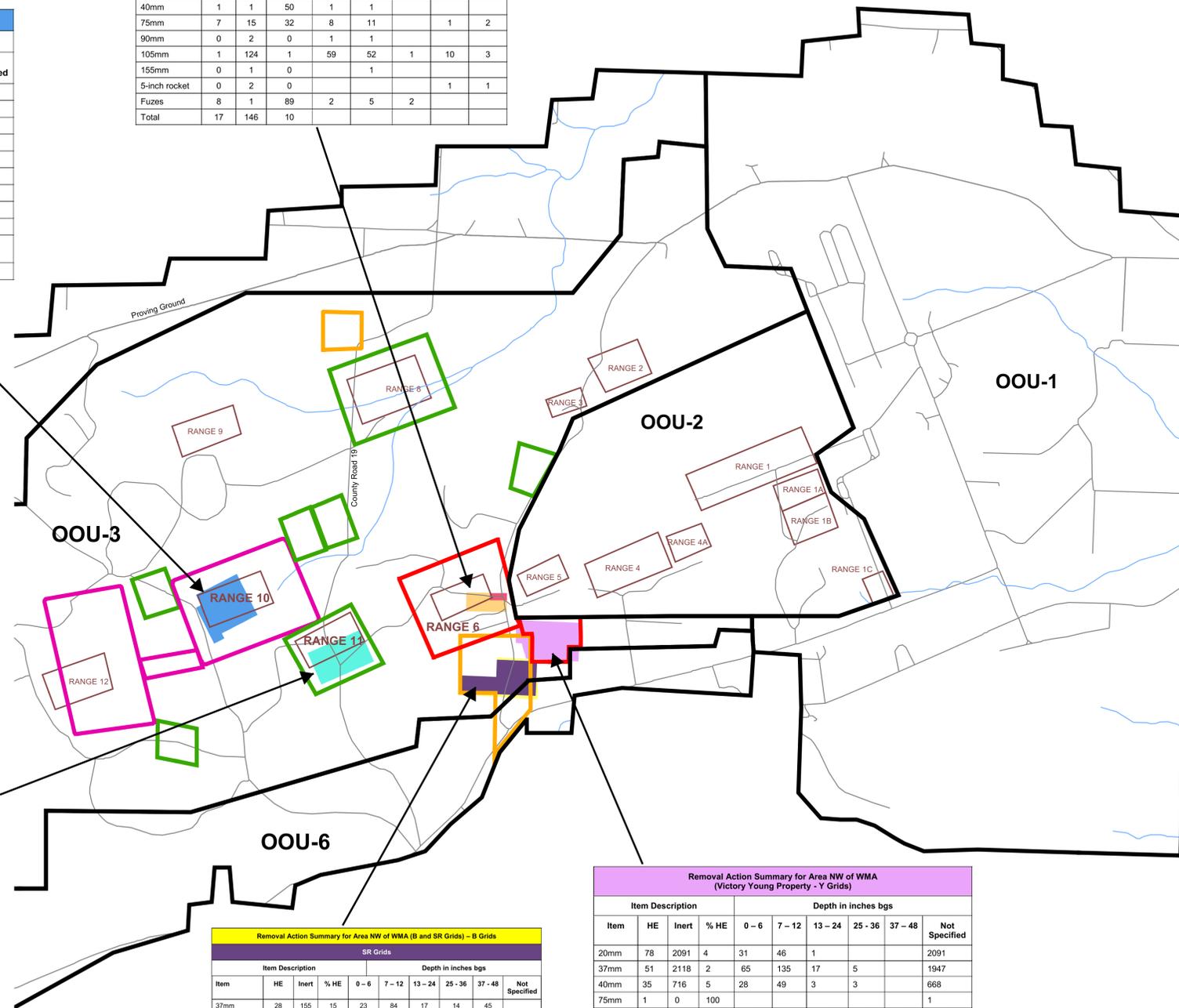
Removal Action Summary for Range 6 Area (DP and L Grids) - Dreyer Property, Range 6										
Light Property, Range 6										
Item	Item Description			Depth in inches bgs						
	HE	Inert	% HE	0 - 6	7 - 12	13 - 24	25 - 36	37 - 48		
40mm	1	1	50	1	1					
75mm	7	15	32	8	11					
90mm	0	2	0	1	1					
105mm	1	124	1	59	52	1	10	3		
155mm	0	1	0		1					
5-inch rocket	0	2	0					1	1	
Fuzes	8	1	89	2	5	2				
Total	17	146	10							

Removal Action Summary for Range 11 Area			
Item	HE	Inert	% HE
20mm	0	1	0
37mm	5	4	56
40mm	10	8	56
75mm	6	1	86
105mm	10	72	12
Burster assembly, bomb	1	0	100
Total	32	86	27

Notes:
1. Two of the 105mm projectiles were filled with WP.
2. Depths are all less than 12 inches.

Removal Action Summary for Area NW of WMA (B and SR Grids) - B Grids										
SR Grids										
Item	Item Description			Depth in inches bgs						
	HE	Inert	% HE	0 - 6	7 - 12	13 - 24	25 - 36	37 - 48		
37mm	28	155	15	23	84	17	14	45		
40mm	452	85	84	128	340	56	12			1
75mm	7	1	88	7	1					
90mm	0	1	0	1						
105mm	1	0	100	1						
20-lb fragmentation bomb	2	0	100		2					
Fuzes	60	0	100	42	18					
Total	550	242	69							

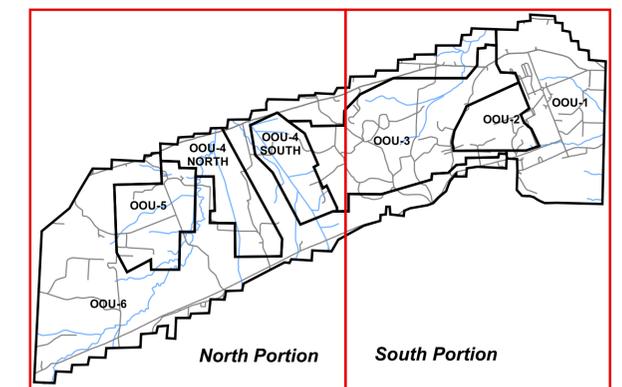
Removal Action Summary for Area NW of WMA (Victory Young Property - Y Grids)										
Item	Item Description			Depth in inches bgs						
	HE	Inert	% HE	0 - 6	7 - 12	13 - 24	25 - 36	37 - 48		
20mm	78	2091	4	31	46	1				2091
37mm	51	2118	2	65	135	17	5			1947
40mm	35	716	5	28	49	3	3			668
75mm	1	0	100							1
Fuzes	10	1	91	9	2					
Total	175	4926	3							



Legend

- Road
- Stream
- Range
- OOU-1 OOU Boundary & ID
- Implementation Priority Area (Final EE/CA 1997)**
- 1
- 2
- 3
- 4
- Removal Action Area**
- Range 10
- Range 11
- Dreyer Property, Range 6
- Light Property, Range 6
- B Grid, NW WMA
- SR Grid, NW WMA
- Young Property

Index Map



0 2,500 5,000 10,000 15,000 Feet

Coordinate System: NAD 1983 State Plane, Arkansas South (FEET)

PARSONS

**U.S. ARMY ENGINEERING
AND SUPPORT CENTER,
HUNTSVILLE**

DESIGNED BY:	BT	Figure 3.1a Completed Removal Action Summary (South Portion)	
DRAWN BY:	BT	SCALE: 1 inch equals 2500 feet	PROJECT NUMBER: 740168
CHECKED BY:	MS	DATE: August 2004	PAGE NUMBER:
SUBMITTED BY:	MS	FILE: x:\gis\740168\maps\eeeca_finalfigure3_1a.mxd	

Figure 3.1b Completed Removal Action Summary (North Portion)

Former Southwestern Proving Ground
Hope, Arkansas

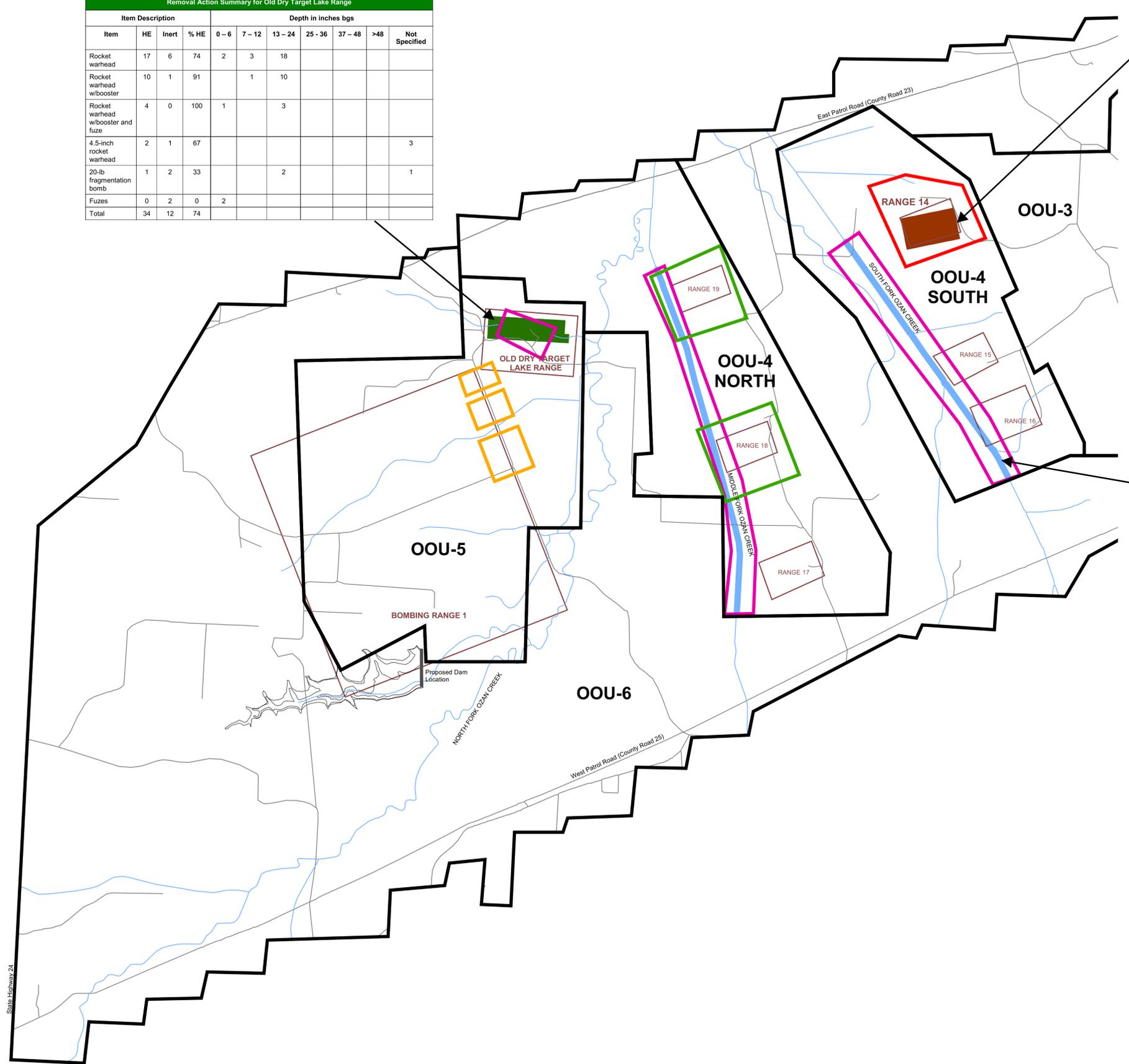
Removal Action Summary for Old Dry Target Lake Range										
Item Description				Depth in inches bgs						
Item	HE	Inert	% HE	0-6	7-12	13-24	25-36	37-48	>48	Not Specified
Rocket warhead	17	6	74	2	3	18				
Rocket warhead w/booster	10	1	91		1	10				
Rocket warhead w/booster and fuze	4	0	100	1		3				
4.5-inch rocket warhead	2	1	67							3
20-lb fragmentation bomb	1	2	33			2				1
Fuzes	0	2	0	2						
Total	34	12	74							

Removal Action Summary for Range 14 Area			
Item Description			
Item	HE	Inert	% HE
20mm	6	0	100
37mm	2	1	67
40mm	10	1	91
75mm	0	3	0
81mm	1	0	100
105mm	0	1	0
155mm	22	25	47
155mm smoke	6	0	100
Flare candles	0	2	0
Fuzes	0	3	0
Total	47	36	57

Note: 1. Depths are all less than 6 inches with the exception of one 155mm smoke projectile recovered at a depth of 23 inches.

Removal and Demolition Summary for South and Middle Forks of Ozan Creek			
Item	HE	Inert	% HE
155mm	6	2	75

Note: 1. No ordnance items were recovered in Middle Fork of Ozan Creek.



Legend

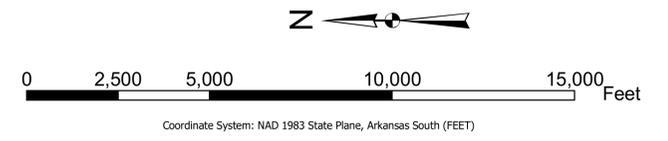
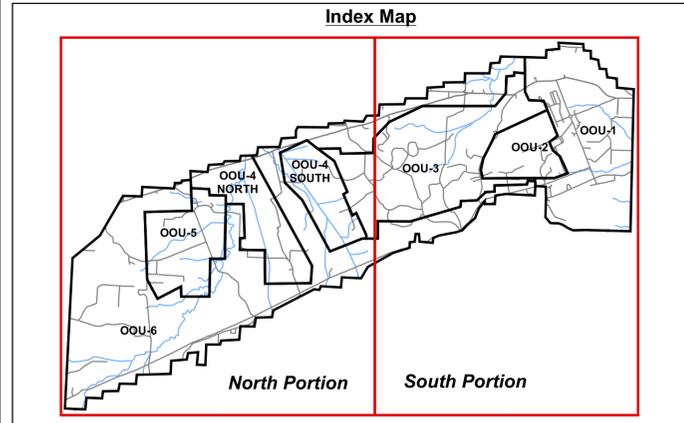
- Road
- Stream
- Range
- OOU-5 OOU Boundary & ID

Implementation Priority Area (Final EE/CA 1997)

- 1 (Red outline)
- 2 (Magenta outline)
- 3 (Green outline)
- 4 (Yellow outline)

Removal Action Area

- Old Dry Target Lake Range (Green fill)
- Range 14 (Brown fill)
- South and Middle Forks of Ozan Creek (Blue fill)



PARSONS		U.S. ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE	
DESIGNED BY: BT	Figure 3.1b Completed Removal Action Summary (North Portion)		
DRAWN BY: BT	SCALE: 1 inch equals 2500 feet	PROJECT NUMBER: 740168	
CHECKED BY: MS	DATE: August 2004	PAGE NUMBER:	
SUBMITTED BY: MS	FILE: x:\gis\740168\maps\eecca_finalfigure3_1b.mxd		

Table 3.1 Items Recovered from Range 6 (Dreyer and Light Properties)

Item Description				Depth in inches (bgs)				
Item	HE	Inert	% HE	0 – 6	7 – 12	13 – 24	25 – 36	37 – 48
40mm	1	1	50	1	1			
75mm	7	15	32	8	11		1	2
90mm	0	2	0	1	1			
105mm	1	124	1	59	52	1	10	3
155mm	0	1	0		1			
5-inch rocket	0	2	0				1	1
Fuzes	8	1	89	2	5	2		
Total	17	146	10					

Note: "bgs" is an abbreviation for "below ground surface".

Table 3.2 Items Recovered from Range 11

Item Description			
Item	HE	Inert	% HE
20mm	0	1	0
37mm	5	4	56
40mm	10	8	56
75mm	6	1	86
105mm	10	72	12
Burster assembly, bomb	1	0	100
Total	32	86	27

Notes:

1. Two of the 105mm projectiles were filled with WP.
2. Depths are all less than 12 inches.

Table 3.3 Items Recovered from Range 10

Item Description				Depth in inches bgs					
Item	HE	Inert	% HE	0 – 6	7 – 12	13 – 24	25 - 36	37 – 48	Not Specified
37mm	0	1	0		1				
40mm	38	17	69	48	4	3			
57mm	30	17	64	38	1	3	4		1
75mm	161	296	35	318	63	50	15	8	3
90mm	0	3	0	3					
105mm	389	811	32	896	76	115	75	23	15
120mm	0	1	0	1					
155mm	0	8	0	6		1	1		
Fuzes	5	2	71	7					
Smoke Canister	0	4		0	4				
Total	623	1,160	35						

3.2.3.7 Approximately 64 acres of the Victor Young property at OOU-3 located Northwest of the WMA was cleared to depths ranging from surface to four feet (EODT 2000b). Two 200-foot by 200-foot grids (1.84 acres) immediately around the Young residence were cleared to a depth of four feet. Approximately 44 acres were cleared to a depth of one foot and the remaining 18 acres were cleared of ordnance on the surface only. The area cleared of ordnance encompassed approximately 83% of the residential area Northwest of the WMA Priority 1 acreage in OOU-3.

3.2.3.8 In the Victor Young property, a total of 5101 ordnance items (including fuzes) were recovered (Table 3.4). The most prevalent ordnance items recovered were 20mm, 37mm, and 40mm projectiles. The majority of the recovered items were inert. The amount of small arms ammunition recovered on the Young property indicates that the area may have been an undocumented line-of-site target area. One unfired unfuzed HE-filled 75mm projectile was also recovered at an unspecified depth in grid Y-45 located southeast of the Young residence; this grid was cleared to a depth of 1 foot. The density of UXO items encountered in the removal area was 2.7 UXO per acre (175 UXO items identified in 64 acres).

3.2.3.9 A second area northwest of the WMA (B and SR Grids), located within a designated Priority 4 activity area immediately northwest of Victor Young's property, was cleared of ordnance (EODT 1999). This area encompassed approximately 64 acres and was cleared to a depth ranging from 0 to 4 feet. Individual property owners in this area were Hilda Faulk, Roy Beaty, Albert Brown, Richard Dunn & Doug Catt.

**Table 3.4 Items Recovered from Area Northwest of WMA
(Victor Young Property - Y Grids)**

Item Description				Depth in inches bgs					
Item	HE	Inert	% HE	0 – 6	7 – 12	13 – 24	25 - 36	37 – 48	Not Specified
20mm	78	2,091	4	31	46	1			2,091
37mm	51	2,118	2	65	135	17	5		1,947
40mm	35	716	5	28	49	3	3		668
75mm	1	0	100						1
Fuzes	10	1	91	9	2				
Total	175	4,926	3						

3.2.3.10 A total of 792 ordnance items (including fuzes) were identified on the B and SR Grid Area (Table 3.5). HE-filled projectiles were recovered ranging from 37mm to 105mm. Two armed 20-lb fragmentation bombs were also identified. These fragmentation bombs are anomalous and would not be expected at this location. A possible explanation is that these bombs may have resulted from a premature release by the pilot or malfunction in the bomb release mechanism prior to or after completing the bombing run. The most prevalent ordnance items recovered were 37mm and 40mm projectiles. The density of UXO items encountered in the removal area was 8.6 UXO per acre (550 UXO items identified in 64 acres).

Table 3.5 Items Recovered from Area Northwest of WMA – Hilda Faulk, Roy Beaty, Albert Brown, Richard Dunn & Doug Catt Properties (B and SR Grids)

Item Description				Depth in inches bgs					
Item	HE	Inert	% HE	0 – 6	7 – 12	13 – 24	25 - 36	37 - 48	Not Specified
37mm	28	155	15	23	84	17	14	45	
40mm	452	85	84	128	340	56	12		1
75mm	7	1	88	7	1				
90mm	0	1	0	1					
105mm	1	0	100	1					
20-lb fragmentation bomb	2	0	100		2				
Fuzes	60	0	100	42	18				
Total	550	242	69						

3.2.4 OOU-4 - Long Distance Artillery Range

3.2.4.1 OOU-4 includes two non-contiguous portions of the former SWPG Impact Area located north of OOU-3. Historical information regarding this portion of the former SWPG indicates that it was extensively used as an Impact Area for artillery of varying sizes. The total size of OOU-4 is approximately 5,800 acres. The southernmost portion is designated OOU-4 South and includes 2,700 acres. The northernmost portion is designated as OOU-4 North and includes 3,100 acres. The unit contains numerous perennial streams and two large creeks. The two large creeks are the South Fork Ozan Creek located within OOU-4 South and the Middle Fork Ozan Creek within OOU-4 North.

3.2.4.2 Land within OOU-4 is privately owned. The unit contains approximately 50 separate land parcels held by numerous owners. Timber interests own a significant number of the parcels. During the 1947 through 1949 clearance action, the area was determined to contain ordnance and was sold to private individuals with "surface use only" deed restrictions.

3.2.4.3 Approximately 12.4 acres were surveyed during the EE/CA investigation in OOU-4. This represents 0.21% of the total acreage of the unit. A total of 3,657 anomalies were identified from the geophysical data and 34%, or 1,252 anomalies, were intrusively investigated. Six HE-filled ordnance items were identified. Sampling conducted during the EE/CA field investigation recovered the following ordnance in the northern portion of OOU-4:

- One fuzed 4.5-inch HE-filled rocket warhead;
- Eighteen 155mm inert projectiles;
- Two inert 5-inch rocket warheads; and
- Two HE-filled 3.25-inch rockets.

3.2.4.4 Recovered ordnance in the southern portion of OOU-4 included:

- Three fuzed HE-filled 155mm projectiles;
- Three inert M83 butterfly bombs; and
- Nineteen projectiles (20mm to 90mm) mostly inert.

3.2.4.5 Removal actions implemented at OOU-4 since the Final EE/CA Report have included a surface clearance in the majority of Range 14 and an ordnance reconnaissance in the Middle and South Forks of Ozan Creek (Figure 3.1b). These actions are described in the following paragraphs.

3.2.4.6 A surface clearance was conducted on approximately 77 acres of the Priority 1 acreage associated with Range 14 in OOU-4. A total of 83 ordnance items (including fuzes and flare candles) were recovered (Table 3.6). Projectiles recovered ranged from 20mm to 155mm. Fifty-three 155mm projectiles were recovered and was the most prevalent ordnance type. Approximately half of the recovered 155mm projectiles were designated as UXO. The surface density of UXO items encountered in the removal area was 0.6 UXO per acre (47 UXO items identified in 77 acres).

Table 3.6 Items Recovered from Range 14

Item Description			
Item	HE	Inert	% HE
20mm	6	0	100
37mm	2	1	67
40mm	10	1	91
75mm	0	3	0
81mm	1	0	100
105mm	0	1	0
155mm	22	25	47
155mm smoke	6	0	100
Flare candles	0	2	0
Fuzes	0	3	0
Total	47	36	57

Note: Depths are all less than 6 inches with the exception of one 155mm smoke projectile recovered at a depth of 23 inches.

3.2.4.7 An ordnance reconnaissance consisting of visually locating the presence of ordnance and removal and demolition of those items was performed in both the Middle Fork and South Fork of Ozan Creek (Table 3.7). This ordnance reconnaissance was conducted along the creek bed and bank and along portions of tributaries without the aid of any geophysical instrumentation. The reconnaissance was repeated in order to take advantage of low creek levels in late summer of 1998. Approximately 4.8 miles of the creek bed and banks of Ozan Creek were surface cleared of ordnance. The surface density of UXO items encountered was approximately 1.2 UXO per mile (6 UXO items identified in 4.8 miles).

Table 3.7 Removal and Demolition Summary for South and Middle Forks of Ozan Creek

Item	HE	Inert	% HE
155mm	6	2	75

Note: No ordnance items were recovered in Middle Fork of Ozan Creek.

3.2.5 OOU-5 - Bombing Range

3.2.5.1 OOU-5 includes the historical Main Bombing Range, the Old Dry Target Lake Range and other nearby portions of the Impact Area. OOU-5 encompasses an area of 3,335 acres. The Main Bombing Range portion of the unit was used extensively for training and testing associated

with conventional aerial bombing. Bombs as large as 500 pounds each were reportedly dropped in this area. The area is heavily cratered which suggests that many of the bombs were HE-filled.

3.2.5.2 Land within OOU-5 is privately owned. The unit contains approximately 30 separate land parcels. During the 1947 through 1949 clearance action, the area was determined to contain ordnance and was sold to private individuals with “surface use only” deed restrictions.

3.2.5.3 Approximately 8.74 acres were surveyed during the EE/CA investigation at the OOU-5 unit. This represents 0.26% of the total acreage of the unit. A total of 2,300 anomalies were identified from the geophysical data and 39% or 895 anomalies were intrusively investigated. Sampling conducted during the EE/CA field investigation recovered the following ordnance:

- One fuzed HE-filled 20-lb fragment bomb;
- One unfuzed and unfilled 20-lb fragment bomb;
- Six fuzed HE-filled 4.5-inch rockets; and
- One bomb burster tube.

3.2.5.4 Removal actions implemented at OOU-5 since the 1997 Final EE/CA Report have included partial clearance of ordnance in the Old Dry Target Lake Range (Figure 3.1b). A total of 80 acres in the EE/CA Priority 2 area were cleared to depths ranging from surface to four feet (EODT 2000b). Two 200 foot by 200 foot grids (1.84 acres) were cleared of ordnance to a depth of four feet. Approximately 16 acres were cleared of ordnance to a depth of two feet and the remaining 62 acres was cleared of ordnance on the surface only. A total of 46 ordnance items were recovered (Table 3.8). The most prevalent ordnance item identified were rocket warheads. Three 20-lb fragmentation bombs (one HE-filled and fuzed) were also recovered. The density of UXO items encountered in the Old Dry Target Lake Range removal area was 0.4 UXO per acre (34 UXO items identified in 80 acres).

Table 3.8 Items Recovered from Old Dry Target Lake Area

Item Description				Depth in inches bgs					
Item	HE	Inert	% HE	0 – 6	7 – 12	13 – 24	25 – 36	37 – 48	Not Specified
Rocket warhead	17	6	74	2	3	18			
Rocket warhead w/booster	10	1	91		1	10			
Rocket warhead w/booster and fuze	4	0	100	1		3			
4.5-inch rocket warhead	2	1	67						3
20-lb fragmentation bomb	1	2	33			2			1
Fuzes	0	2	0	2					
Total	34	12	74						

3.2.6 OOU-6 - Buffer Area

3.2.6.1 OOU-6 includes all areas within the former SWPG boundaries that are not included in other OOU's. OOU-6 includes a total of 22,000 acres. Historical information regarding this portion of the former SWPG indicates that ordnance was not intentionally directed into this area. However, much of the land was part of the Impact Area and cannot be deemed clear of ordnance. The land within the unit is privately owned. The unit contains several hundred separate land parcels, and timber interests own a significant number of the parcels. Land within OOU-6 is outside the "surface use only" designation.

3.2.6.2 Approximately 6.43 acres were surveyed during the EE/CA investigation in OOU-6. This represents 0.03% of the total acreage of the unit. A total of 200 anomalies were identified from the geophysical data and 69% or 137 anomalies were intrusively investigated. No ordnance was identified during the EE/CA sampling activities.

3.2.6.3 Institutional Controls was the recommended alternative for OOU-6 in the Final EE/CA Report, based on the ASR and EE/CA findings. No removal actions have been conducted in OOU-6 and no new characterization data was obtained during preparation of the EE/CA Supplement.

3.3 OE CONCEPTUAL SITE MODEL

A comprehensive OE Conceptual Site Model (CSM) has been developed and is presented in Table 3.9. The OE CSM provides a picture of the past and present site conditions at the former Southwestern Proving Ground. The OE CSM summarizes the OE source areas, prior military usage, likelihood of OE contamination, current ownership, and land use information.

3.4 DESCRIPTION OF HAZARDS OF SPECIFIC OE ENCOUNTERED

A variety of OE items have been recovered at the former SWPG. Recovered items include projectiles, rockets, and bombs (inert and HE-filled). Recovered OE-related scrap items include fragments of fired ordnance, smoke canisters, flare candles, and fuzes. The following paragraphs provide a brief description of the OE-related items similar to those recovered at the former SWPG. The descriptions below are based on typical OE items for each category and reflect the most hazardous condition/form for that item.

3.4.1 Projectiles

Projectiles recovered can be classified as HE, inert, or scrap. The HE rounds contain a HE bursting charge, whereas the inert round contains no explosive filler. Items recovered also included armor piercing (AP) inert projectiles with a tracer filled element of red phosphorus, AP-HE that contained an HE filler, and smoke filled (WP) projectiles. Other items recovered were projectile fuzes. These fuzes contain a small amount of explosives.

Table 3.9 OE Conceptual Site Model

General Site Information											
Ordnance Operable Units (OOUs)	Description	Acres	Range Impact Areas	Site Decon. by DOD Prior to Transfer ⁽¹⁾	Deed Restrictions Pertaining to OE	Current Owner(s)	Current/ Future Land Use ⁽²⁾	# of Private Residences	Presence of OE in OOU	Prior Military Use	Comments
1	Airport/Building Area. South of the firing line.	8,700	None	No	None	Private interests/ City of Hope	Pasture (61%) Commercial (18%) Agriculture (10%) Forestry (8%) Roadways (3%) Residential (0%)	0	None	None	OE may have been temporarily stored, but indications are that any OE was moved before site closure.
2	Wildlife Management Area (WMA)	2,115	1, 1A, 1B, 1C, 4, 4A, 5	Yes (mid-50's)	Surface Use Only.	Arkansas Game & Fish Commission (AGFC)	Forestry (77%) Pasture (11%) Agriculture (10%) Roadways (2%) Commercial (0%) Residential (0%)	0	Confirmed	Target impact area for mortars & artillery (Inert & live). MPM=105mm.	Large % of OE expected to be found below the surface.
3	Short Distance Impact Area	8,200	Mortar, 2, 3, 6, 8, 9, 10, 11, 12	Yes (1947-49)	Surface Use Only.	Private interests (Several hundred separate land parcels from 20 to 600 acres in size).	Forestry (86%) Pasture (10%) Agriculture (2%) Roadways (1.5%) Commercial (.5%) Residential (<0.1%)	12	Confirmed	Target impact area for mortars & artillery (Inert & live). MPM=105mm.	Significant amount of OE expected to be found both on and below the surface.
4	Long Distance Artillery Impact Area	5,800	14, 15, 16, 17, 18, 19	Yes (1947-49)	Surface Use Only.	Private individuals & companies (~ 50 separate land parcels).	Agriculture (59%) Forestry (29%) Pasture (9%) Roadways (3%) Residential (<0.1%) Commercial (0%)	5	Confirmed	Target impact area for artillery (Inert & live). MPM=155mm.	Includes South & Middle Fork Ozan Creeks. OE less dense than in OOU 3.
5	Bombing Ranges (Main & Old Dry Lake)	3,335	Two bombing ranges.	Yes (1947-49)	Surface Use Only.	Private individuals & companies (~30 separate land parcels).	Forestry (59%) Pasture (37%) Roadways (2%) Agriculture (2%) Residential (<0.1%) Commercial (0%)	8	Confirmed	Conventional bombs (Main) & Rockets (Old Dry Lake) (Inert & live). MPM=4.5-inch rocket.	Includes "highly cratered" areas in Main Range, which indicate "live" bombs were dropped. Sampling showed large % expected to be found below the surface.
6	Buffer Area	22,000	None	No	None	Private interests (Several hundred separate land parcels).	Forestry (67%) Pasture (17%) Agriculture (14%) Roadways (0.7%) Commercial (0.6%) Water (0.5%) Residential (0.2%)	12	Potential	Not a target area. May contain mis-directed or errant OE.	No OE found during sampling, although possibility exists that OE is present.

(1) Visual surface clearance only.

(2) Data derived from the Final EE/CA Report (1997). Current land use is not expected to change significantly.

3.4.1.1 HE Filled

The following types of HE projectiles were recovered at the former SWPG:

- 20mm, HE filler is 0.03 lbs;
- 37mm, TNT filler 0.053 lbs;
- 40mm, TNT filler 0.2 lbs;
- 57mm, TNT filler 0.6 lbs;
- 60mm, TNT filler 0.34 lbs;
- 75mm, TNT filler 1.47 lbs;
- 105mm, TNT filler 4.9 lbs; and
- 155mm (projectile without fuze), TNT filler 15.71 lbs.

3.4.1.2 Inert Filled

The following types of inert projectiles were recovered at the former SWPG:

- 20mm;
- 37mm;
- 40mm;
- 60mm;
- 75mm;
- 81mm;
- 90mm;
- 105mm; and
- 155mm.

3.4.1.3 AP

The following types of AP projectiles were recovered:

- 37mm;
- 40mm;
- 57mm; and
- 105mm.

3.4.1.4 AP-HE

The following type of AP-HE projectile was recovered:

- 75mm, HE filled 1 lb.

3.4.1.5 WP

The following type of WP projectile was recovered:

- 105mm, WP filled 4.1 lbs with M5 burster (3 oz TNT) and M20 booster (0.3 lb TNT).

3.4.1.6 Fuzes

The following types of fuzes were recovered:

- Mech Time/Super Quick, M54, 0.3 lb TNT if M20 booster present;
- Mech Time, M43 series, 0.3 lb TNT if M20 booster present;
- Powder Train Time, M1907M, 30 grains of smokeless powder;
- Base Detonating, M66, 45 grains of tetryl;
- Point Detonating, M48, 0.3 lb TNT if M20 booster present; and
- Point Detonating, M51, 0.3 lb TNT if M20 booster present.

3.4.2 Rockets

Rockets recovered can be classified as HE or inert. The HE rounds contain a HE bursting charge whereas the inert round contains no explosive filler. Rocket motors (propelling charge) encountered were fired and expended when recovered (posed no threat).

3.4.2.1 3.25-inch Target Rocket

The 3.25-inch target rocket is approximately 59 inches long and weighs 36 lbs. The rocket consists of a motor assembly in a tubular body with three large plywood fins. Some models have a flare assembled to the nose for increased visibility. These rockets are designed to provide fast-flying targets for training purposes. The motor contains 3.2 lbs propelling charge black powder igniter.

3.4.2.2 4.5-inch Aircraft Rocket

The 4.5-inch rocket is approximately 33 inches long and weighs 40 lbs. The rocket consists of a fuze, shell, and motor body. The rocket shell consists of a body and burster tube. The burster charge consists of 4.3 lbs of cast TNT (HE). The shell is loaded with HE for service rounds or inert material for practice rounds. The propelling charge consists of 30 sticks of double-based powder mounted on wires. The fuze (M4) contains the auxiliary booster M1A1 that consists of approximately 1 lb of TNT. A dummy fuze is used for practice rounds. HE filled and inert 4.5-inch aircraft rockets were recovered at the former SWPG.

3.4.2.3 5-inch Aircraft Rocket

The 5-inch rocket is approximately 68.9 inches long and weighs 134 lbs. The rocket consists of a fuze, head, and motor body. The motor propellant consists of 23.9 lbs of single grain propellant and the head contains 7.5 lb TNT. The fuze can be either base or nose assembled and contains approximately 12 grams of tetryl. Inert 5-inch aircraft rockets were recovered at the former SWPG.

3.4.3 Bombs

Bombs recovered can be classified as HE or inert. The HE rounds contain a HE bursting charge whereas the inert round contains no explosive filler.

3.4.3.1 M83 Fragmentation Bomb

The M83 fragmentation bomb (Butterfly bomb) weighs approximately 3.8 lbs. The bomb contains a main charge of approximately 0.5 lb TNT and explosive train (fuze) containing less than 1 gram each of priming mixture and ignition mixture of explosive material, and a booster containing approximately 10 grams of tetryl. This type of bomb was recovered in an inert form at the former SWPG.

3.4.3.2 20-lb. Fragmentation Bomb

The 20-lb fragmentation bomb is constructed of spirally wound wire and cast steel nose and tail pieces. The fin assembly consists of 4 rectangular sheet-steel vanes welded to a 1-inch diameter pipe. The explosive filler contains approximately 2.7 lbs of amatol (ammonium nitrate and TNT) or TNT. HE filled and inert practice bombs were recovered at the former SWPG.

3.4.3.3 Fuze, M100

The AN-M100A2 fuze is used with 100-lb and 250-lb general-purpose bombs. The explosive components consist of a primer, black powder delay element, relay, and detonator equivalent to approximately 10 grains of tetryl.

3.4.4 Miscellaneous

Miscellaneous items were recovered including expended smoke canisters and flare candles. These items are considered scrap and not hazardous.

CHAPTER 4 PUBLIC INVOLVEMENT

4.1 INTERVIEWS

During the preparation of this EE/CA Supplement, citizens from the local community, and industry and government representatives were contacted in an attempt to assess local land use practices and determine the depth of any intrusive activities conducted within the boundaries of the former SWPG. Telephone interviews confirmed that the public was very familiar with the past history of the site and potential hazards from unexploded ordnance, and that very few landowners currently disc the soil. More importantly, the majority of people contacted also stated that they limit their intrusive activities within the former military site because of the known ordnance hazards. The telephone contact reports are included in Appendix C.

4.2 RESTORATION ADVISORY BOARD (RAB) MEETINGS

4.2.1 A local RAB was formed in September 2001 in order to improve public participation by giving the community a voice in the cleanup decision process at the former SWPG. The RAB consists of nine local volunteers that serve for a period of one – two years. Three other individuals serve on the Board as follows; Project Manager from the Corps' Little Rock District, a representative from EPA Region IV, and a representative from the Arkansas Department of Environmental Quality (ADEQ). To date, four (4) official or public RAB meetings have been held. Each of the RAB meetings were announced in the local media and members of the public were invited to attend. A summary of the meeting minutes can be accessed via the Internet at the following link: <http://www.swl.usace.army.mil/projimgt/swpg.html>.

4.2.2 At the first RAB meeting in September 2001, a mission statement and operating procedures were developed. Also discussed was the history of the former SWPG, the federal budget process, and the FUDS program in Arkansas. During the meeting, Dan Woolfolk (RAB member) pointed out that it would cost less for the government to purchase the land and fence it off rather than pay for an ordnance cleanup. Ms. Morehead explained that this alternative was considered during preparation of the Final EE/CA Report. She stated that the government does not have the authority to buy back the property unless Congress were to pass a law authorizing such a purchase.

4.2.3 At the second RAB meeting in December 2001, the findings from the completed ordnance removal actions were discussed. Also, an overview of OE institutional controls and how they can be used to reduce public risk from residual ordnance were discussed. Following the discussion on institutional controls, RAB members and the audience were asked for input on what additional institutional controls would be appropriate for the former SWPG. It was suggested that additional signage may be useful.

4.2.4 Stan James (RAB member) stated: "There are very few signs out there. Where somebody from out of state comes in and deer hunts and those people that are landowners are aware of the problem, I think it would be inexpensive and fairly effective to put at most major entrances to the Proving Ground, have a big warning".

4.2.5 The third meeting conducted in July 2002, discussed the availability of technical assistance for public participation and the approach being used in preparing the EE/CA Supplement. The main focus of the meeting was to solicit community input on current land use and activities for use in the cleanup decision process. Forestry practices and implementation of clearance actions were discussed. A desire was expressed in having a small local workforce dedicated for clearance available year round to work the priority areas and provide construction support elsewhere onsite in response to community needs as they arise.

4.2.6 At the fourth meeting conducted in September 2003, an overview of the FUDS program and EE/CA Supplement progress was provided. Questions and answers on how to obtain construction support were discussed and the issue of relocating the Administrative Record was considered.

4.3 THIRTY-DAY PUBLIC COMMENT PERIOD

Before the EE/CA Supplement is finalized, stakeholders and the general public shall have thirty (30) days to submit written comments on the Report and its conclusions and recommendations.

CHAPTER 5 RISK EVALUATION

5.1 INTRODUCTION

5.1.1 An explosive safety risk is the probability for UXO to detonate and potentially cause harm as a result of human activities. An explosive safety risk exists if a person can come into contact with UXO and act on it to cause detonation. The potential for an explosive safety risk depends on the presence of three critical elements: a source (presence of UXO), a receptor or person, and interaction between the source and receptor (such as picking up the item or disturbing the item by plowing). There is no risk if any one element is missing. Each of the three elements provides a basis for implementing effective risk-management response actions.

5.1.2 The exposure route for UXO to a receptor is primarily direct contact as a result of some human activity. Agricultural or construction activities involving subsurface intrusion are examples of human activities that will increase the likelihood for direct contact with buried UXO. UXO will tend to remain in place unless disturbed by human or natural forces, such as erosion. Movement of UXO may increase the probability for direct human contact but not necessarily result in a direct contact or exposure.

5.1.3 A qualitative risk evaluation was conducted using the OE Risk Impact Assessment (OERIA) for OE EE/CA Evaluations Interim Guidance document (USACE 2001) to assess explosive safety risk to the public at the former SWPG. The risk evaluation presented herein is based on the site characterization findings presented in Chapter 3 for the following ordnance operable units:

- OOU-2 - Wildlife Management Area;
- OOU-3 - Short Distance Impact Area;
- OOU-4 - Long Distance Artillery Range;
- OOU-5 - Bombing Range; and
- OOU-6 - Buffer Area.

5.2 DEFINITION OF RISK EVALUATION FACTORS, CATEGORIES, AND SUBCATEGORIES

5.2.1 Introduction

The potential risk posed by UXO was characterized qualitatively by evaluating three primary risk factors. The three primary risk factors include: 1) presence of UXO source, 2) site characteristics that affect the accessibility or pathway between the source and human receptor, and 3) human factors that define the number of receptors and type of activities that may result in direct contact

between a receptor and UXO source. By performing a qualitative assessment of these three factors, an overall assessment of the safety risk posed by UXO was evaluated. The following paragraphs describe the components of each of the primary risk factors and an overview of the risk evaluation factors is shown in Figure 5.1.

5.2.2 Presence of UXO Factors

5.2.2.1 There are four risk factor categories that are evaluated when UXO is present. These include UXO type, UXO sensitivity, UXO density, and UXO depth distribution.

5.2.2.2 **Type.** The UXO type affects the likelihood of injury and the severity of exposure. If multiple UXO items are identified in an area, that item which poses the greatest risk to public health is selected for risk evaluation. There are four subcategories of UXO type, as shown in Table 5.1. These subcategories are presented in order of severity from highest to lowest risk.

Table 5.1 UXO Type Subcategories

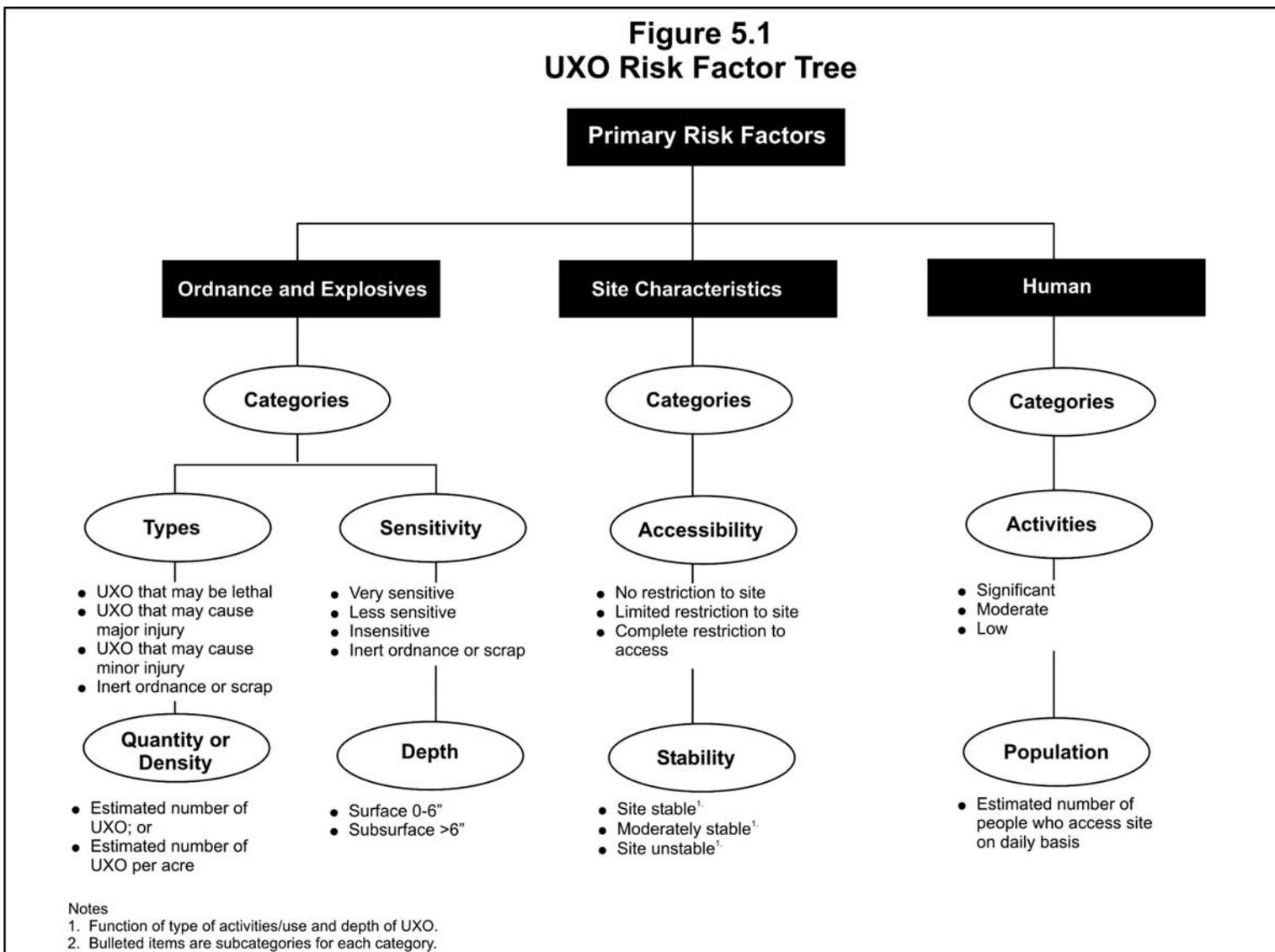
Subcategory	UXO Type Description
Most severe	UXO that may be lethal if detonated by an individual's activities
Moderate severity	UXO that may cause major injury to an individual if detonated by an individual's activities
Least severity	UXO that may cause minor injury to an individual if detonated by an individual's activities
No injury	OE scrap (inert), will cause no injury

5.2.2.3 **Sensitivity.** The UXO sensitivity affects the likelihood of detonation and the severity of exposure. Factors considered in evaluating sensitivity include fuzing and environmental factors such as weathering. There are four potential subcategories of UXO sensitivity. When multiple subcategories of UXO types are discovered in an area, the highest risk subcategory is used in the risk evaluation. The subcategories of sensitivity are defined and presented in order from highest to lowest in Table 5.2.

Table 5.2 UXO Sensitivity Subcategories

Subcategory	UXO Sensitivity
Very Sensitive	UXO that is very sensitive, i.e., electronic fuzing, land mines, booby traps
Less sensitive	UXO that has standard fuzing
Insensitive	UXO that may have functioned correctly, or is unfuzed, but has a residual risk
Inert	OE scrap (inert), will cause no injury

**Figure 5.1
UXO Risk Factor Tree**



J:\740168\figure5-1

5.2.2.4 Density. The UXO density affects the likelihood that an individual will be exposed to UXO. There exists a direct relationship between density and potential for harm. For example, the more ordnance per acre, the greater the likelihood of exposure to UXO and thereby an opportunity to create an incident.

5.2.2.5 Depth Distribution. The UXO depth distribution refers to where the UXO is located vertically in the subsurface. The UXO depth distribution affects the likelihood that an individual will be exposed to UXO. There exists a direct relationship between the depth at which UXO are found and the likelihood of exposure to UXO. That is, the greater the depth where UXO are found, the lower the risk of exposure. There are two subcategories within UXO depth distribution category: surface and subsurface. The surface subcategory includes those items recovered from between 0 and 6 inches bgs. The subsurface subcategory includes those items recovered from greater than 6 inches bgs. Assessment of this risk category reflects the findings of the updated site characterization.

5.2.3 Site Characteristics Factors

5.2.3.1 There are two categories that are evaluated in the site characteristic risk factor. These are site accessibility and site stability.

5.2.3.2 Site Accessibility. The accessibility of an OOU affects the likelihood of encountering UXO. Natural or physical barriers can limit the accessibility. Natural barriers can include the terrain or topography of the area as well as the vegetation. Physical barriers can include walls and fences that limit the public's accessibility to the OOU. Both the physical and natural barriers found at an OOU are considered when evaluating this category. Site accessibility has three subcategories. These subcategories are presented in Table 5.3.

Table 5.3 Site Accessibility Subcategories

Subcategory	Accessibility Description
No Restriction to Site	No man-made barriers, gently sloping terrain, no vegetation that restricts access, no water that restricts access
Limited Restriction to Access	Man-made barriers, vegetation that restricts access, water, snow or ice cover, and/or terrain restricts access
Complete Restriction to Access	All points of entry are controlled

5.2.3.3 Site Stability. This category relates to the probability of being exposed to UXO by natural processes. These natural processes include recurring natural events (e.g., frost heave, sand movement, erosion) or extreme natural events (e.g., tornadoes, hurricanes). The local soil type, topography, climate, and vegetation affect stability of the site. The soil type and climate primarily affects the depth of penetration of UXO. Over time, the soil type and climate will also affect the degree of erosion that takes place at a site. Topography and vegetation will also affect the rate of erosion that takes place in an area. Site stability has three subcategories. Table 5.4 describes these subcategories.

Table 5.4 Site Stability Subcategory

Subcategory	Stability Description
Site Stable	UXO should not be exposed by natural events
Moderately Stable Site	UXO may be exposed by natural events
Site Unstable	UXO most likely will be exposed by natural events

5.2.4 Human Factors

5.2.4.1 There are two categories that are evaluated in the primary human risk factor. These include activities and population.

5.2.4.2 **Site Activity.** The types of activities conducted at a site affect the likelihood of encountering UXO. The types of activities may be generally classified as recreational and occupational. This category examines whether the impact from an activity on UXO is significant, moderate or low. In order to assign such a score, the general guidelines presented in Table 5.5 were considered. First, the type of activity should be identified. Then, the depth of the activity must also be considered. For example, at a site where UXO is at the surface, all activities that can impact UXO at the surface are considered activities that have significant impact. Conversely, if all UXO is located at depths greater than 1 foot and only surface impact activities are being performed then the activities are considered as moderate or low impact. After the type of activity and depth of UXO are identified, then a score of significant, moderate or low may be assigned.

Table 5.5 Activities UXO Contact Probability Levels

Examples of Activities	Actual Depth of OE	Contact Level
Child Play, Short Cuts, Hunting, Fishing, Hiking, Swimming, Jogging, Ranching, Surveying, Off-Road Driving	0-6" 6"-12" >12"	Significant Low Low
Picnic, Camping, Metal Detecting	0-6" 6"-12" >12"	Significant Moderate Low
Construction, Archaeology, Crop Farming	0-6" 6"-12" >12"	Significant Significant Moderate

5.2.4.3 **Population.** This category refers to the number of people that potentially access the OOU on a daily basis. The number of people using the OOU affects the likelihood of encountering UXO. A direct relationship exists between the number of people and the risk of exposure. An estimate of the number of people accessing the OOU on a daily basis was made using census data and best professional judgment based on knowledge of the type of site, land use, and site accessibility.

5.3 RISK EVALUATION

5.3.1 Introduction

Each of the primary risk factors identified above was evaluated using the data collected from the EE/CA field investigation and completed removal actions. The risk evaluation for each OOU is presented in Table 5.6. The following sections discuss the risk evaluation by each primary risk factor.

5.3.2 Presence of UXO Factor

5.3.2.1 Type

5.3.2.1.1 **OOU-2:** Twenty-nine fuzed WP-filled 81mm mortar bodies, three fuzed HE-filled 60mm mortars, and two fuzed WP-filled 60mm mortars were identified during the EE/CA investigation at OOU-2. In addition a large number of inert or practice items were also found (ESE 1997). No follow-on removal actions were conducted in the WMA. The HE-filled 60mm mortar identified during the EE/CA sampling in OOU-2 is assigned the subcategory of most severe because it has the potential to cause the most injury if detonated.

5.3.2.1.2 **OOU-3:** Multiple fuzed HE-filled projectiles ranging from 40mm to 105mm were identified at OOU-3 during the EE/CA investigation. During the ORAs, a total of 1,397 UXO, representing 18% of the total ordnance items, were recovered. The UXO identified included 401 HE-filled 105mm projectiles, two fuzed 20-lb fragmentation bombs, as well as a number of 20mm to 90mm projectiles. Results from the five areas that underwent clearance in OOU-3 confirmed the EE/CA findings that ordnance is not confined to the range areas, but is present throughout the impact area. Although two 20-lb fragmentation bombs were identified, the more prevalent 105mm HE-filled projectile poses the greatest risk to the public because it is more widespread and is carried forward in this risk evaluation, reference Table 5.6. The 105mm is assigned a subcategory of most severe.

5.3.2.1.3 **OOU-4:** Three fuzed HE-filled 155mm projectiles and one fuzed 4.5-inch HE-filled rocket warhead were recovered from OOU-4 during the EE/CA investigation. Fifty-three items, representing 58% of the total ordnance items recovered during the ORAs, were designated as UXO. The predominant munition recovered during the ORAs in OOU-4 was a 155mm projectile; 28 were HE-filled and 6 contained smoke. Six of the HE-filled 155mm projectiles were recovered from the South Fork of Ozan Creek; the remainder was recovered from Range 14. The HE-filled 155mm projectile is assigned a subcategory of most severe.

5.3.2.1.4 **OOU-5:** One fuzed HE-filled 20-lb fragmentation bomb and six fuzed HE-filled 4.5-inch rockets were recovered at the OOU-5 unit during the EE/CA investigation. The HE-filled rockets were recovered during the EE/CA from the Old Dry Target Lake Range and the fragmentation bomb was recovered in the Main Bombing Range. A removal action was conducted in the Old Dry Target Lake Range portion of the OOU. Although 20-lb fragmentation bombs were identified in OOU-5, the more prevalent 4.5-inch HE-filled rocket warhead poses the greatest risk to the public since it is more widespread. The 4.5-inch rocket is assigned a subcategory of most severe and is carried forward in this risk evaluation, reference Table 5.6.

Table 5.6 Risk Evaluation

Area	Ordnance and Explosives Factors					Site Characteristics Factors		Human Factors	
	Type ¹		Sensitivity	UXO Density (UXO per acre)	Number of UXO by Depth ²	Accessibility	Stability	Activities	Population
OOU-2	60mm mortar	Most Severe	Less Sensitive	5.3	No data	Limited Restriction	Moderately Stable	Significant (agriculture, forestry, hunting, hiking)	10 – 30
OOU-3	105mm projectile	Most Severe	Less Sensitive	5.2	Surface – 755 Subsurface – 609 Not Specified – 33	Limited Restriction	Moderately Stable	Significant (forestry, agriculture, hunting, child play)	70 – 100
OOU-4	155mm projectile	Most Severe	Less Sensitive	0.6	Surface – 47 Subsurface – 1 Not Specified – 5	Limited Restriction	Moderately Stable	Significant (agriculture, forestry, child play)	25 – 35
OOU-5	4.5-inch rocket	Most Severe	Less Sensitive	0.4	Surface – 3 Subsurface – 28 Not Specified – 3	Limited Restriction	Moderately Stable	Significant (agriculture forestry, child play)	30 – 40
OOU-6	OE Scrap	No Injury	Inert	Not Applicable	Not Applicable	Limited Restriction	Moderately Stable	Low (forestry, child play)	250 – 500

¹ Denotes the item that poses the greatest risk to the public based on findings during the EE/CA and ORAs as described in Chapter 3.

² Denotes number of UXO items found at the surface (0 to 6 inches deep) and in the subsurface (>6 inches deep) as reported in the ORA reports.

5.3.2.1.5 **OOU-6:** No UXO was identified during the EE/CA investigation in OOU-6. No follow-on removal actions were conducted in this area. Based on the information presented in the ASR and the findings of the EE/CA investigation, the likelihood for occurrence of any UXO at this site is considered low. Scrap items identified in OOU-6 during the EE/CA investigation are assigned the subcategory of no injury.

5.3.2.2 Sensitivity

The subcategory of less sensitive is assigned to UXO Types for OOU-2, OOU-3, OOU-4, and OOU-5 as defined in Table 5.2. The UXO sensitivity for OOU-6 is not applicable, as no UXO was found in this area.

5.3.2.3 Density

5.3.2.3.1 The UXO density was estimated based on the number of UXO found and the number of acres investigated during the removal actions as described in Chapter 3. The Final EE/CA Report results are not included in the density estimate in OOU-2 where removal actions were conducted, because the Final EE/CA Report results are likely to be biased low since all geophysical anomalies were not intrusively investigated during the EE/CA fieldwork.

5.3.2.3.2 In OOU-2, UXO density is estimated to be 5.3 UXO per acre. This density is based on the 1997 EE/CA sampling results, as no removal actions were conducted in this area. The overall UXO density in OOU-3 is estimated to be 5.2 UXO per acre based on a total of 1,397 UXO items recovered during the removal actions in an area of 271 acres. In OOU-3, UXO density ranged between 0.6 to 9.4 UXO per acre in each removal area. The UXO density in OOU-4 is estimated to be approximately 0.6 UXO per acre based on the surface clearance data for the Range 14 area. The density in OOU-5 is estimated to be approximately 0.4 UXO per acre based on the clearance data for the Old Dry Target Lake Range.

5.3.2.4 Depth

5.3.2.4.1 The UXO depth distribution affects the likelihood that an individual will be exposed to UXO. There are two subcategories within the distribution depth category: surface (0 to 6 inches bgs) and subsurface (> 6 inches bgs). No specific depth information on UXO distribution was provided in the Final EE/CA Report. Of the 34 UXO items identified in OOU-2, the Final EE/CA Report stated that a small percentage of the total ordnance is expected to be located on the surface. The depth category is "not applicable" for OOU-6 as no UXO was identified in the Buffer Area. Table 5.6 summarizes the depth distribution for UXO items in the ordnance operable units.

5.3.3 Site Characteristics Factors

5.3.3.1 Site Accessibility

The WMA (OOU-2) is currently fenced with signage and open to the public for hunting. The main fence surrounding the WMA is a wire fence with a single barbed wire at the top. A ½-mile portion of the fence is partially down and in need of repair. The warning signs are old and rusted and read: "Area Closed to All Vehicular Traffic, Foot Travel Only" and "Danger Unexploded Military Ammunition, Do Not Disturb, If Found Call 911". There are three main entrances to the WMA

and all three are kept locked to vehicular traffic. The remainder of the former SWPG is unrestricted and is accessible by road and foot. However, large portions of the area are undeveloped and heavily forested. The lack of improved roads limits access into much of the site.

5.3.3.2 Site Stability

Overall, the site stability subcategory is moderately stable for the entire former SWPG. The large amounts of wooded areas make it possible that UXO may become exposed through natural processes, particularly burning initiated by lightning. The UXO exposure due to erosion is more likely in OOU-3 and OOU-5 where the majority of the terrain is hilly. In addition, localized erosion along creek banks may occur in other areas of the former proving ground.

5.3.4 Human Factors

5.3.4.1 Site Activities

5.3.4.1.1 The type of activities conducted at the former SWPG, in combination with the depth distribution of UXO, is related to the likelihood of individuals encountering UXO and is critical in determining an appropriate depth for any UXO clearance. Table 5.6 describes the type of activity anticipated in each OOU based on the current land use. The future land use is likely to remain virtually unchanged as is discussed in Chapter 2. The WMA is a wildlife preserve. The most common site activities in OOU-2 are hiking, hunting, food plot planting, timber planting, and harvesting. The entire WMA is open for hunting; no hunting permits are required, except for a gun permit for the youth deer hunt. Approximately 500 acres of the total 2115 acreage in the WMA is disced each spring and fall, to a depth of approximately 6 inches, for planting of food and cover crops for wildlife habitat improvement and fire lane maintenance. In OOU-2, the potential presence of UXO on the surface in combination with the intrusive site activities results in an overall significant contact level rating.

5.3.4.1.2 In each of the other OOU's, the primary site activities are forestry and agriculture. Forestry practices involving intrusive activities include the hand planting of trees, mechanized ripping of soils, and maintenance of roads. Trees are planted using a dibble bar and is typically performed using migrant laborers. The maximum depth for tree planting does not exceed 12 – 16 inches. Representatives contacted from Deltic Timber Corporation and Potlatch Corporation reported that they do not rip the soils because of the potential presence of unexploded ordnance. (See Appendix C for a record of significant telephone interviews.) International Paper reportedly ripped soils in the past, but does not foresee the need to rip in the future. Weyerhaeuser Corporation reported that they may continue to rip soils at the former SWPG. Disc penetration for ripping may range between 0 – 10 inches or 18 – 24 inches depending upon the equipment used. Mechanical ripping is performed by independent contractors. Potlatch reported that their biggest concern is the intrusive activities associated with restructuring of roads. Under normal conditions, road maintenance involves adding gravel and blading the road to a maximum depth of 4 inches. If there has been extensive erosion, restructuring of a road may be required and may involve blading to a depth of up to 3 feet.

5.3.4.1.3 Agricultural activities include raising cattle, swine, and poultry. Potential intrusive activities are related to the construction of ponds for the livestock and fences. It should be noted that the Natural Resource Conservation Service will not design ponds located in the former SWPG; however, this may not preclude a landowner from constructing a pond. Also some ponds in the area are built up and do not involve excavation; borrow soil may be brought in. Mr. Kenneth Knoll, a resident in OOU-5, reported that he would like to construct additional watering holes but hesitates to do so because of the ordnance hazards. Mr. Knoll also reported that he and other landowners disced the soil to a depth of 6 – 8 inches in the area.

5.3.4.1.4 Because of currently low profit margins, row crops (soybean, cotton, and corn) are no longer planted in the area. Many farms formerly used for growing row crops have reverted to tree farming or hay production. Most local residents contacted indicated that they do not plow the soils anymore. Land disturbances are generally associated with setting of fence posts, maintenance of existing drainage ditches, and planting of trees.

5.3.4.1.5 Hunting is widespread throughout OOU-3 and child play is potentially present wherever there are residences. There may be some limited house construction in the former SWPG, but it is difficult to track since building permits are not required in the rural areas. Other construction activities include a planned 55-acre flood control structure, located in the northwest corner of Bombing Range 1 in OOU-5 (see Figure 3.1b), and potential future rural water lines into the area.

5.3.4.1.6 In summary, the predominant forestry and agricultural practices conducted in the former SWPG are intrusive to depths of generally up to 2 feet. The detection of UXO on the surface and subsurface in OOU-2, OOU-3, OOU-4, and OOU-5 combined with the activities result in a significant contact level rating for those units. The contact level rating for OOU-6 is considered low, as no UXO was detected in this operable unit during the EE/CA field investigation.

5.3.4.2 Population

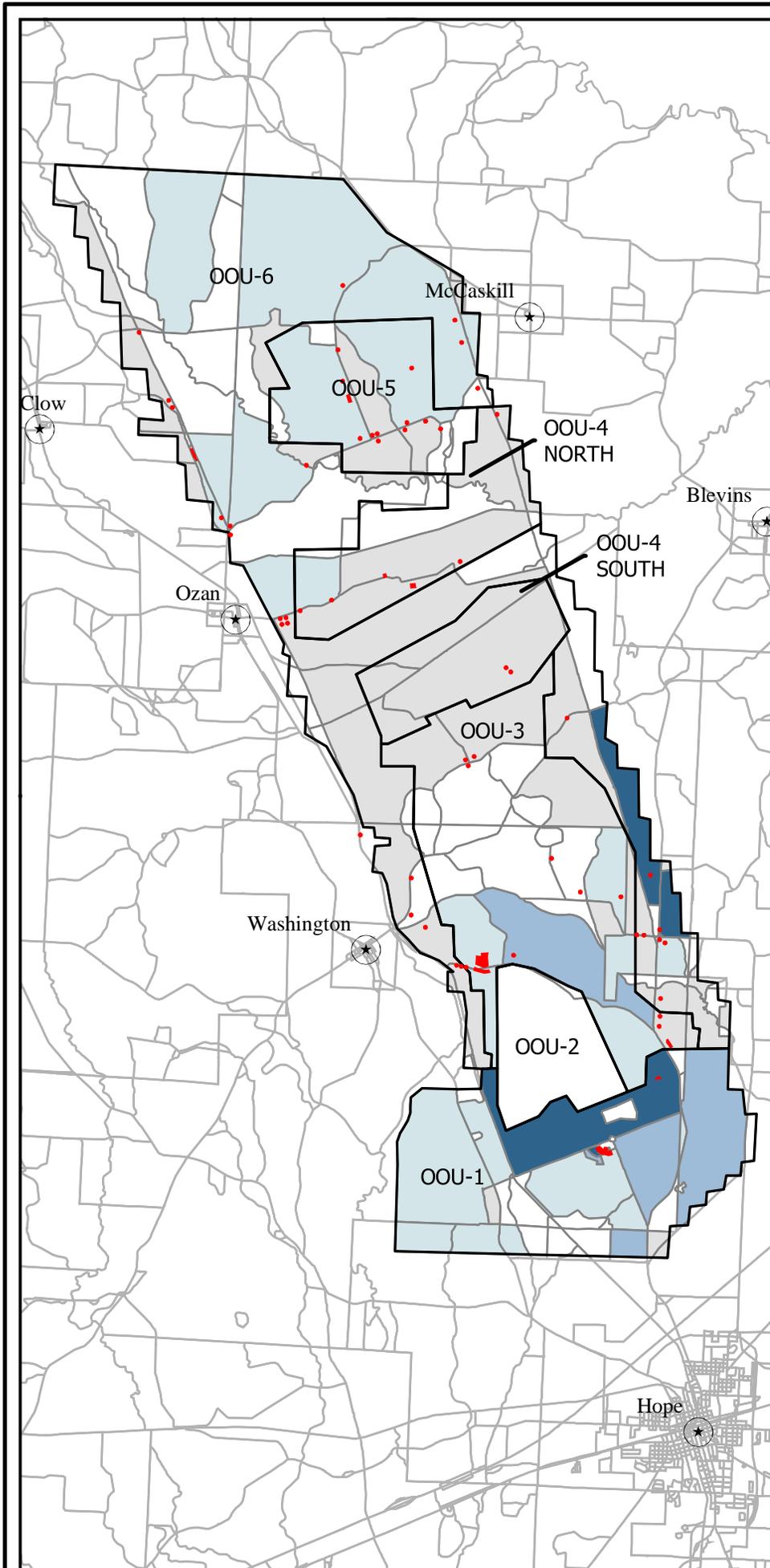
5.3.4.2.1 The population living within the former SWPG is very low. The number of occupied residences in the former SWPG was estimated to be 37 by ESE (1997). The 2000 census indicates the majority of people live in the south within OOU-1. Population was estimated based on block group level data from the 2000 census. Each census block group was intersected using GIS with the OOU areas. If an entire block group fell within an OOU area then the total population for that block group was used to derive the population. If only a portion of a block group fell within an OOU area, then only a percentage of that population was used. For example, if 10 acres of a 20-acre block group fell within OOU-6 then only 50% of the reported population for that block group was used. The block groups and estimated OOU populations are shown in Figure 5.2.

5.3.4.2.2 The census population in an OOU was used to estimate the lower bound of the number of people that potentially access an OOU on a daily basis. The census populations were then adjusted upward by 50% to 100% to account for potential under-reporting and visitors and workers traveling through the area to provide the upper bound for the population category. Daily

Figure 5.2

Former Southwestern Proving Ground
Hempstead County, Arkansas

2000 Population



Legend

- Town / City
- Census Block Group
- OOU Boundary & ID
- Residential Area

Population

(people in census block group)

- 0
- 1 - 5
- 6 - 15
- 16 - 30
- 31 - 43

Area	Number of People in OOU
OOU-1	246
OOU-2	0
OOU-3	69
OOU-4 NORTH	14
OOU-4 SOUTH	10
OOU-5	26
OOU-6	234
TOTAL	599



Note: Locations of residences are based on land use data presented in the Final EE/CA (ESE 1997) and have not been field verified.



Source: Block group boundaries and census data - Census 2000
Coordinate System: NAD 1983 State Plane Arkansas, South (FEET)

PARSONS

**U.S. ARMY ENGINEERING
AND SUPPORT CENTER,
HUNTSVILLE**

DESIGNED BY: BT	Figure 5.2 2000 Population		PROJECT NUMBER: 740168
DRAWN BY: BT			PAGE NUMBER:
CHECKED BY: MS	SCALE: 1 inch equals 12,500 feet	DATE: August 2004	
SUBMITTED BY: MS	FILE: x:/gis/740168/maps/eeca_final/figure5_2.mxd		

visitor information provided by the AG&FC was used for OOU-2. The population estimated to be living in the Buffer Area, OOU-6, is 234. This may be biased high and is a result of the large number of census blocks partially overlapping with the Buffer Area. The actual number of people routinely passing through OOU-6 on a daily basis; however, is estimated to range between 250 to 500 because of the presence of the SWPG boundary road and population living immediately outside the former SWPG boundary.

5.4 RISK ASSESSMENT SUMMARY

5.4.1 The potential risk to public safety associated with the presence of UXO at the former SWPG was evaluated for OOU-2, 3, 4, 5, and 6. The explosive safety risk is due to a combination of each of the primary risk factors that are presented above. A large number of UXO items have been identified both on the surface and subsurface in each of these OOU-2. These items can be lethal if detonated by an individual's activities. Although several removal actions have been conducted, large portions of the priority areas have not been cleared. In those areas where a clearance action has been completed, a residual risk still remains because of limitations in UXO detection technology, and the clearance actions were not all completed to depth.

5.4.2 Although the Quitclaim deed, upon transfer in 1960 from the General Services Administration to the State of Arkansas, recommended that the land in the WMA be restricted to "surface use only", intrusive agricultural activities are being performed in the area. In OOU-2, the greatest explosive safety risk is posed by workers involved in intrusive agricultural activities (discing and planting). In addition, visitors, trespassers, and hunters also have a potential to come into contact with UXO on the ground surface. Overall, the explosive safety risk in OOU-2 is considered to be high.

5.4.3 The explosive safety risk in OOU-3 is high and is based on the high density of UXO identified in the operable unit, unrestricted access, intrusive site activities, and the potential for future exposure of UXO on the surface from erosion. The primary receptors in OOU-3 include forestry workers, hunters, trespassers, and residents.

5.4.4 The explosive safety risk in OOU-4 and OOU-5 is moderate to high. The density of UXO in OOU-4 and OOU-5 is lower than the density in the other operable units; however, the estimated UXO density is biased low because all anomalies were not cleared to depth. Based on UXO type, the depth of the ordnance penetration is also expected to be greater than in other parts of the former proving ground. Reported soil discing activities in OOU-5 and other potentially intrusive activities combined with subsurface UXO contribute to an overall high explosive safety risk in these operable units.

5.4.5 Although no UXO was detected in OOU-6, a low potential explosive safety risk is present in the operable unit. The explosive safety risk in OOU-6 is based on the large amount of UXO in adjoining units, potential for migration of UXO by human intervention, and higher degree of human activity due to the relative larger number of residences located within and adjoining OOU-6 as compared to the other operable units in the former proving ground.

CHAPTER 6

EFFECTIVENESS OF EXISTING INSTITUTIONAL CONTROLS

6.1 INTRODUCTION

Institutional controls, as it pertains to the DERP-FUDS ordnance program, is a non-intrusive response action for reducing public risk associated with residual unexploded ordnance (UXO). In lieu of physically locating and removing the ordnance from the ground, institutional controls emphasizes increasing public awareness of local ordnance issues and/or limiting public access to those areas potentially contaminated with ordnance.

6.2 INSTITUTIONAL CONTROLS RECOMMENDED IN THE FINAL EE/CA REPORT

In order to successfully implement institutional control measures, a certain level of support from local communities and state agencies is required. In order to gauge the level of that support and implementation feasibility, an Institutional Analysis (IA) must be conducted for the particular site. In the case of the former SWPG, an IA was conducted during the study. The IA Report is included in the Final report as Appendix E. The IA evaluated potential institutional control strategies/alternatives for risk reduction based on effectiveness, ease of implementation, and cost. The Final EE/CA Report recommended the following institutional controls:

- OOU-2.
 - Installation and maintenance of existing perimeter fencing and signage;
 - Conduct Information/Education Program; and
 - Enforcement of specific land use restrictions (“surface use only” deed restrictions).
- OOU-3, -4, -5, and -6.
 - Conduct Information/Education Program.

6.3 INSTITUTIONAL CONTROLS IMPLEMENTED

6.3.1 Public involvement and community education pertaining to ordnance issues at the former SWPG was begun in 1993 following completion of the Preliminary Assessment phase. The information/education program included a combination of printed media, classroom education, visual media, and public information exhibits and displays to educate the public about the dangers that remained at the former SWPG. A complete list of IC measures implemented to date for the site are shown in Table 6.1.

Table 6.1 Institutional Controls Implemented at the Former SWPG

Institutional Control	Description/Purpose	Dates	Examples/Details
Public Meetings/ Workshops	Inform people who own property, live, hunt, or work in the SWPG area about project status	1993-Present	Community meeting concerning RAB: 6/12/01 Public meetings were also held the following dates: 12/9/97, 9/17/96, and 8/25/94 Sentimental Journey also presents materials to Civic Groups on a regular basis
Restoration Advisory Board (RAB)	Improve public participation by involving the community in the restoration decision-making process. Comprised of nine local volunteers	Established in 2001 (ongoing)	RAB meetings were held: 9/12/01, 12/12/01, 7/24/02, and 9/25/2003 Minutes from each meeting available online at http://www.swl.usace.army.mil/projmgt/swpg.html
News Releases	Less technical than fact sheets Sometimes accompanied by video clips or photos for print media	Produced 1994 through 2001	2001 – Restoration Advisory Board for Southwestern Proving Grounds to meet 2001 – Restoration Advisory Board for former Southwestern Proving Grounds to hold first meeting 2001 – Corps of Engineers seeks volunteers to serve on advisory board for Proving Grounds re-study 1999 Efforts continue to remove ordnance from former Southwestern Proving Ground 1998 – Business is booming at former Southwestern Proving Ground 1998 – Safety procedures announced at former Southwestern Proving Ground 1997 – Public workshop slated to discuss Southwestern Proving Ground

Table 6.1 (Continued) Institutional Controls Implemented at the Former SWPG

Institutional Control	Description/Purpose	Dates	Examples/Details
News Releases (Continued)	Less technical than fact sheets Sometimes accompanied by video clips or photos for print media	Produced 1994 through 2001	<p>1996 – Partnerships reduce risks of World War II ordnance in cost-efficient manner</p> <p>1996 – Comments sought, workshop slated for Southwestern Proving Ground</p> <p>1994 – Corps to hold news conference regarding work at Southwestern Proving Ground</p> <p>1994 – Ordnance demolition at former Southwestern Proving Ground to occur Monday, Tuesday</p> <p>1994 – Ordnance cleanup at former Southwestern Proving Ground begins</p> <p>1994 – Ordnance cleanup at former Southwestern Proving Ground to include demolition during next six weeks</p> <p>1994 – Corps to hold public workshop concerning former Southwestern Proving Ground</p> <p>1994 – Corps hires firm to begin ordnance removal at Southwestern Proving Ground</p>
News Articles	Provide background on project and details of cleanup efforts	Published in papers throughout the area (1994-1999)	<p>5/3/99 – No place could escape WWII – not even Hope (Blytheville Courier News)</p> <p>4/29/99 – Small towns could not escape the effects of World War II (Hope Star)</p> <p>3/25/99 – Ordnance removal to resume at SWPG (Hope Star)</p> <p>2/15/99 – The hunt goes on, Proving Ground research continues (Hope Star)</p> <p>11/2/98 – WWII live artillery round is exploded...(Nashville News)</p> <p>7/30/98 – Danger keeps grandchildren out of yard (Hope Star)</p> <p>7/30/98 – Corps doubtful of chemical weapons (Hope Star) </p> <p>7/25/98 – WWII mustard gas shells may be at old proving ground near Hope (Arkansas Democrat Gazette)</p>

Table 6.1 (Continued) Institutional Controls Implemented at the Former SWPG

Institutional Control	Description/Purpose	Dates	Examples/Details
News Articles (Continued)	Provide background on project and details of cleanup efforts	Published in papers throughout the area (1994-1999)	<p>2/23/98 – Ordnance teams find shells in cow pasture (Evening Times)</p> <p>2/23/98 – Ordnance teams finding more explosives than expected</p> <p>2/22/98 – Workers finding more old military explosives (Daily Times)</p> <p>2/22/98 – World War II shells being gathered at training site (Pine Bluff Commercial)</p> <p>2/21/98 – Hundreds of WWII shells blown up (Arkansas Democrat Gazette)</p> <p>2/21/98 – Artillery cleanup begins (Texarkana Gazette)</p> <p>2/16/98 – Corps of Engineers to clear ordnance at Hope (Arkansas Democrat Gazette)</p> <p>2/13/98 Corps will begin 5-year cleanup of ordnance (Batesville Daily Guard, Malvern Daily Record, Jacksonville Patriot, El Dorado News-Times, The Benton Courier, Texarkana Gazette, Camden News, The Morning News)</p> <p>12/22/97 – Time to say thanks (Arkansas Democrat Gazette)</p> <p>12/10/97 – WWII shells near Hope due to blow (Arkansas Democrat Gazette)</p> <p>12/10/97 – Army to remove old ammunition (Texarkana Gazette)</p> <p>12/10/97 – Clean up area is ‘hottest site’ in Arkansas (Hope Star)</p> <p>12/09/97 – Proving ground residents asked to attend Army Corps workshop (Texarkana Gazette)</p> <p>9/29/97 – Airport to preserve ex-proving ground (Arkansas Democrat Gazette)</p> <p>6/3/97 – Where danger lies: Hope’s unseen crops (Arkansas Democrat Gazette)</p> <p>12/3/94 – Corps searches for old ordnance (Hope Star)</p> <p>11/12/94 – Army blowing up munitions at site (Arkansas Democrat Gazette)</p>

Table 6.1 (Continued) Institutional Controls Implemented at the Former SWPG

Institutional Control	Description/Purpose	Dates	Examples/Details
News Articles (Continued)	Provide background on project and details of cleanup efforts	Published in papers throughout the area (1994-1999)	10/7/94 – Cleanup crew to explode munitions left at Hope site (Arkansas Democrat Gazette) 10/3/94 – Corps destroying unexploded munitions (Northwest Arkansas Morning News) 1/24/49 – Scene where five died in shell explosion (Hope Star) 10/14/47 – Boys' death due to 37-mm shell, says commander of SPG Second child dies in Hope shell blast (Hope Star)
News Conference/On-site Tours and Demonstrations/Media Day	Developed for media. Demonstrated ordnance removal to media	April 1998, Feb. 1998, Nov. 1994	4/7/98 – Letter of invitation to news editors Mailing list developed
Public Information Fact Sheets	Designed in newsletter format and distributed by direct mail to members of affected community, political representatives and other interested parties	1993 to present	12/01 – Corps forms SWPG Restoration Advisory Board, holds first meeting 5/01 – Corps seeks community members to serve on SWPG Advisory Board 8/99 – Corps continues cleanup of SWPG site 4/98 – Work progressing to make SWPG safer 11/97 – Work launched to make SWPG safer 9/97 – Corps to begin first phase of 5-phase plan to make SWPG safer 8/96 – SWPG Administrative Record 8/94 – Southwestern Proving Ground undated – Southwestern Proving Ground History; Ordnance identification undated – Mandatory Center of Expertise and Design Center for Unexploded Ordnance

Table 6.1 (Continued) Institutional Controls Implemented at the Former SWPG

Institutional Control	Description/Purpose	Dates	Examples/Details
School Visits/Dissemination of information to Schools	Present information to school age children, fourth grades through 12 th grade	Ongoing until 2000 (due to cancellation of 2001 air show, funding is currently limited)	"Sentimental Journey" tour, Present safety briefings to schoolchildren (video and handouts are used) Educational materials are also disseminated to area schools (this is currently done)
Sentimental Journey Air Show	Public show	Annual – September 1997, 1998, 1999, 2000, 2001 (postponed)	Corp participates in the annual air show Attendance generally anticipated at 15,000 people and 5,000 students
Video Presentation	Video developed to communicate site information	1994	Documents history of SWPG and promotes safe behavior Available to news media and the organizations in the community
Safety & History Displays	Display posted in public place communicating site information	Ongoing	Display is located in Visitor's Center, former railroad station in downtown Hope, AR Larger display located in the airport hangar, former SWPG airport hangar
Daily Public Notices	Posted in media to inform public during site activity	Ongoing during site activity	Provided updates on field investigation activities on radio and in local newspaper
Signage	Inform people that entry is prohibited or that activities within the property are restricted	Ongoing	Signs erected at perimeter of the wildlife management area A proposed agreement has been completed to install signs along key areas of the former SWPG

Table 6.1 (Continued) Institutional Controls Implemented at the Former SWPG

Institutional Control	Description/Purpose	Dates	Examples/Details
Fencing	Provide a physical barrier to entry	Ongoing	Fencing maintained at the wildlife management area
Deed Notices	Notification of ordnance contamination placed on the deeds of affected properties	Various dates	"Surface use only" deed restrictions placed on select areas of the former SWPG (see Final)
Web Pages	Information available on the Internet	Ongoing	www.swl.usace.army.mil/projmgmt/swpg.html Contains project overview and periodic updates as well as Fact Sheets and minutes from RAB meetings www.sentimentaljourney.org Contains site history and educational materials http://www201.pair.com/paratl/swpg/ Contains copy of Final Work Plan for the Supplement www.pirs.mrv.usace.army.mil/fuds/q-t/swprove/oe/oe.html Contains copies of public documents (Archives Search Report and)
Community Interviews	Interview specific community organizations/groups	Part of 1997 Final	Conducted to assess the applicability of various institutional controls Also provided information on how to communicate with the community
Good Neighbor Program Correspondence/ Letters	Correspondence to specific addresses	Through 8/9/99	Letters sent to homeowners, residents, organizations, schools 8/9/99 - Explanation of removal process
Advertisements	Placed in local media outlets	1996	Announced public meetings/workshops

6.3.2 A Community Relations Plan (CRP) was developed in 1999 to establish a formal communication and information exchange with the public and local officials. This plan also documented public involvement and education activity conducted until 1999. The purpose of the CRP was to:

- Provide information exchange regarding OE removal activities;
- Solicit comments and involvement from the public and local officials regarding the program;
- Provide a centralized point of contact for the public and media;
- Provide the opportunity for site visits by media and to answer questions from the media and public in general;
- Identify methods for communicating with the public;
- Identify various segments of the public including mailing lists, media lists, property ownership and other interested groups and individuals;
- Communicate safety information to the public;
- Keep the affected community informed of government activities;
- Provide local residents, officials and other stakeholders with an opportunity to review and comment on studies being conducted and on suggested removal alternatives and decisions; and
- Foster and maintain a climate of understanding and trust between stakeholders and the Corps of Engineers.

6.4 EFFECTIVENESS OF CURRENT INSTITUTIONAL CONTROLS

6.4.1 The effectiveness of institutional controls currently being implemented for the former military site was evaluated during the Supplemental . A telephone survey of a percentage of residents in the SWPG area and representative officials was conducted. Those contacted were asked a series of questions to determine their knowledge of the former Southwestern Proving Grounds and how they learned of it.

6.4.2 Two sets of survey questions were developed for these interviews. The first set was designed for residents, who were RAB members, and included:

- a. How did you learn about the former Southwestern Proving Ground?
- b. Do you remember reading about the former Southwestern Proving Ground in the newspaper? Seeing on television? Hearing about it on the radio?
- c. Have you ever received any printed material about the former Southwestern Proving Ground, e.g., fact sheet or brochure?
- d. Have you ever visited the former Southwestern Proving Ground?
- e. How did you learn about unexploded ordnance?

- f. Do you know what to do if you discover unexploded ordnance?
- g. If you have children, do your children know what to do?
- h. Do you know the three R's of ordnance safety? (Explain if not known)
- i. How can awareness about unexploded ordnance at the former Southwestern Proving Ground be improved?
- j. How can safety at the former Southwestern Proving Ground be improved?

6.4.3 The second set of questions was designed for members of state and local government agencies, businesses, organizations, and special interest groups, and included:

- a. Has your agency ever received questions about the former Southwestern Proving Ground from the public? How recently?
- b. Do you know the appropriate person to contact for information about the former SWPG?
- c. Do you have any suggestions or ideas on how public safety at SWPG can be improved?
- d. Do you have any suggestions as to how your agency can help with public safety at SWPG?
- e. Do you know what procedures to take if UXO is encountered?

6.4.4 The following agencies/organizations responded to the survey:

- a. Hope – City Manager;
- b. Hempstead County Sheriff Department;
- c. Hempstead County Health Department;
- d. Hope Fire Department;
- e. University of Arkansas Hempstead County Cooperative Extension Service;
- f. Arkansas State Forestry Commission;
- g. Arkansas Game & Fish Commission;
- h. Farm Service Agency;
- i. Timber company representatives for International Paper, Deltic Timber Corporation, and Potlatch Timber; and
- j. Sentimental Journey to Southwestern Proving Ground.

6.5 SURVEY RESULTS

A summary of the results of the interviews is presented in the following subsections. A record of the individual telephone interviews are included in Appendix C.

6.5.1 Residents

6.5.1.1 The surveys indicated that residents and workers in the Hope area are very familiar with the former SWPG and understand the potential dangers associated with UXO items. Most of the

residents have lived there for over 15 to 20 years and have extensive family networks in the area. The most effective form of communication to date has been publications in local newspapers. Radio and television have been effective to a lesser degree. In addition, informational brochures at the Hope Municipal Airport have been an effective means of information dissemination.

6.5.1.2 Residents know what actions to take if UXO is encountered at the site. Many have also shared this information with their children. The greatest concern indicated by residents was for non-local individuals who are not familiar with the area. People use the WMA for hunting purposes and are not familiar with the potential presence of and safety issues concerning UXO. In general, residents are supportive of additional signage in the area and future removal actions to increase safety for residents and non-locals who may visit the area. Increased education of children through school functions was also suggested.

6.5.1.3 Most residents were not aware that the deeds to their properties contained “surface use only” restrictions when originally conveyed by the Government to private interests.

6.5.2 Agency/Companies

Results of the surveys indicated that agencies and companies do not receive many inquiries regarding the former SWPG. The only agency that regularly receives questions or concerns with regard to public safety is the AG&FC. These questions/concerns are voiced by hunters. In general, agencies and companies in the area are aware of CESWL contacts for the site, and have been provided sufficient information concerning safety issues. Agencies and companies are aware of the appropriate actions regarding discovery of UXO. Some suggestions provided for enhanced public awareness and communications include the following:

- Continue working with the Sentimental Journey to SWPG organization;
- Distribute information at the annual Watermelon Festival;
- Increase signage along roads and points of entry to the site;
- Provide information at the Hope Visitors Center/Depot;
- Provide information to local Fire Departments for incorporation into fire safety programs;
- Provide information and maps to the County Health Department for distribution with sewer permit applications; and
- Provide information to the State Forestry Commission for incorporation into Forest Management Plans.

6.6 RECOMMENDATIONS

6.6.1 The majority of institutional controls recommended in the Final have been implemented. The “surface use only” land use restriction has not been implemented in OOU-2 as recommended in the 1960 Quitclaim Deed. Although this was a recommendation in the Final EE/CA Report, it was not included in the 1997 Action Memorandum. Additional risk mitigation measures may be required if land use controls are not implemented.

6.6.2 The installation of warning signs along county-maintained roads that traverse ordnance impacted areas in OOU-2, -3, -4, -5, and -6 was discussed in the Final Report. It was stated that installation of signage might be an effective measure. However, costs associated with the installation/maintenance of signage were not included in the Final EE/CA Report recommendations or the Action Memorandum.

6.6.3 Public outreach and education efforts have been effective, and the majority of the population in the area is aware of the former SWPG and safety issues pertaining to ordnance. In addition, the general public is aware of the proper actions to take when a piece of ordnance is discovered. The recent Removal Actions and the publicity they generated within the community of Hope have also contributed to public awareness.

6.6.4 Changes to existing institutional controls recommendations are as follows:

- OOU-2
 - Install additional signage, and consistently maintain existing signs and fencing;
 - Coordinate with the AG&FC to distribute information to hunters, hunting clubs, and other appropriate organizations associated with OOU-2;
 - Develop a formal agreement between USACE and AG&FC regarding implementation of existing recommendations; and
 - Enforce the “surface use only” land use restriction in the WMA.

- OOU-3, 4, -5, and -6
 - Install signage at key entry points and other roadways in the former SWPG.
 - Include a notice to landowners at least once a year regarding ordnance issues pertaining to their property, and the fact that a “surface use only” land use restriction was included in the deed at the time of conveyance by the Government. Also, inform local real estate offices that potential buyers of land located within the boundaries of the former SWPG should be informed of the potential of ordnance being on that property.

CHAPTER 7

IDENTIFICATION OF RESPONSE ACTION OBJECTIVES

7.1 RESPONSE ACTION OBJECTIVES

7.1.1 The OE response action objective for the former SWPG is to reduce the explosive safety threat posed by residual UXO that remains at the site. This goal will be achieved by minimizing the public's exposure to UXO. To date, four OE removal actions and the implementation of institutional control measures have contributed to the fulfillment of this goal.

7.1.2 A specific objective of the selected response action is that it meets the requirements set forth in the applicable or relevant and appropriate requirements (ARARs) documents for this project. Another specific objective is that the selected response action be realistic and implementable in terms of logistics and cost. The criteria of effectiveness, implementability, and cost were used to evaluate response action alternatives in the Final EE/CA Report. Those same criteria were used during this Supplemental EE/CA.

CHAPTER 8

IDENTIFICATION AND ANALYSIS OF RESPONSE ACTION ALTERNATIVES

8.1 INTRODUCTION

8.1.1 The Final EE/CA Report identified and analyzed risk-reduction alternatives. It also prioritized the recommended alternatives in order to improve the efficiency of implementation. Risk reduction alternatives for the former SWPG were categorized as intrusive or non-intrusive. Non-intrusive alternatives included; 1) No Further Action Response, which is currently referred to as No DoD Action Indicated (NDAI), 2) government buy-back, and 3) institutional controls. Intrusive alternatives included; 1) surface clearance and 2) subsurface clearance.

8.1.2 During the Supplemental EE/CA, a re-evaluation of EE/CA risk-reduction alternatives was conducted. An analysis and screening of the possible alternatives was conducted using the same general categories that were used during the EE/CA; 1) effectiveness, 2) implementability, and 3) cost. With a wider array of tools for locating and disposing of UXO, improvements in technology since the mid-1990s, and a more knowledgeable appreciation for the problems UXO pose at the former SWPG, the response action alternatives were again evaluated with regard to the five risk reduction alternatives..

8.2 RISK-REDUCTION ALTERNATIVES

8.2.1 The following risk-reduction alternatives were evaluated in the Final EE/CA Report and are summarized below:

8.2.2 **Alternative 1: No DoD Action Indicated.** Alternative 1 is for the government to take no action in regards to locating, removing, and disposing of any potential OE present within a specific OOU at the former SWPG. In addition, no public awareness or education training would be initiated with regards to the risk of UXO. The NDAI alternative assumes continued use of the OOU in its present state. If the potential exposure and hazards associated with the OOU are compatible with current and future development in the area as well as the OE response action objectives, then NDAI may be warranted. The NDAI should not be recommended where there is a large amount of UXO on the property and access is not completely denied.

8.2.3 **Alternative 2: Institutional Controls.** Alternative 2 would provide a means for the DoD and their representatives to reduce OE exposure risk to the public through behavior modification resulting from public awareness programs and administrative restrictions, as summarized in Chapter 6 of this report. The IC alternative can be used in combination with other OE response actions or in cases where it may not be possible or practical to physically clear OE from the OOU. Successful implementation of IC is contingent on the cooperation and active participation of local and state authorities.

8.2.4 Aside from conventional OE response actions, risks related to OE may be managed through access control, public awareness programs, or a combination of strategies. It is important to understand that the OE risk is associated with three causative factors that, if any of these three factors is completely avoided, would prevent an OE-related accident. These three factors are: presence, access, and behavior. If there is no presence of ordnance within the OOU, then there is no possibility of an OE-related accident. If ordnance exists within the ordnance operable unit, but people do not have access, then there will be no OE accident. Even if ordnance exists within the OOU, if the ordnance is located below the depth of the intrusive activity, then there will be no OE accident. Excluding acts of God, an accident requires all three events or circumstances to be present. No UXO accident can happen if any one causative factor is missing.

8.2.5 Behavior modification is an IC that relies on the personal responsibility of the individual. Even if the OE exists and there is open access to it, there is no risk if the behavior is appropriate. For behavior to be appropriate, one must understand the situation and voluntarily react in a responsible manner. The power of the federal government is limited in any situation where local enforcement is available. Therefore, the local authorities must be convinced that the risks are sufficient to warrant their participation. The concept of behavior modification through public awareness extends to agencies that have jurisdiction over the property. Some behaviors that must be modified may belong to the local government. The full Institutional Analysis Plan for the former SWPG is provided in Appendix E of the Final EE/CA Report. This alternative is acceptable when adequate controls can be maintained or when the likelihood that ordnance would be encountered is low.

8.2.6 **Alternative 3: Government Buyback.** Alternative 3 is an interim alternative that involves the government purchasing the affected land from the landowner with the intent of postponing risk-reduction actions until some future date. It is applicable for sites where the current risk-reduction costs are too high and it is anticipated that, due to new information or technological advancements, the risk-reduction costs may be significantly less in the future. Implementing this alternative would require institutional controls during the interim period. The interim institutional controls could involve fencing, sign posting, and/or information/education.

8.2.7 **Alternative 4: Surface Clearance.** Alternative 4 entails removal of ordnance items on the ground surface, protruding from the ground, or existing under the ground cover (leaves and vegetation). Surface clearance would be completed by experienced UXO-qualified personnel with the use of metal detection devices for screening to ensure that any OE items that may be present under the existing ground cover (leaves and vegetation) are located during the sweep. The UXO-qualified personnel would perform the sweep in fixed width intervals depending on the sweep reach of the type of metal detection equipment used, to ensure complete surface coverage.

8.2.8 Any OE located during the sweep would be inspected to evaluate its stability. During this inspection, a determination would be made whether the uncovered OE item was potentially dangerous and safe to move. If the item could not be safely moved, then it would be destroyed in place. Otherwise, removal of the item may be considered to a remote location for onsite destruction and disposal. If necessary, engineering controls would be used to minimize the need

for evacuation of the public. Any ordnance-related scrap would be removed from the area and transported offsite for disposal by smelting, shredding, or crushing.

8.2.9 For implementation of this alternative, land surveying and brush clearing operations would be necessary. A land surveyor (aided by a qualified individual performing visual OE avoidance) would establish control points for the areas that require clearance. Brush clearing crews would clear enough undergrowth so that the clearance crews could adequately perform their work.

8.2.10 **Alternative 5: Clearance to Depth.** Alternative 5 includes clearance of OE to depth. This alternative would also include the surface clearance of OE as described above. In addition, a geophysical survey would be performed over the entire area and each selected target anomaly would be intrusively investigated.

8.2.11 For implementation of this alternative, land surveying and brush clearing operations would be necessary. A land surveyor (aided by a qualified individual performing visual OE avoidance) would establish control points for the areas that require clearance. Brush clearing crews would clear enough undergrowth so that the clearance crews could adequately perform their work. A metal detection device capable of performing both the surface sweep and the subsurface survey will be used. In this way, both the surface and subsurface surveys can be performed simultaneously.

8.2.12 During field intrusive operations, all non-essential personnel are evacuated to the site-specific public withdrawal distance in order to minimize danger to the general public. The general public may be asked to leave their homes or places of business during these field operations. In order to minimize these disruptions, it may be necessary to use engineering controls to decrease the public withdrawal distance(s) and the number of people that require evacuation. Evacuation distances are a function of the largest munition expected to be found in that particular area. During the intrusive investigation, each anomaly is excavated until the source of the geophysical instrument reading is identified or until a predetermined clearance depth has been reached. Once the OE item is identified, the public withdrawal distance may be adjusted accordingly for demolition operations.

8.2.13 Alternative 5 is generally employed selectively within an area because of its relatively high cost. The depth to which ordnance is removed is dependent on the expected depth of OE and the intrusive activity that is either planned or that could occur in a given area.

8.3 ANALYSIS OF RISK-REDUCTION ALTERNATIVES

8.3.1 Alternative 1: No DoD Action Indicated

8.3.1.1 The NDAI alternative does not provide for protection of public safety in operable units, OOU-2, OOU-3, OOU-4, and OOU-5 because of the confirmed presence of UXO. The Final EE/CA Report did not recommend the NDAI response alternative for these operable units, and this EE/CA Supplement concurs with that recommendation. The NDAI response alternative will not be further developed for these operable units.

8.3.1.2 The NDAI alternative was considered as potentially applicable in OOU-6. The explosive safety risk in OOU-6, the Buffer Area, is low in part because no ordnance was identified during the EE/CA field investigation. However, although no ordnance was intentionally aimed into this operable unit, much of the area cannot be assumed to be free of ordnance. Ordnance may be present as a result of the potential for errant projectiles impacting beyond designated targets, and the potential for migration of UXO by human intervention. The NDAI response alternative would provide no additional risk reduction to ordnance exposure. NDAI is also not considered an effective risk-reduction alternative because of the relatively larger number of residents that reside within and adjacent to OOU-6. Also, any residents, workers, and visitors in OOU-6 are an important target population for any beneficial risk-reduction response alternative that may be implemented elsewhere at the former proving ground, such as site-wide ICs. The residents in OOU-6 are the most likely group of local residents who may come into contact with OE originating from the other operable units. The Final EE/CA Report did not recommend the NDAI response alternative for OOU-6, and this EE/CA Supplement concurs with that recommendation. The NDAI response alternative will not be further developed for OOU-6.

8.3.2 Alternative 2: Institutional Controls

8.3.2.1 Effectiveness

8.3.2.1.1 The exposure risks associated with the IC alternative are assumed to be the same as for the NDAI alternative because ordnance will not be removed. However, although unquantifiable, some reduction in the number of exposures will likely result because of the modification of people's behavior. Educational awareness programs are considered effective institutional controls and are useful in reducing the risk of exposure to potential accidents. Continued maintenance of fencing and signage around the perimeter of the WMA will continue to reinforce public safety and awareness of OE hazards within OOU-2. Focused educational programs for hunters and residents would also be an effective tool for increasing public safety and awareness on the hazards of ordnance. Other effective IC measures would be 1) the installation and maintenance of warning signs along key access points on county roads in order to minimize the likelihood that the public would pick up ordnance that they may come into contact with, and 2) the enforcement of the 'surface use only' land use restriction in the WMA by the AG&FC.

8.3.2.1.2 During the preparation of this Supplement to the Final EE/CA Report, two additional ICs were considered for implementation at the former SWPG. An innovative IC included the manufacture and distribution of a combination dibble/magnetometer bar to be used by tree planters for UXO avoidance. It was determined that it would not be possible to ensure its proper use and maintenance and therefore this IC was considered to be ineffective. Another IC evaluated included the armoring of vehicles used in tree harvesting. However, this IC was also not considered to be viable or effective because of the difficulty in confirming fabrication to specifications and monitoring its use on a site-wide basis.

8.3.2.2 Implementability

Repair of the perimeter fencing in OOU-2, installation of signage along county roadways, and development of additional focused public and hunter education programs can be readily

implemented. The AG&FC may not be willing to enforce the 'surface use only' land use restriction in OOU-2 because of a potential decrease in food cover yield for wildlife. A formalized agreement between the AG&FC and USACE may need to be created in order to implement land use controls in the WMA.

8.3.2.3 Cost

The estimated cost for implementing a site-wide IC information/education program, fabrication and installation of signage along county roads, and repair of fencing at OOU-2 is approximately \$46,000.

8.3.3 Alternative 3: Government Buyback

8.3.3.1 Effectiveness

A government buyback program will not remove or destroy ordnance. However, a government buyback would provide a reduction in the explosive safety threat to the extent that the program and its associated institutional controls are effective in limiting the number of visitors and residents coming into contact with ordnance.

8.3.3.2 Implementability

The Final EE/CA Report concluded that the implementability of the Government Buyback alternative poses administrative and legal challenges and is not considered a readily viable alternative. This EE/CA Supplement concurs with that finding and this response alternative will not be further developed.

8.3.4 Alternative 4: Surface Clearance

8.3.4.1 Effectiveness

8.3.4.1.1 The depth at which UXO is located is a primary determinant of both potential human exposure and the cost of investigation and cleanup. The depth to which UXO remediation is necessary depends on the projected end use of the land and the extent of human exposure (DoD 1999). Table 8.1 illustrates that in the Old Dry Target Lake Range a larger percentage of UXO was found at depth compared to the other areas and is expected based on the larger size of the ordnance used in OOU-5 and the method of delivery.

Table 8.1 Summary of UXO Depth Distribution for ORAs

Location	Count/Percent of UXO by Depth (inches bgs)				
	0- 6	7 –12	13 – 24	25 – 36	37 – 48
NW WMA (Y Grids)	72 / 41%	95 / 54%	6 / 3%	1 / 1%	
NW WMA (B & SR Grids)	165 / 30%	319 / 58%	56 / 10%	10 / 2%	
Range 6 (DP & L Grids)	4 / 24%	9 / 53%	2 / 12%		2 / 12%
Range 10	514 / 83%	37 / 6%	47 / 8%	16 / 3%	9 / 1%
Old Dry Target Lake Range	3 / 9%	3 / 9%	25 / 74%		

Site-wide	758 / 54%	463 / 33%	136 / 10%	27 / 2%	11 / <1%
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8.3.4.1.2 Based on the depth distribution shown in Table 8.1, it is anticipated that a similar distribution would be present throughout the remainder of the site. Although not all grids were cleared to depth during the ORAs, the data set is generally adequate to characterize the UXO depth distribution and can be used to evaluate the effectiveness of potential future clearance actions. The table does not incorporate data from the surface clearances conducted in Range 14, Ozan Creek, and Range 11. Implementation of the surface clearance alternative for OOU-2, OOU-3, OOU-4, OOU-5 as well as the 18 acres that comprise the old TCRA sites located in OOU-6 will provide protection of public safety.

8.3.4.1.3 This alternative will be effective long-term because it should permanently remove the residual UXO sources. However, no clearance can ever assure complete removal of all UXO with the current level of available technology. Implementation of this alternative will provide increased overall protection of public safety. The Final EE/CA Report recommended surface clearance in some areas of the SWPG. This EE/CA Supplement concurs that clearance is necessary; however, the depth of clearance should be based on the intrusive activities and site-specific land use.

8.3.4.2 Implementability

This type of OE removal activity is both technically and administratively feasible and the services and materials necessary to implement such a removal are readily accessible. The large size of the area requiring potential clearance would entail a very extensive effort in terms of resources and logistics. Generally, clearance alternatives are acceptable to local agencies, property owners and the local community as a means to reduce the residual OE risk.

8.3.4.3 Cost

An approximate cost associated with a surface clearance in each OOU in its entirety was estimated using unit costs provided by USAESCH. Manual digital geophysical mapping and surface clearance is estimated to be approximately \$7,700 per acre. The cost for a surface clearance in each operable unit is estimated to be:

- OOU-2 \$16,285,500
- OOU-3 \$63,140,000
- OOU-4 \$44,660,000
- OOU-5 \$25,679,500
- OOU-6 \$138,600 (old TCRA sites only)

8.3.5 Alternative 5: Clearance to Depth

8.3.5.1 Effectiveness

In this alternative, qualified UXO clearance personnel would perform a one-time clearance of OE to depth in OOU-2, OOU-3, OOU-4, OOU-5, as well as the 18 acres that comprise the old TCRA sites located in OOU-6. A clearance depth of two feet would be performed in areas where the

predominant land use is agriculture and forestry. Clearance to a depth four feet would be performed near residences. If the land use changes, periodic recurring reviews as discussed in chapter 11 of this report, will ensure that appropriate safety measures are considered when compared to the clearance depths previously performed.. This alternative has an impact on the overall protection of public safety and would be effective in both the long term and short term. However, even though clearance will be performed to a depth, no clearance can ever assure complete removal of all OE

8.3.5.2 Implementability

This alternative is both technically and administratively feasible and the materials and services necessary to implement this alternative are readily available. The large size of the area requiring potential clearance would entail an extensive effort in terms of resources and logistics. Clearance to depth in OOU-2 may be potentially disruptive to the wildlife habitat in the WMA and may require safeguards such as off-site demolition to minimize any adverse short-term impacts. Generally, clearance alternatives are acceptable to local agencies, property owners, and the local community as a means to reduce the residual OE risk.

8.3.5.3 Cost

An approximate cost associated with a clearance to depth in each OOU in its entirety was estimated using unit costs provided by USAESCH. Manual digital geophysical mapping and clearance to depth is estimated to be approximately \$10,400 per acre. The cost for a clearance to depth in each operable unit is estimated to be:

- OOU-2 \$21,996,000
- OOU-3 \$85,280,000
- OOU-4 \$60,320,000
- OOU-5 \$34,684,000
- OOU-6 \$187,200 (old TCRA sites only)

8.4 SUMMARY OF REMAINING RISK-REDUCTION ALTERNATIVES

8.4.1 The OE response action alternatives for the SWPG that remained after the initial screening of the five response action alternatives against the three general categories of effectiveness, implementability, and cost include:

- Alternative 2 – Institutional Controls (OOU-2, OOU-3, OOU-4, OOU-5 and OOU-6);
- Alternative 4 – Surface Clearance (OOU-2, OOU-3, OOU-4, OOU-5, and old TCRA sites located in OOU-6); and
- Alternative 5 – Clearance to Depth (OOU-2, OOU-3, OOU-4, OOU-5, and old TCRA sites located in OOU-6)

8.4.2 Alternative 1 – NDAI and Alternative 3 - Government Buyback was eliminated from further consideration for all ordnance operable units.

CHAPTER 9

COMPARATIVE ANALYSIS OF RESPONSE ACTION ALTERNATIVES

9.1 INTRODUCTION

9.1.1 A comparative analysis of response action alternatives was presented in Appendix B of the Final EE/CA Report to determine the relative performance of each alternative with respect to the evaluation criteria of effectiveness, implementability, and cost. The comparative analysis was used to support the selection of the recommended response action. The comparative analysis was re-evaluated based upon the findings presented in this Supplement (updated land use information, updated site characterization, risk evaluation and review of technologies) and is summarized below.

9.1.2 A comparative analysis is presented in this chapter to determine the relative performance of the retained alternatives for each of the evaluation criteria. Similar to the initial alternative screening conducted in Chapter 8, the comparative analysis was performed by evaluating each alternative relative to the other alternatives for effectiveness, implementability, and cost. The approach used in this comparative analysis is consistent with the comparative analysis used in the Final EE/CA Report.

9.2 OOU-2

9.2.1 Effectiveness

No residences are located within OOU-2, the WMA. The area is used mainly for hunting, hiking, and planting of ground cover crops for habitat improvement. Approximately 500 acres are disced semiannually to a depth of approximately 6 inches. Enforcement of a “surface use only” land use restriction that was included in the Quitclaim deed will help mitigate the explosive safety risk to workers involved in the agricultural activities. Additional ICs, including fence repair, signage, and brochures would increase knowledge of UXO safety to the public and potentially modify their behavior. Behavior modification in combination with the land use restriction can be an effective means for mitigating the explosive safety threat in OOU-2. A surface clearance will temporarily eliminate the source of UXO on the surface and decrease the likelihood for any direct contact. The clearance to depth alternative would also remove the UXO from the subsurface, and provide greater protection than the surface clearance alternative because of the intrusive activities associated with the planting of food cover. Based on this evaluation, the clearance to depth alternative is the most protective of public safety.

9.2.2 Implementability

All three alternatives are technically feasible and implementable. A formalized agreement between the AG&FC and USACE would facilitate implementation of the ‘surface use only’ land use restriction in OOU-2, but may be met with some reluctance as it may result in a decreased

crop yield. Administratively, the surface and subsurface clearance alternatives might be met with some reluctance on the part of the State of Arkansas because of the potential disruption to the wildlife habitat.

9.2.3 Cost

Institutional Controls is the least expensive of the alternatives. The cost for the estimated ½-mile perimeter fence repair and additional signage is \$30,000. Additional annual IC costs include maintaining an information/education program at a cost of \$2400 annually. The costs for the surface clearance and clearance to depth alternatives in OOU-2 are \$16,285,500 and \$21,996,000, respectively.

9.3 OOU-3

9.3.1 Effectiveness

Agriculture, commercial forestry, and hunting are the predominant activities conducted in OOU-3. The main intrusive activities are associated with planting of timber. The 2000 census data indicates that there are very few residences in the central portion of OOU-3; therefore, the likelihood of a person coming into contact with an ordnance item in this area is low. Implementation of ICs would increase public knowledge of UXO safety and potentially modify their behavior. With implementation of ICs, an explosive safety threat would still exist because ordnance is not destroyed and would remain in place. A surface clearance would eliminate the source of UXO on the surface and decrease the likelihood for any direct contact. The clearance to depth alternative would remove the UXO from the subsurface and provide greater protection than the surface clearance alternative, because of the intrusive activities. Based on this evaluation, the clearance to depth alternative is the most protective of public safety.

9.3.2 Implementability

All three alternatives are technically feasible and implementable. The surface and subsurface clearance alternatives may be administratively difficult to implement due to the number of property owners involved and impact on timber and hunting performed in the former SWPG. The clearance alternatives will require scheduling and coordination with local landowners. There is both public and local government support for the installation of warning signs along county road right of ways in all ordnance operable units. Hempstead County has already offered to provide USACE with the services for design, installation, and maintenance of roadway signs.

9.3.3 Cost

Institutional Controls is the least expensive of the alternatives. The cost for fabrication and installation of signage is approximately \$1000. Additional annual IC costs include maintaining an information/education program at a cost of \$2400 annually. The costs for the surface clearance and clearance to depth alternatives are \$63,140,000 and \$85,280,000, respectively.

9.4 OOU-4

9.4.1 Effectiveness

Raising cattle, swine, and poultry are the predominant agricultural activities conducted in OOU-4. Commercial forestry and hunting also occur within OOU-4. The density of UXO in OOU-4 is low

and the number of residents within the unit is also low. Implementation of ICs would increase knowledge of UXO safety to the public and modify their behavior. With implementation of ICs, an explosive safety threat would still exist because ordnance is not destroyed and would remain in place. A surface clearance would eliminate the source of UXO on the surface and decrease the likelihood for any direct contact. The clearance to depth alternative would remove the UXO from the subsurface, and provide greater protection than the surface clearance alternative, because of the intrusive activities. Based on this evaluation, the clearance to depth alternative is the most protective of public safety.

9.4.2 Implementability

All three alternatives are technically feasible and implementable. The surface and subsurface clearance alternatives may be administratively difficult to implement due to the short-term impacts of vegetative clearing and detonation/disposal on agricultural activities performed in the area. The clearance alternatives will require scheduling and coordination with local landowners.

9.4.3 Cost

Institutional Controls is the least expensive of the alternatives. The cost for fabrication and installation of signage is approximately \$1000. Additional annual IC costs include maintaining an information/education program at a cost of \$2400 annually. The costs for the surface clearance and clearance to depth alternatives are \$44,660,000 and \$60,320,000, respectively.

9.5 OOU-5

9.5.1 Effectiveness

Forestry, hunting, hay production, and cattle grazing are the primary activities conducted in OOU-5. The density of UXO in OOU-5 is low. The number of residents within the unit is also low. Implementation of ICs would increase knowledge of UXO safety to the public and potentially modify their behavior. With implementation of ICs, an explosive safety threat would still exist because ordnance is not destroyed and would remain in place. A surface clearance would eliminate the source of UXO on the surface and decrease the likelihood for any direct contact. The clearance to depth alternative would remove the UXO from the subsurface, and provide greater protection than the surface clearance alternative because of the intrusive activities. Based on this evaluation the clearance to depth alternative is the most protective of public safety.

9.5.2 Implementability

All three alternatives are technically feasible and implementable. The surface and subsurface clearance alternatives may be administratively difficult to implement due to the short-term impacts of vegetative clearing and detonation/disposal on agricultural activities performed in the area. The clearance alternatives will require scheduling and coordination with local landowners.

9.5.3 Cost

Institutional Controls is the least expensive of the alternatives. The cost for fabrication and installation of signage is approximately \$1000. Additional annual IC costs include maintaining an information/education program at a cost of \$2400 annually. The costs for the surface clearance and clearance to depth alternatives are \$25,679,500 and \$34,684,000, respectively.

9.6 OOU-6

9.6.1 Effectiveness

No UXO has been recovered from OOU-6. The number of residents within the unit is relatively high compared to the other OOU's. Implementation of ICs would increase public knowledge of UXO safety and potentially modify their behavior. With implementation of ICs, an explosive safety threat may still exist because ordnance is not destroyed and ordnance may potentially remain in place within the operable unit. A surface clearance limited to previously identified TCRA sites would remove any potential UXO on the surface and decrease the likelihood for any direct contact. The clearance to depth alternative, limited to previously identified TCRA sites, would remove the UXO from the subsurface and provide greater protection than the surface clearance alternative. Based on this evaluation the clearance to depth alternative is the most protective of public safety.

9.6.2 Implementability

All three alternatives are technically feasible and implementable. The surface and subsurface clearance alternatives may be administratively difficult to implement due to the short-term impacts of vegetative clearing and detonation/disposal on agricultural activities performed in the area. The clearance alternatives will require scheduling and coordination with local landowners.

9.6.3 Cost

Institutional Controls is the least expensive of the alternatives. The cost for fabrication and installation of signage is approximately \$1000. Additional annual IC costs include maintaining an information/education program at a cost of \$2400 annually. The costs for the surface clearance and clearance to depth alternatives are \$200,200 and \$273,000, respectively.

9.7 SUMMARY OF COMPARATIVE ANALYSIS

The results of the comparative analysis indicate that the clearance to depth response alternative is the most effective in mitigating the explosive safety risk in OOU-2 through OOU-6.

9.8 PRIORITIZATION OF RISK-REDUCTION ALTERNATIVES

9.8.1 OE clearance actions are the most effective methods of reducing the explosive safety risk in the former SWPG. However, clearance of very large tracts of land is cost prohibitive. In an effort to maximize the risk reduction at the former SWPG as expeditiously and cost effectively as possible, the following five priority actions were established in the Action Memorandum:

- Priority 1 Actions – Implementation of an Information/Education Program for all units; installing warning signs on the existing perimeter fence around OOU-2; and clearance to depth in the area in and around Range 6, Range 14, and selected residential areas within OOU-3 located near Range 6 and the WMA. The cost of implementing the Priority 1 actions was estimated to be \$7,840,000.
- Priority 2 Actions – Clearance to depth in the following locations: around Ranges 10 and 12 and the creek bed that traverses these two ranges in OOU-3; around the Old Dry Target Lake in OOU-5; and along South and Middle Fork Ozan Creek in OOU-4. The cost of implementing the Priority 2 actions was estimated to be \$9,510,000.

- Priority 3 Actions – Clearance to depth in the following locations: around Range 8 and near selected EE/CA sampling sites 89, 90, 94, 98, and 99 in OOU-3; around Ranges 18 and 19 in OOU-4. The cost of implementing the Priority 3 actions was estimated to be \$11,890,000.
- Priority 4 Actions – Implementation of additional sampling and surface clearance or subsurface clearance in the following locations: near the residential area NW of the WMA and on the east side of OOU-3; near residential areas in OOU-5. The cost of implementing the Priority 4 actions was estimated to be \$3,890,000.
- Priority 5 Actions – Implementation of additional sampling and surface clearance along fence lines and hedgerows in OOU-3, OOU-4, and OOU-5. The cost of implementing the Priority 5 actions was estimated to be \$7,930,000.

9.8.2 These priority actions were re-evaluated based on the updated land use, updated site characterization results, and risk evaluation presented previously in this Supplement. This Supplement concurs with the basis for selection of the Priority actions with refined clearance depths based on the site-specific land use activities and inclusion of the former TCRA locations in the Priority 1 actions. Inclusion of the old TCRA sites located throughout the former SWPG is recommended as a Priority 1 action, because of the greater level of activity and resulting potential for exposure to UXO around these areas, the majority of which are residential dwellings. Clearance of the old TCRA sites within the former SWPG as a Priority 1 action provides for a cost-effective and substantial overall reduction in explosive safety risk to the public.

9.8.3 **Clearance Depths.** Forestry and agriculture are the predominant land uses in the former SWPG. The main intrusive activity associated with forestry is the hand-planting of trees. The maximum depth of ground disturbance during planting typically does not exceed between 12 – 16 inches. The other major ground disturbance activities involve site bedding preparation and/or mechanical ripping of soils. Only one of the four timber companies (Weyerhaeuser Corporation) contacted in the former SWPG reported that they still mechanically rip soils. Weyerhaeuser Corporation reported that the typical depth of ground disturbance will range between 0 – 10 inches or 18 – 24 inches depending upon the type of equipment used. A clearance depth of 2 feet is recommended in areas where the major land use is forestry based on the site-specific levels of ground disturbances reported by timber companies in the former SWPG.

9.8.4 Agricultural activities are limited to raising poultry, hogs, cattle, planting trees, and hay production. Most landowners previously plowed their land, generally up to the 1970s, when row crops were still economical. Most of the landowners contacted during preparation of this Supplement to the EE/CA reported that they do not plow their fields. One group of individuals located in OOU-5 reportedly plows their ground annually to an approximate depth of 8 inches. In consideration of the potential for future conversion of existing farmland to timberland, or future conversion of fallow land to row cropping should economic conditions for row crops improve, a clearance depth of 2 feet is recommended for those areas where the predominant land use is agriculture.

9.8.5 It is recommended that a clearance depth of four feet be conducted around the residential dwellings in the former SWPG.

9.8.6 Priority 1 Actions. The Action Memorandum Priority 1 actions included IC components and clearance to depth near residential areas that are near known high densities of OE, due to the higher level of public activity associated with these areas which results in a high probability of exposure to ordnance (ESE 1997). Several ranges containing high densities of OE and located adjacent to residential areas were also included as Priority 1 actions due to the higher probability that the public may enter these areas and be exposed to ordnance. Priority 1 areas include Ranges 6 and 14 and residential areas NW of the WMA.

9.8.7 This Supplement concurs with the basis for identification of Priority 1 actions and implementation of site-wide Institutional Controls. This Supplement recommends that clearance to a depth of two feet be conducted at Range 6, Range 14, and the residential areas NW of the WMA as the land use in these areas is predominantly forestry and agriculture.

9.8.8 This Supplement also recommends clearance of the former TCRA sites located within OOU-2 through OOU-6, with the exception of TCRA sites 36 and 37 as identified in Appendix F of the Site Prioritization Report (ESE 1994). TCRA sites 36 and 37 include the streambed and stream bank along the South Fork Ozan Creek and Terra Rouge Creek that are incorporated in other Priority recommendations (Terra Rouge Creek is included in the Priority 3 cleanup of Range 8). Clearance to a depth of four feet at the old TCRA sites within the former SWPG as a Priority 1 action provides for a cost-effective and substantial overall reduction in explosive safety risk to the public.

9.8.9 This Supplement recommends the following ICs be implemented as a Priority 1 action:

- enforcement of 'surface use only' land use restriction in the WMA,
- continued implementation of the information/education incorporating multilingual aspects as necessary,
- fence repair along the perimeter of the WMA and installation of additional signage, and
- fabrication and installation of warning signs along county roads.

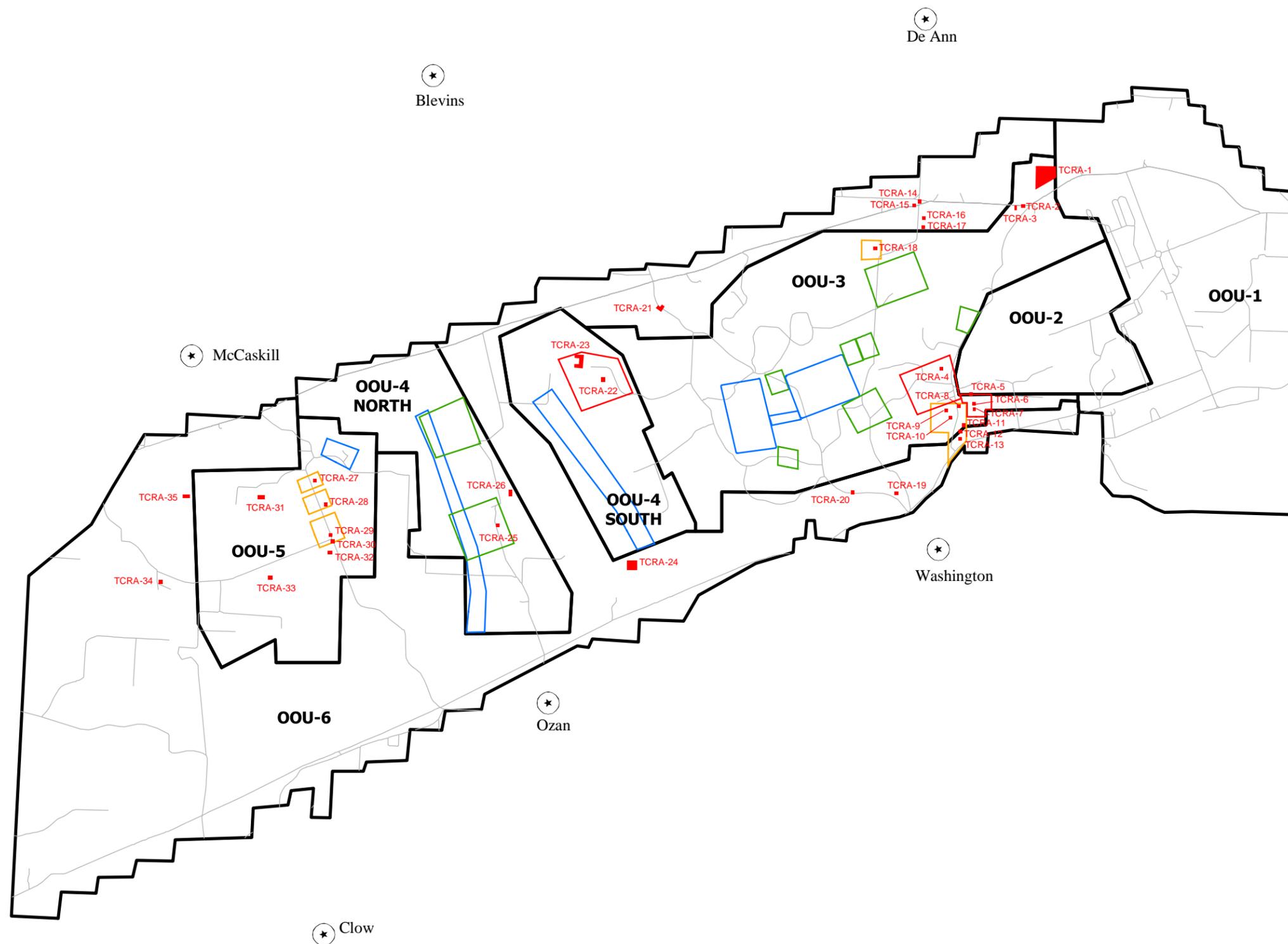
This Supplement also recommends that OE construction support be provided for construction activities by others in OOU-3 through OOU-6. The cost-to-complete the Priority 1 actions is \$10,951,284. Table 9.1 provides updated cost-to-complete estimates based on the recommendations in this Supplement in addition to the Action Memorandum recommendations and original cost estimates. The basis for the Supplement recommendations cost-to-complete clearance estimate is provided in Appendix D. The location for the Priority 1 clearance actions is shown in Figure 9.1.

9.8.10 Priority 2 Actions. The Action Memorandum Priority 2 actions were defined as those clearance actions that were determined to provide a less cost-effective risk reduction than the

Figure 9.1

Former Southwestern Proving Ground
Hempstead County, Arkansas

**Recommended
Priority Action Areas**



Legend

- Town / City
- Road
- OOU Boundary & ID
- Old TCRA Site Location (ESE 1994)
- Implementation Priority Area**
 - 1
 - 2
 - 3
 - 4



NOTE:
1. Priority 5 action includes 643 acres of surface clearance along fencelines and hedgerows in OOU-3, OOU-4, and OOU-5.



Coordinate System: NAD 1983 State Plane Arkansas, South (FEET)

PARSONS

U.S. ARMY ENGINEERING
AND SUPPORT CENTER,
HUNTSVILLE

DESIGNED BY:	BT	Figure 9.1 Recommended Priority Action Areas	
DRAWN BY:	BT		
CHECKED BY:	MS	SCALE: 1 inch equals 8,000 feet	PROJECT NUMBER: 740168
SUBMITTED BY:	MS	DATE: August 2004	PAGE NUMBER:
		FILE: x:\gjs\740168\maps\eecca_final\figure9_1.mxd	

**Table 9.1 Summary of Action Memorandum and Supplement Recommendations
Former Southwestern Proving Grounds (SWPG), AR**

Final EE/CA Report (August 1997) and Action Memorandum (August 1997)			Final EE/CA Supplement (August 2004)		
Risk Reduction Alternatives (by Priority Action)	Cost of Risk Reduction Alternatives	Comments	Risk Reduction Alternatives (by Priority Action)	Cost of Risk Reduction Alternatives	Comments
OOU-1 No Further Action (NOFA).	\$0		OOU-1 No Further Action (NOFA).	\$0	
OOU-2 1. Maintain ICs (Info/Ed). 1. Develop/implement ICs (Info/Ed). 1. ICs (Fab./install signs on perimeter fencing & enforce land use controls).	\$2,400 - Annually. \$15,180 - First year only. \$100,100 - Includes inspect/repair perimeter fencing.		OOU-2 1. ICs (Info/Ed program). 1. ICs (Fab./install additional signs on perimeter fencing & enforce "surface use only" land use restrictions).	\$2,400 - Annually. 1st year cost done. \$30,000 - Includes repair of 2,500 linear feet of perimeter fencing. No \$ for sign maintenance.	
Subtotal =	\$115,280 - Excludes annual cost.		Subtotal =	\$30,000 - Excludes annual cost.	
Subtotal =	\$2,400 - Annual cost		Subtotal =	\$2,400 - Annual cost	
OOU-3 1. Maintain ICs (Info/Ed). 1. Develop/implement ICs (Info/Ed). 1. Clear to surface & depth residential areas NW of the WMA (60 acs). 1. Clearance in/around Rge 6 (240 acs). 2. Clearance in/around Rges 10 & 12, and the creek bed between them (650 acs). 3. Clear KNOWN contaminated areas in/around Rge 8 (230 acs). 3. Clear areas near EE/CA grid sites 89, 90, 94, 98, and 99 (200 acs). 4. Clearance of residential areaa NW of the WMA, other than Priority 1 sites (150 acs). 4. Clearance of residential area on east side of OOU-3 (40 acs.) 5. Surface clearance fence lines/hedgerows (460 ac	\$2,400 - Annually. \$15,180 - First year only. \$782,400 \$3,129,600 \$8,398,667 \$2,980,657 \$2,591,876 \$1,953,894 \$521,039 \$5,928,708		OOU-3 1. ICs (Info/Ed program). Include multilingual. 1. ICs (Fab./install signs along county roads). 1. Clearance to 2 feet bgs in residential area NW of the WMA (60 acs). 1. Clearance to 2 feet in/around Rge 6 (240 acs). 1. Clearance to 4 feet @ twelve old TCRA sites (16 acs). 1. OE Construction support. 2. Clearance to 2 feet in/around Rges 10 & 12, and surface clearance in the creek bed between the ranges (650 acs). 3. Clearance to 2 feet known contaminated areas in/around Rge 8 (230 acs). 3. Clearance to 2 feet known contaminated areas in/around Rge 11 (135 acs). 3. Clearance to 2 feet areas near EE/CA grid sites 89, 90, 94, 98, and 99 (200 acs). 4. Clearance to 2 feet of residential areas NW of the WMA, other than Priority 1 sites (120 acs) 4. Clearance to 2 feet of residential area on east side of ODU-3 (40 acs). 5. Surface clearance of fence lines/hedgerows (469 acs.)	\$2,400 - Annually. 1st year cost done. \$1,000 - No \$ for sign maintenance. \$1,008,480 \$4,722,960 \$315,568 - TCRA sites 1-11 & 18. \$40,000 - Annually. Only for selected construction activities. \$12,516,790 \$4,093,540 \$2,402,730 \$4,210,888 \$2,361,480 - TCRA sites 8, 9, 10 & 11 addressed separately. Also minus quarry acreage. \$672,320 \$2,530,000 - 95 miles & 20 feet on each side.	
Subtotal =	\$26,302,021 - Excludes annual cost.		Subtotal =	\$34,835,756 - Excludes annual cost.	
Subtotal =	\$2,400 - Annual cost		Subtotal =	\$42,400 - Annual cost	

Table 9.1 Summary of Action Memorandum and Supplement Recommendations (Continued)

Final EE/CA Report (August 1997) and Action Memorandum (August 1997)			Final EE/CA Supplement (August 2004)		
Risk Reduction Alternatives (by Priority Action)	Cost of Risk Reduction Alternatives	Comments	Risk Reduction Alternatives (by Priority Action)	Cost of Risk Reduction Alternatives	Comments
OOU-4			OOU-4		
1. Maintain ICs (Info/Ed).	\$2,400	- Annually.	1. ICs (Info/Ed program). Include multilingual.	\$2,400	- Annually. 1st year cost done.
1. Develop/implement ICs (Info/Ed).	\$15,180	- First year only.	1. ICs (Fab./install signs along county roads).	\$1,000	- No \$ for sign maintenance.
1. Clear in/around Rge 14. One residence-chicken farm (300 acs).	\$3,752,000		1. Clearance to 2 feet in/around Rge 14 (300 acs).	\$3,927,000	
2. Clearance along banks of South & Middle Fork Ozan Creeks (34 acs).	\$462,463	- 25 feet on each side of creekbed.	1. Clearance to 4 feet @ four old TCRA sites (8 acs).	\$195,888	- TCRA sites 22, 23, 25 & 26.
3. Clear in & around Ranges 18 and 19 (510 acs).	\$6,322,400		1. OE Construction support.	\$40,000	- Annually. Only selected work.
5. Surface clearance of fence lines/hedgerows (92 acs.)	\$1,171,967	- 19 miles & 20 feet on either side.	2. Surface clearance in riverbeds of South & Middle Fork Ozan Creeks (14 acs).	\$107,663	- No clearance of river banks.
	Subtotal =	\$11,724,010	- Excludes annual cost.		
	Subtotal =	\$2,400	- Annual cost		
OOU-5			OOU-5		
1. Maintain ICs (Info/Ed).	\$2,400	- Annually.	1. ICs (Info/Ed program). Include multilingual.	\$2,400	- Annually. 1st year cost done.
1. Develop/implement ICs (Info/Ed).	\$15,180	- First year only.	1. ICs (Fab./install signs along county roads).	\$1,000	- No \$ for sign maintenance.
2. Clear to depth in/around Old Dry Target Lake (70 acs).	\$652,800		1. Clearance to 4 feet @ seven old TCRA sites (9 acs).	\$220,374	- TCRA sites 27-33.
4. Clearance to depth of residences (160 acs.)	\$1,414,400		1. OE Construction support.	\$40,000	- Annually. Only for selected construction activities.
5. Surface clearance of fence lines/hedgerows of fence lines/hedgerows (92 acs).	\$825,388	- 19 miles & 20 feet on either side.	2. Clearance to 2 feet in/around Old Dry Target Lake (70 acs).	\$1,728,881	
	Subtotal =	\$2,907,768	- Excludes annual cost.		
	Subtotal =	\$2,400	- Annual cost		
OOU-6			OOU-6		
1. Maintain ICs (Info/Ed).	\$2,400	- Annually.	1. ICs (Info/Ed program).	\$2,400	- Annually. 1st year cost done.
1. Develop/implement ICs (Info/Ed).	\$15,180	- First year only.	1. ICs (Fab./install signs along county roads).	\$1,000	- No \$ for sign maintenance.
	Subtotal =	\$15,180	- Excludes annual cost.		
	Subtotal =	\$2,400	- Annual cost		
TOTAL COST TO IMPLEMENT RISK REDUCTION ALTERNATIVES			COST TO IMPLEMENT RISK REDUCTION ALTERNATIVES		
		\$41,064,259	- One-time costs.		\$51,185,876
		\$12,000	- Annual costs.		\$172,000

Priority 1 actions. Priority 2 actions that were identified in the Action Memorandum included clearance to depth of affected creek beds, lakebeds, and other areas that are subject to significant erosion that could uncover ordnance or where the users of adjacent land potentially have disposed of ordnance in the past. Priority 2 actions included clearance to depth around Ranges 10 and 12 and the creek bed that traverses these two ranges in OOU-3, the Old Dry Target Lake Range in OOU-5 and along the South and Middle Fork Ozan Creek in OOU-4.

9.8.11 This Supplement concurs with the basis for identification of Priority 2 actions and recommends completion of these removals to a depth of two feet based on the reported depths of intrusive site activities in these areas. The cost-to-complete the Priority 2 clearance actions is \$14,353,334. The location for the Priority 2 clearance actions is shown in Figure 9.1.

9.8.12 **Priority 3 Actions.** The Action Memorandum Priority 3 actions were defined to include clearance to depth in areas with known UXO in and around Ranges 8, 18, and 19 and other areas (centered around individual EE/CA sampling grids 89, 90, 94, 98, and 99) that are near county roads with high densities of UXO. The predominant land use in each of these Priority 3 action areas is forestry and/or farming. This Supplement concurs with the basis for identification of Priority 3 actions and recommends completion of these removals to a depth of two feet. The cost to complete the Priority 3 clearance actions is \$17,383,058. The location for the Priority 3 clearance actions is shown in Figure 9.1.

9.8.13 **Priority 4 Actions.** The Action Memorandum Priority 4 actions were defined to include supplemental OE sampling and selective implementation of surface clearance and clearance to depth in residential areas adjacent to known contaminated areas or high public activity areas located where the extent of ordnance is unknown or poorly known. Priority 4 areas identified include approximately 160 acres along the southern boundary of the Main Bombing Range in OOU-5, approximately 150 acres NW of the WMA (of which approximately 30 acres is an active quarry operation), and a residential area (40 acres) on the east side of OOU-3. The predominant land use in these areas is farming, forestry, and industrial (quarry). The quarry has not been included in the Priority 4 actions because it has been extensively excavated with no reported ordnance. This Supplement concurs with the basis for identification of Priority 4 actions and recommends completion of these removals to a depth of two feet consistent with the predominant land use activities in these areas. The cost to complete the Priority 4 clearance actions is \$5,128,200. The location for the Priority 4 clearance actions is shown in Figure 9.1.

9.8.14 **Priority 5 Actions.** The Action Memorandum Priority 5 actions were defined to include supplemental OE sampling and selective implementation of surface clearance along fence lines and hedgerows in areas closest to where OE is either known or suspected, along county roads, and near residences. This Supplement concurs with the basis for identification of Priority 5 actions and recommends a surface clearance be conducted in these areas. The cost to complete the Priority 5 clearance actions is \$3,542,000.

CHAPTER 10

RECOMMENDED RESPONSE ACTION ALTERNATIVE

10.1 INTRODUCTION

10.1.1 This Supplement to the EE/CA incorporates new information obtained since the Final EE/CA Report was published. The elements of the Final EE/CA Report that were updated during the Supplement study include: 1) OE site characterization; 2) current and future land use designations; 3) OE risk evaluation; 4) analysis of risk reduction alternatives including institutional controls, and 5) cost-to-complete estimates. Also, improvements in OE clearance technology were evaluated.

10.1.2 During the course of the Supplement study, citizens from the local community, and industry and government representatives were contacted in an attempt to assess local land use practices. This was done, primarily, in order to optimize future OE clearance depths. Also during the study, persons were asked to comment on the effectiveness of existing institutional controls being implemented at the site. This chapter presents the updated recommended response action alternative and its corresponding cost-to-complete estimate.

10.2 RECOMMENDATIONS

10.2.1 Overview

10.2.1.1 This Supplemental EE/CA generally concurs with the recommendation contained in the EE/CA Report. In the case of Institutional Controls (ICs), less repair of perimeter fencing is recommended for OOU-2. Otherwise, the recommendation for ICs remains unchanged from the EE/CA. The areas and acreage to be cleared of ordnance basically remains unchanged from the EE/CA to the Supplemental EE/CA. Changes include; 1) the Supplemental EE/CA stipulates specific clearance depths which coincide with future land use, 2) the Supplement includes old TCRA sites for clearance of OE, and 3) OE Construction Support is included as a Priority 1 action in the EE/CA Supplement for selected construction activities by others.

10.2.1.2 The one-time cost associated with the implementation of the recommended alternative has increased from approximately \$41 million in the EE/CA to approximately \$51 million in the Supplemental EE/CA. The increase is due, primarily, to 1) the inclusion of the TCRA sites, 2) a different source for the unit costs used to prepare the estimates, and 3) inflation. The technology used in the detection and clearance of OE has changed significantly during the past six (6) years. It was hoped that this project could take advantage of the newer technologies and efficiencies. However, due to the extensive amount of OE fragmentation in the Priority areas, "mag-and-dig" technology was used for the cost estimate and is still recommended over more advanced digital geophysical methods (DGM) except where DGM may be applicable i.e., less metal fragmentation

debris present. See Appendix E for a discussion of OE Detection, Recovery, and Disposal Technologies.

10.2.1.3 The recommended alternatives of this Supplemental EE/CA are presented in Table 10.1. Table 10.2 presents a CSM comparison between the Final EE/CA Report and Supplemental EE/CA, with previous and current cost estimates provided.

10.2.2 OOU-1 - Airport/Building Area

The Final EE/CA Report and Action Memorandum (dated August 1997) recommended “No Further Action” for this ordnance operable unit. Since 1997, no new information has been forthcoming that would warrant changing the EE/CA recommendation. Therefore, it is recommended that the recommendation for OOU-1 remain “No Further Action” by the Government.

10.2.3 OOU-2 – Wildlife Management Area

10.2.3.1 OOU-2 is utilized as a wildlife management area and is administered by the AG&FC. The entire 2,115-acre area is open for hunting. Approximately 500 acres in food plots are reportedly disced semiannually to a depth of 6 inches for habitat improvement. It is unlikely that the future land use will change. No residences are located within the unit. The presence of UXO was confirmed during the EE/CA investigation.

10.2.3.2 **Priority 1 Actions.** The 1960 Quitclaim deed recommended that land use in the WMA be restricted to ‘surface use only’. It is recommended that the enforcement of the land use restriction be formalized in an agreement between USACE and AG&FC. It is also recommended that additional signage be installed on the fence and along access roads into the WMA, and 2,500 feet of perimeter fencing be repaired. Distribution of informational/educational materials to hunters and other visitors to the WMA should be coordinated with AG&FC officials. The cost for site-wide implementation of ICs in OOU-2 is \$30,000 the first year, and \$2,400 annually.

10.2.3.3 If the AG&FC is not willing to enforce land use restrictions within OOU-2, an OE clearance to one-foot below ground surface (bgs) is recommended within the food plot areas, and an OE surface clearance is recommended in the intervening forested area. The cost-to-complete these clearance actions would be \$25,303,575 (Appendix D).

10.2.3.4 **Other Priority Actions.** No Priority 2, 3, 4 or 5 actions are recommended in OOU-2.

10.2.4 OOU-3 – Short Distance Impact Area

10.2.4.1 OOU-3 includes the portion of the former Impact Area immediately north of the old Firing Line. Land is primarily used for agriculture (livestock production), commercial forestry, and hunting. The EE/CA investigation results, coupled with the ORA findings, confirm the presence of UXO explosive hazards within OOU-3.

10.2.4.2 **Priority 1 Actions.** Implementation of a site-wide informational/educational ICs program and installation of signage along county roads is recommended. The cost for site-wide implementation of ICs in OOU-3 is \$1,000 the first year, and \$2,400 annually.

Table 10.1 Cost of Recommended Alternative by OOU, Former Southwestern Proving Grounds (SWPG), AR

Final

Ordnance Operable Units (OOU)	Description	Acres	Current Owner(s)	Recommended Alternative (by Priority Action)	Cost of Recommended Alternative	Comments
1	Airport/Building Area. South of the firing line.	8,700	Private interests/ City of Hope	No Further Action (NOFA).	\$0	
2	Wildlife Management Area (WMA)	2,115	Arkansas Game & Fish Commission (AGFC)	1. ICs (Info/Ed program). Include multilingual. 1. ICs (Fab./install additional signs on perimeter fencing & enforce "surface use only" land use restrictions.	\$2,400 \$30,000 Subtotal = \$30,000 Subtotal = \$2,400 Total = \$32,400	- Annually. 1st year cost done. - Includes repair of 2,500 linear feet of perimeter fencing. No \$ for sign maintenance. - Excludes annual cost. - Annual cost - Total costs including annual costs
3	Short Distance Impact Area	8,200	Private interests (Several hundred separate land parcels from 20 to 600 acres in size).	1. ICs (Info/Ed program). Include multilingual. 1. ICs (Fab./install signs along county roads). 1. Clearance to 2 feet bgs in residential area NW of the WMA (60 acs). 1. Clearance to 2 feet in/around Rge 6 (240 acs). 1. Clearance to 4 feet @ twelve old TCRA sites (16 acs). 1. OE Construction support. 2. Clearance to 2 feet in/around Rges 10 & 12, and surface clearance in the creek bed between the ranges (650 acs). 3. Clearance to 2 feet known contaminated areas in/around Rge 8 (230 acs). 3. Clearance to 2 feet known contaminated areas in/around Rge 11 (135 acs). 3. Clearance to 2 feet areas near EE/CA grid sites 89, 90, 94, 98, and 99 (200 acs). 4. Clearance to 2 feet of residential areas NW of the WMA, other than Priority 1 sites (120 acs). 4. Clearance to 2 feet of residential area on east side of OOU-3 (40 acs). 5. Surface clearance of fence lines/hedgerows (460 acs).	\$2,400 \$1,000 \$1,008,480 \$4,722,960 \$315,568 \$40,000 \$12,516,790 \$4,093,540 \$2,402,730 \$4,210,888 \$2,361,480 \$672,320 \$2,530,000 Subtotal = \$34,835,756 Subtotal = \$42,400 Total = \$34,878,156	- Annually. 1st year cost done. - No \$ for sign maintenance. - TCRA sites 1-11 & 18. - Annually. Only for selected construction activities. - TCRA sites 8, 9, 10 & 11 addressed separately. Also minus quarry acreage. - 95 miles & 20 feet on each side. - Excludes annual cost. - Annual cost - Total costs including annual costs
4	Long Distance Artillery Impact Area	5,800	Private individuals & companies (~ 50 separate land parcels).	1. ICs (Info/Ed program). Include multilingual. 1. ICs (Fab./install signs along county roads). 1. Clearance to 2 feet in/around Rge 14 (300 acs). 1. Clearance to 4 feet @ four old TCRA sites (8 acs). 1. OE Construction support. 2. Surface clearance in riverbeds of South & Middle Fork Ozan Creeks (14 acs). 3. Clearance to 2 feet in/around Ranges 18 and 19 (510 acs). 5. Surface clearance of fence lines/hedgerows (92 acs).	\$2,400 \$1,000 \$3,927,000 \$195,888 \$40,000 \$107,663 \$6,675,900 \$506,000 Subtotal = \$11,413,451 Subtotal = \$42,400 Total = \$11,455,851	- Annually. 1st year cost done. - No \$ for sign maintenance. - TCRA sites 22, 23, 25 & 26. - Annually. Only selected work. - No clearance of river banks. - 19 miles & 20 feet on either side. - Excludes annual cost. - Annual cost - Total costs including annual costs
5	Bombing Ranges (Main & Old Dry Lake)	3,335	Private individuals & companies (~30 separate land parcels).	1. ICs (Info/Ed program). Include multilingual. 1. ICs (Fab./install signs along county roads). 1. Clearance to 4 feet @ seven old TCRA sites (9 acs). 1. OE Construction support. 2. Clearance to 2 feet in/around Old Dry Target Lake (70 acs). 4. Clearance to 2 feet in/around residences (160 acs). 5. Surface clearance of fence lines/hedgerows (92 acs).	\$2,400 \$1,000 \$220,374 \$40,000 \$1,728,881 \$2,094,400 \$506,000 Subtotal = \$4,550,655 Subtotal = \$42,400 Total = \$4,593,055	- Annually. 1st year cost done. - No \$ for sign maintenance. - TCRA sites 27-33. - Annually. Only for selected construction activities. - 19 miles & 20 feet on either side. - Excludes annual cost. - Annual cost - Total costs including annual costs
6	Buffer Area	22,000	Private interests (Several hundred separate land parcels).	1. ICs (Info/Ed program). Include multilingual. 1. ICs (Fab./install signs along county roads). 1. Clearance to 4 feet @ twelve old TCRA sites (18 acs). 1. OE Construction support.	\$2,400 \$1,000 \$355,014 \$40,000 Subtotal = \$356,014 Subtotal = \$42,400 Total = \$398,414	- Annually. 1st year cost done. - No \$ for sign maintenance. - TCRA sites 12-17, 19-21, 24, 34 & 35. - Annually. Only for selected construction activities. - Annual cost - Total costs including annual costs
TOTALS		50,150		TOTAL COST TO IMPLEMENT RECOMMENDED ALTERNATIVE	\$51,185,876 \$172,000	- One-time costs. - Annual costs.

Table 10.2 Conceptual Site Model Comparison, Former Southwestern Proving Grounds (SWPG), AR

General Site Information												Final EE/CA Report (August 1997) and Action Memorandum (August 1997)			Final EE/CA Supplement (August 2004)		
Ordnance Operable Units (OOUs)	Description	Acres	Range Impact Areas	Site Decon. by DOD Prior to Transfer _1/	Deed Restrictions Pertaining to OE	Current Owner(s)	Current/Future Land Use _2/	# of Private Residences	Presence of OE in OOU	Prior Military Use	Comments	Risk Reduction Alternatives (by Priority Action)	Cost of Risk Reduction Alternatives	Comments	Risk Reduction Alternatives (by Priority Action)	Cost of Risk Reduction Alternatives	Comments
1	Airport/Building Area. South of the firing line.	8,700	None	No	None	Private interests/ City of Hope	Pasture (61%) Commercial (18%) Agriculture (10%) Forestry (8%) Roadways (3%) Residential (<0.1%)	0	None	None	- OE may have been temporarily stored, but indications are that any OE was moved before site closure.	No Further Action (NOFA).	\$0		No Further Action (NOFA).	\$0	
2	Wildlife Management Area (WMA)	2,115	1, 1A, 1B, 1C, 4, 4A, 5	Yes (mid-50's)	Surface Use Only.	Arkansas Game & Fish Commission (AGFC)	Forestry (77%) Pasture (11%) Agriculture (10%) Roadways (2%) Commercial (0%) Residential (0%)	0	Confirmed	Target impact area for mortars & artillery (Inert & live). MPM=105mm.	- Large % of OE expected to be found below the surface.	1. Maintain ICs (Info/Ed). 1. Develop/implement ICs (Info/Ed). 1. ICs (Fab./install signs on perimeter fencing & enforce land use controls). Subtotal =	\$2,400 - Annually. \$15,180 - First year only. \$100,100 - Includes inspect/repair perimeter fencing. \$115,280 - Excludes annual cost.		1. ICs (Info/Ed program). Include multilingual. 1. ICs (Fab./install additional signs on perimeter fencing & enforce "surface use only" land use restrictions). Subtotal =	\$2,400 - Annually. \$30,000 - Includes repair of 2,500 linear feet of perimeter fencing. No \$ for sign maintenance. \$30,000 - Excludes annual cost. \$2,400 - Annual cost	
3	Short Distance Impact Area	8,200	Mortar, 2, 3, 6, 8, 9, 10, 11, 12	Yes (1947-49)	Surface Use Only.	Private interests (Several hundred separate land parcels from 20 to 600 acres in size).	Forestry (86%) Pasture (10%) Agriculture (2%) Roadways (1.5%) Commercial (.5%) Residential (<0.1%)	12	Confirmed	Target impact area for mortars & artillery (Inert & live). MPM=105mm.	- Significant amount of OE expected to be found both on and below the surface.	1. Maintain ICs (Info/Ed). 1. Develop/implement ICs (Info/Ed). 1. Clear to surface & depth residential areas NW of the WMA (60 acs). 1. Clearance in/around Rge 6 (240 acs). 2. Clearance in/around Rges 10 & 12, and the creek bed between them (650 acs). 3. Clear KNOWN contaminated areas in/around Rge 8 (230 acs). 3. Clear areas near EE/CA grid sites 89, 90, 94, 98, and 99 (200 acs). 4. Sampling & possible clearance of residential areas NW of the WMA, other than Priority 1 sites (150 acs). 4. Sampling & possible clearance of residential area on east side of OOU-3 (40 acs). 5. Sampling & possible surface clearance of fence lines/hedgerows (460 acs). Subtotal =	\$2,400 - Annually. \$15,180 - First year only. \$782,400 \$3,129,600 \$8,398,667 \$2,980,657 \$2,591,876 \$1,953,894 \$521,039 \$5,928,708 \$26,302,021 - Excludes annual cost.		1. ICs (Info/Ed program). Include multilingual. 1. ICs (Fab./install signs along county roads). 1. Clearance to 2 feet bgs in residential area NW of the WMA (60 acs). 1. Clearance to 2 feet in/around Rge 6 (240 acs). 1. Clearance to 4 feet @ twelve old TCRA sites (16 acs). 1. OE Construction support. 2. Clearance to 2 feet in/around Rges 10 & 12, and surface clearance in the creek bed between the ranges (650 acs). 3. Clearance to 2 feet known contaminated areas in/around Rge 8 (230 acs). 3. Clearance to 2 feet known contaminated areas in/around Rge 11 (135 acs). 3. Clearance to 2 feet areas near EE/CA grid sites 89, 90, 94, 98, and 99 (200 acs). 4. Clearance to 2 feet of residential areas NW of the WMA, other than Priority 1 sites (120 acs). 4. Clearance to 2 feet of residential area on east side of OOU-3 (40 acs). 5. Surface clearance of fence lines/hedgerows (460 acs). Subtotal =	\$2,400 - Annually. \$1,000 - No \$ for sign maintenance. \$1,008,480 \$4,722,960 \$315,568 - TCRA sites 1-11 & 18. \$40,000 - Annually. Only for selected construction activities. \$12,516,790 \$4,093,540 \$2,402,730 \$4,210,888 \$2,361,480 - TCRA sites 8, 9, 10 & 11 addressed separately. Also minus quarry acreage. \$672,320 \$2,530,000 - 95 miles & 20 feet on each side. \$34,835,756 - Excludes annual cost. \$42,400 - Annual cost	
4	Long Distance Artillery Impact Area	5,800	14, 15, 16, 17, 18, 19	Yes (1947-49)	Surface Use Only.	Private individuals & companies (~ 50 separate land parcels).	Agriculture (59%) Forestry (29%) Pasture (9%) Roadways (3%) Residential (<0.1%) Commercial (0%)	5	Confirmed	Target impact area for artillery (Inert & live). MPM=155mm.	- Includes South & Middle Fork Ozan Creeks. OE less dense than in OOU 3.	1. Maintain ICs (Info/Ed). 1. Develop/implement ICs (Info/Ed). 1. Clear in/around Rge 14. One residence-chicken farm (300 acs). 2. Clearance along banks of South & Middle Fork Ozan Creeks (34 acs). 3. Clear in & around Ranges 18 and 19 (510 acs). 5. Sampling & possible surface clearance of fence lines/hedgerows (92 acs). Subtotal =	\$2,400 - Annually. \$15,180 - First year only. \$3,752,000 \$462,463 - 25 feet on each side of creekbed. \$6,322,400 \$1,171,967 - 19 miles & 20 feet on either side. \$11,724,010 - Excludes annual cost.		1. ICs (Info/Ed program). Include multilingual. 1. ICs (Fab./install signs along county roads). 1. Clearance to 2 feet in/around Rge 14 (300 acs). 1. Clearance to 4 feet @ four old TCRA sites (8 acs). 1. OE Construction support. 2. Surface clearance in riverbeds of South & Middle Fork Ozan Creeks (14 acs). 3. Clearance to 2 feet in/around Ranges 18 and 19 (510 acs). 5. Surface clearance of fence lines/hedgerows (92 acs). Subtotal =	\$2,400 - Annually. \$1,000 - No \$ for sign maintenance. \$3,927,000 \$195,888 - TCRA sites 22, 23, 25 & 26. \$40,000 - Annually. Only selected work. \$107,663 - No clearance of river banks. \$6,675,900 \$506,000 - 19 miles & 20 feet on either side. \$11,413,451 - Excludes annual cost. \$42,400 - Annual cost	
5	Bombing Ranges (Main & Old Dry Lake)	3,335	Two bombing ranges.	Yes (1947-49)	Surface Use Only.	Private individuals & companies (~30 separate land parcels).	Forestry (59%) Pasture (37%) Roadways (2%) Agriculture (2%) Residential (<0.1%) Commercial (0%)	8	Confirmed	Conventional bombs (Main) & Rockets (Old Dry Lake) (Inert & live). MPM=4.5-inch rocket.	- Includes "highly cratered" areas in Main Range, which indicate "live" bombs were dropped. Sampling showed OE less dense in "Main" range. Large % expected to be found below the surface.	1. Maintain ICs (Info/Ed). 1. Develop/implement ICs (Info/Ed). 2. Clear to depth in/around Old Dry Target Lake (70 acs). 4. Sampling & possible clearance to depth of residences (160 acs). 5. Sampling & possible surface clearance of fence lines/hedgerows (92 acs). Subtotal =	\$2,400 - Annually. \$15,180 - First year only. \$652,800 \$1,414,400 \$825,388 - 19 miles & 20 feet on either side. \$2,907,768 - Excludes annual cost.		1. ICs (Info/Ed program). Include multilingual. 1. ICs (Fab./install signs along county roads). 1. Clearance to 4 feet @ seven old TCRA sites (9 acs). 1. OE Construction support. 2. Clearance to 2 feet in/around Old Dry Target Lake (70 acs). 4. Clearance to 2 feet in/around residences (160 acs). 5. Surface clearance of fence lines/hedgerows (92 acs). Subtotal =	\$2,400 - Annually. \$1,000 - No \$ for sign maintenance. \$220,374 - TCRA sites 27-33. \$40,000 - Annually. Only for selected construction activities. \$1,728,881 \$2,094,400 \$506,000 - 19 miles & 20 feet on either side. \$4,550,655 - Excludes annual cost. \$42,400 - Annual cost	
6	Buffer Area	22,000	None	No	None	Private interests (Several hundred separate land parcels).	Forestry (67%) Pasture (17%) Agriculture (14%) Roadways (0.7%) Commercial (0.6%) Water (0.5%) Residential (0.2%)	12	Potential	Not a target area. May contain mis-directed or errant OE.	- No OE found during sampling, although possibility exists that OE is present.	1. Maintain ICs (Info/Ed). 1. Develop/implement ICs (Info/Ed). Subtotal =	\$2,400 - Annually. \$15,180 - First year only. \$15,180 - Excludes annual cost.		1. ICs (Info/Ed program). Include multilingual. 1. ICs (Fab./install signs along county roads). 1. Clearance to 4 feet @ twelve old TCRA sites (18 acs). 1. OE Construction support. Subtotal =	\$2,400 - Annually. \$1,000 - No \$ for sign maintenance. \$355,014 - TCRA sites 12-17, 19-21, 24, 34 & 35. \$40,000 - Annually. Only for selected construction activities. \$356,014 \$42,400 - Annual cost	
TOTALS		50,150						37				TOTAL COST TO IMPLEMENT RISK = REDUCTION ALTERNATIVES	\$41,064,259 - One-time costs. \$12,000 - Annual costs.		TOTAL COST TO IMPLEMENT RISK = REDUCTION ALTERNATIVES	\$51,185,876 - One-time costs. \$172,000 - Annual costs.	

_1/ Visual surface clearance only.
_2/ Data derived from the EE/CA. Current land use is not expected to change significantly.

10.2.4.3 OE Construction Support for selected construction activities by others is recommended. The annual cost for OE Construction Support in OOU-3 is \$40,000 annually (Appendix D). A subsurface clearance to a depth of 2 feet is recommended to mitigate the explosive safety risk in and around Range 6, and the residential area NW of the WMA. Clearance to a depth of 4 feet is recommended around old TCRA sites 1 -11 and 18. The cost-to-complete these clearance actions is \$6,047,008.

10.2.4.4 **Priority 2 Actions.** A subsurface clearance to a depth of 2 feet is recommended to mitigate the explosive safety risk in and around Ranges 10 and 12 and the creekbed between these ranges. The cost-to-complete these clearance actions is \$12,516,790.

10.2.4.5 **Priority 3 Actions.** A subsurface clearance to a depth of 2 feet is recommended to mitigate the explosive safety risk in and around Range 8 and selected EE/CA field investigation sites 89, 90, 94, 98, and 99. Clearance to a depth of 2 feet in and around Range 11 is an additional recommendation of the Supplemental EE/CA. The cost-to-complete these clearance actions is \$10,707,158.

10.2.4.6 **Priority 4 Actions.** Supplemental sampling and selective implementation of a 2-foot clearance to mitigate the explosive safety risk near the residential area located NW of WMA and on east side of the ordnance operable unit. The cost-to-complete these clearance actions is \$3,033,800.

10.2.4.7 **Priority 5 Actions.** Supplemental sampling and selective implementation of a surface clearance is recommended along fence lines and hedgerows. The cost-to-complete this clearance action is \$2,530,000.

10.2.5 OOU-4 – Long Distance Artillery Range

10.2.5.1 OOU-4 contains numerous perennial streams and two large creeks. The two large creeks are the South Fork Ozan Creek located within OOU-4 South, and the Middle Fork Ozan Creek within OOU-4 North.

10.2.5.2 **Priority 1 Actions.** Implementation of a site-wide informational/educational ICs program and installation of signage along county roads is recommended. The cost for site-wide implementation of ICs in OOU-4 is \$1,000 the first year, and \$2,400 annually.

10.2.5.3 OE Construction Support for selected construction activities by others is recommended. The annual cost for OE Construction Support in OOU-4 is \$40,000 annually. A subsurface clearance to a depth of 2 feet is recommended to mitigate the explosive safety risk in and around Range 14. Clearance to depth is recommended around old TCRA sites 22, 23, 25, and 26. The cost-to-complete these clearance actions is \$4,122,888.

10.2.5.4 **Priority 2 Actions.** A surface clearance only in the riverbeds of the South and Middle Fork Ozan Creeks is recommended to mitigate the explosive safety risk. The creeks levels fluctuate between six inches to four-feet in depth depending on the time of year. The creeks can only be effectively and safely cleared during the low water period of the year. No attempt will be

made to dig below the interface of the creek water level and the ground surface. The cost-to-complete these clearance actions is \$107,663.

10.2.5.5 Priority 3 Actions. A clearance to a depth of 2 feet is recommended to mitigate the explosive safety risk in and around Ranges 18 and 19 as shown in Table 10-1, OOU 4.. The cost-to-complete these clearance actions is \$6,675,900.

10.2.5.6 Priority 4 Actions. No Priority 4 actions are recommended in OOU-4.

10.2.5.7 Priority 5 Actions. Supplemental sampling and selective implementation of a surface clearance is recommended along fence lines and hedgerows. The cost-to-complete this clearance action is \$506,000.

10.2.6 OOU-5 – Bombing Range

10.2.6.1 OOU-5 includes the Main Bombing Range and the Old Dry Target Lake Range that were part of the former SWPG. Land is primarily used for agriculture (livestock production) and commercial forestry. The EE/CA investigation results, coupled with the ORA findings, confirm the presence of UXO explosive hazards within OOU-5.

10.2.6.2 Priority 1 Actions. Implementation of a site-wide informational/educational ICs program and installation of signage along county roads is recommended. The cost for site-wide implementation of ICs in OOU-5 is \$1,000 the first year, and \$2,400 annually.

10.2.6.3 OE Construction Support for selected construction activities by others is recommended. The cost for OE Construction Support in OOU-5 is \$40,000 annually. An additional Priority 1 Action recommendation is clearance to a depth of 4 feet around old TCRA sites 27 through 33. The cost-to-complete this clearance action is \$220,374.

10.2.6.4 Priority 2 Actions. A subsurface clearance to a depth of 2 feet is recommended to mitigate the explosive safety risk in the Old Dry Target Lake. The cost-to-complete this clearance action is \$1,728,881.

10.2.6.5 Priority 3 Actions. No Priority 3 actions are recommended in OOU-5.

10.2.6.6 Priority 4 Actions. Supplemental sampling and selective implementation of a 2-foot clearance to mitigate the explosive safety risk near the residential areas along the southern boundary of the Bombing Range. The cost-to-complete this clearance action is \$2,094,400.

10.2.6.7 Priority 5 Actions. Supplemental sampling and selective implementation of a surface clearance is recommended along fence lines and hedgerows. The cost-to-complete this clearance actions is \$506,000.

10.2.7 OOU-6 – Buffer Area

10.2.7.1 OOU-6 includes all areas within the former SWPG boundaries that are not included in other OOUs. Although no UXO was detected in OOU-6, a low explosive safety risk is considered

to be present because of the large amount of UXO in adjoining units and potential for migration of UXO by human intervention.

10.2.7.2 Priority 1 Actions. Implementation of a site-wide informational/educational ICs program and installation of signage along county roads is recommended. The cost for site-wide implementation of ICs in OOU-6 is \$1,000 the first year, and \$2,400 annually.

10.2.7.3 OE Construction Support for selected construction activities by others is recommended. The cost for OE Construction Support in OOU-6 is \$40,000 annually. An additional Priority 1 Action recommendation is clearance to a depth of 4 feet around old TCRA sites 12 through 17, 19 through 21, 24, 34, and 35. The cost-to-complete this clearance action is \$355,014.

10.2.7.4 Other Priority Actions. No Priority 2, 3, 4 or 5 actions are recommended in OOU-6.

10.2.8 Institutional Controls

10.2.8.1 Specific components of the site-wide information/education program may include; 1) continuation of the RAB, 2) continued school visits through the Sentimental Journey, 3) maintain safety and history display at the Hope Municipal Airport, 4) distribution of fact sheets, brochures, and activity books for young children, 5) issue press releases/articles through local media/organizations, and 6) develop/maintain an Internet website. Because of the use of a migrant work force, the need for multilingual communications should be assessed during implementation.

10.2.8.2 Other specific IC measures that may be implemented include: 1) a notice to landowners at least once a year regarding ordnance issues pertaining to their property, and the fact that a "surface use only" land use restriction was included in the deed at the time of conveyance by the Government, and 2) inform local real estate offices that potential buyers of land located within the boundaries of the former SWPG should be informed of the potential of ordnance being on the property.

10.3 COST-TO-COMPLETE

The total estimated cost-to-complete the recommended Priority Actions described above is \$51,185,876 (Table 10.3).

Table 10.3 Estimated Cost-to-Complete by Priority Action

Action	Cost
Priority 1 Actions Excludes Annual Recurring Cost (\$172,000)	\$10,779,284
Priority 2 Actions	\$14,353,334
Priority 3 Actions	\$17,383,058
Priority 4 Actions	\$5,128,200
Priority 5 Actions	\$3,542,000
Total Cost	\$51,185,876

CHAPTER 11 RECURRING REVIEWS

11.1 FOLLOW-ON ACTIVITIES

11.1.1 Once the Supplemental EE/CA and a new Action Memorandum are finalized, implementation of the recommended response action shall begin. Additional follow-on activities by the USACE shall be in the form of Recurring Reviews. The recurring review process is consistent with Section 121(c) of CERCLA, as amended by SARA, and Section 300.430 (f) (4) (ii) of the NCP. The recurring review process, as outlined by these statutes, require that periodic (at least every five years) reviews be conducted for sites where hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

11.1.2 Recurring reviews will be conducted for the former Southwestern Proving Grounds in order to:

- Ensure that public health, safety, and the environment are being protected by the response actions that were implemented.
- Verify the integrity of any site controls.
- Determine if new information has become available that was not available for consideration during the EE/CA that may warrant further action.
- Determine if there is an immediate threat to the public or environment that may require an Accelerated Response.

11.1.3 The recurring review team, which is to be determined, will gather data to determine if any changes within OOU's are relevant and may affect the prior recommendations of the EE/CA. Changes to be evaluated consist of:

- Physical conditions of the OOU;
- Public accessibility and land use;
- New technology or techniques that have become available and may warrant reconsideration or the EE/CA recommendations; and
- Effectiveness of the response action to reduce risk.

11.1.4 Data gathered during the review process will be used to determine if further action needs to be taken to protect public safety and the human environment in each OOU. If it turns out that no changes have taken place since the Supplemental EE/CA was finalized, the OOU's will continue to be monitored at specified intervals. At the completion of the review, a Recurring

Review Report will be prepared, a public notice will be placed in the local newspaper concerning the continued effectiveness of the OE response action, and a formal Decision Document referencing any actions taken will be prepared. The estimated cost for a Recurring Review at the former SWPG is \$35,000 every five years.

CHAPTER 12

REFERENCES

- Department of Defense (DoD). 1999. DoD Ammunition and Explosives Safety Standards. DoD 6055.9-STD. July 1999.
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- Parsons. 2002b. Ordnance Detection and Discrimination Study (ODDS). Final Report, Volume I. Prepared for the U.S. Army Corps of Engineers, Sacramento District.
- U.S. Army Corps of Engineers (USACE). 1993. Archive Search Report for the Former Southwestern Proving Ground.
- U.S. Army Corps of Engineers (USACE). 2000a. Engineer Pamphlet, Ordnance and Explosives Response EP-1100-1-18, April 2000.
- U.S. Army Corps of Engineers (USACE). 2000b. Engineer Manual, Ordnance and Explosives Response EM-1100-1-4009, June 2000.

U.S. Army Corp of Engineers (USACE). 2001. Interim Guidance, Ordnance and Explosives Risk Impact Assessment. March 27, 2001.

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**APPENDIX A
SCOPE OF WORK**

**SCOPE OF WORK
ORDNANCE AND EXPLOSIVES
SUPPLEMENT TO THE
ENGINEERING EVALUATION/COST ANALYSIS
AT THE
FORMER SOUTHWESTERN PROVING GROUND
HOPE, ARKANSAS**
*5 March 2001
Mod 0001: 24 June 2002*

1.0 BACKGROUND AND OBJECTIVE

1.1 The work required under this Scope of Work (SOW) falls under the Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS) program.

1.2 This action shall be performed in a manner consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Sections 104 and 121; Executive Order 12580 and the National Contingency Plan (NCP).

1.3 No OE intrusive activities are anticipated during performance of this Engineering Evaluation/Cost Analysis (EE/CA) Supplement.

1.4 Since completion of the EE/CA and Action Memorandum in August 1997, four Ordnance & Explosives (OE) Removal Actions (RA) have been completed at the site. Performance of these Removal Actions has provided the Corps with a greater understanding of site conditions, including the interests of the public and stakeholders. The basic objective of this EE/CA Supplement is to assimilate the data and knowledge that has been collected since the EE/CA was finalized, and to use that information to accomplish the following primary and secondary objectives.

1.4.1 Primary objectives include the following:

- a. Prepare a new Action Memorandum.
- b. Prepare an amendment to the approved Explosives Safety Submission (ESS).
- c. Coordinate Final EE/CA recommendations and EE/CA Supplement recommendations with the stakeholders and regulators.

1.4.2 Secondary objectives include the following:

- a. Update the existing OE GIS system for SWPG.
- b. Update the OE site characterization.
- c. Update the current and future land use designations for all Priority sites contained in the EE/CA.
- d. Update the EE/CA's OE risk analysis.
- e. Determine the effectiveness of existing institutional controls, and the feasibility of successfully implementing other measures.

- f. Recommend optimum Removal Action clearance depths.
- g. Identify more cost-efficient means of clearing UXO from the site.
- h. Update EE/CA cost-to-complete estimates.

2.0 INTRODUCTION

2.1 Site History. Between 1941 and 1943, the War Department obtained by acquisition a total of 50,077.85 acres of land in Hempstead County, Arkansas. The land to be used for the SWPG, an ammunition test facility, was acquired through Quit Claim Deed or a Declaration of Taking. Approximately 400 families were displaced by the acquisitions.

2.1.1 Construction of the proposed ammunition test facility was in progress by August 1941, and the first artillery round was fired in January 1942. Munitions tested at the SWPG included small arms ammunition; projectiles (up to 155mm); hand grenades and rifle grenades; rockets (as large as 5 in.); mines; mortars (60 and 81mm); and bombs (20, 100, 250, and 500 lb.). Also tested at the site were component parts that included fuzes, detonators, and primers.

2.1.2 In September 1945 the SWPG was closed. Between 1946 and 1949, most of the land contained in the former SWPG (47,962.22 acres) was transferred to the War Assets Administration and subsequently sold to various individuals under a fee simple agreement after being visually inspected for the presence of ordnance. Many of the deeds contained a restrictive clause limiting the land use to "surface use only" when sold.

2.1.3 The remaining 2,115.63 acres of the former SWPG was under the control of the War Department /Department of the Army until 1958 when the land was reported as excess to the General Services Administration (GSA). In January 1960, the GSA conveyed 2,115 acres to the Arkansas Game and Fish Commission by Quit Claim Deed containing a stipulation of "surface use only" and a reversion clause. This land is currently a wildlife management area (WMA) operated by the State of Arkansas. No part of the former SWPG is owned by the U.S. government at the present time.

2.2 Chemical Warfare Materiel. The former SWPG is not a suspected Chemical Warfare Materiel (CWM) facility. CWM may have been present at the site. Archival information states that CWM could have been stored there during World War II. However, no Chemical Warfare Materiel has been observed at the site since its closure and no documentation has been discovered that verifies the presence of Chemical Warfare Materiel. No CWM was found during EE/CA or OE Removal Action field operations.

3.0 SPECIFIC REQUIREMENTS

3.1 (Task 1) - Site Visit & Information Collection. The Contractor shall visit the site, familiarize himself with site conditions, and meet with appropriate Corps and local officials. If the Contractor intends

to visit areas of the site which contain, or potentially contain, UXO, an abbreviated Site Safety and Health Plan (ASSHP) shall be prepared by the Contractor and submitted to the Contracting Officer for review and approval prior to the visit. While visiting areas which potentially contain UXO, all persons must be escorted by someone who, as a minimum, has obtained UXO Technician II qualifications. This UXO technician shall be provided by the Contractor.

3.1.1 The Contractor shall visit CEHNC offices and collect Government-furnished materials (GFM), as listed in paragraph 6.0. The Contractor shall have one person spend one to two days at CEHNC procuring copies of GFM materials. The Contractor shall use a local reproduction company to make necessary copies of GFM materials. The Contractor shall obtain other project-related information, as needed, from other sources.

3.2 (Task 2) - Prepare Work Plan. The Contractor shall prepare an EE/CA Supplement Work Plan (WP) in accordance with CEHNC guidance contained in Data Item Description (DID) OE-001 and this SOW. Only portions of the DID pertaining to this SOW shall apply. The WP shall describe how SOW objectives shall be achieved and tasks accomplished.

3.3 (Task 3) – EE/CA Supplement Report. The Contractor shall prepare and submit an EE/CA Supplement Report. The report shall utilize applicable portions of DID OE-010. Concurrence or changes to Final EE/CA recommendations shall be presented in the EE/CA Supplement Report. In accordance with SOW objectives, the report shall include the following:

3.3.1 Site Characterization. Utilizing existing EE/CA and Removal Action data, the Contractor shall update the site OE characterization, including the nature, location and concentration of OE.

3.3.2 Current & Future Land Use. The Contractor shall determine the current and future land use of all Priority areas contained in the EE/CA.

3.3.3 Risk Evaluation. The Contractor shall update the EE/CA's OE risk analysis. The SiteStats/GridStats and OECert computer modeling programs were used to evaluate public risk during preparation of the EE/CA. New techniques for risk evaluation have been developed since that time. The Contractor shall determine the baseline public exposure and the predicted risk reduction for the selected risk reduction option for any areas recommended for removal action as a result of the EE/CA Supplement. The analysis should include an assessment as to the effect the four Removal Actions has had in reducing risk to the public. The method used in determining risk shall have been proposed and approved in the Work Plan

3.3.4 Institutional Controls. The Contractor shall determine the effectiveness of existing institutional control measures being implemented at the site. The Contractor shall determine the feasibility of successfully implementing other measures. A separate Institutional Analysis report is not required. The implementation of institutional controls is an EE/CA Priority 1 recommendation.

3.3.5 Optimum Clearance Depths. Based upon future land use, etc., the Contractor shall recommend optimum clearance depths for Priority areas. These depths shall be incorporated into the

Amendment to the ESS, and shall be used in the development of SOWs for future removal actions.

3.3.6 New Approaches to Clearing UXO. The Contractor shall evaluate more cost-efficient means of clearing UXO from the site. The evaluation shall include the use of new approaches and innovative technologies. To date, all OE clearance activities have been conducted using “mag and flag” technology. The costs associated with using recommended approaches/technologies shall be compared to the cost of using “mag and flag” technology.

3.3.7 Cost-to-Complete Estimates. The Contractor shall update project cost-to-complete estimates contained in the EE/CA. Estimates should be based upon the amendment to the Explosives Safety Submission and recommended removal technologies for specific Priority areas.

3.4 (Task 4) - Prepare Amendment to the Explosives Safety Submission (ESS). The Contractor shall review the approved Explosives Safety Submission, and prepare an amendment for submittal to Army explosive safety approval authorities. The amendment shall stipulate clearance depths based upon future land use for all Priority areas.

3.5 (Task 5) - Prepare Action Memorandum. The Contractor shall prepare a new Action Memorandum in accordance with applicable CEHNC guidance documents. Recommendations contained in the Action Memorandum shall be consistent with EE/CA Supplement recommendations. The Action Memorandum shall be a bound document and ready for signature.

3.6 (Task 6) - Update OE Geographical Information System (GIS). The Contractor shall incorporate grid and UXO data from the last two Removal Actions into the existing OE GIS system.

3.7 (Task 7) - Meetings and Project Management. The Contractor shall perform project management functions, as necessary, to maintain project control and to meet required reporting requirements.

3.8 (Task 8) – Community Relations Support. The Contractor shall attend and participate in public meetings as directed by the Contracting Officer and outlined in the approved WP. Support may include preparation and delivery of briefings, graphics and presentations. EE/CA Supplement recommendations, presented in context with Final EE/CA recommendations, shall be coordinated with stakeholders and regulators. A 30-day review and comment period on the EE/CA Supplement shall be provided. The EE/CA Supplement shall be revised to incorporate changes resulting from these reviews. The Contractor shall assist the Government in determining the public’s satisfaction with regard to how the Corps has implemented EE/CA recommendations to date.

3.9 (Task 9) – Project Website. The Contractor shall create and maintain a project Internet website, which shall include the Supplemental EE/CA Report and the Action Memorandum.

4.0 SUBMITTALS AND CORRESPONDENCE

4.1 Review Comments. Various reviewers shall have the opportunity to review submittals made by the Contractor under this task order. The Contractor shall review all comments received from the Contracting Officer and evaluate their appropriateness based upon their merit and the requirements of the SOW. The Contractor shall issue to the Contracting Officer a formal, annotated response to each comment received.

4.2 Minutes of Meetings. The Contractor shall prepare and submit to the Contracting Officer (or his representative) the minutes of all significant meetings. Minutes of significant meetings shall be prepared and submitted in accordance with DID OE-045.

4.3 Correspondence. The Contractor shall keep a record of all significant communications, including phone conversations and written correspondence. Records of significant communications shall be prepared and submitted in accordance with DID OE-055.

4.4 Monthly Progress Reports. The Contractor shall prepare and submit monthly progress reports during the life of this task order in accordance with DID OE-080. Each report shall describe the work performed since the previous report, work currently underway, and work anticipated. Each report shall show the earned value curves for the amount of funds obligated, planned and actually spent to date on the project. The report shall provide continuous tracking of the actual versus proposed cost, since the beginning of the project. The report shall state whether current work is on schedule. If the work is not on schedule, the Contractor shall state what actions are anticipated in order to get back on-schedule. The report shall be submitted not later than the 10th day of the following month.

4.5 Public Affairs. Reports and data generated under this contract are the property of the Department of Defense (DoD) and distribution by the Contractor to any other entity, unless authorized by the Contracting Officer, is prohibited.

4.6 Submittal Copies and Mailing Addresses. The Contractor shall use the following addresses and number of copies when distributing the Work Plan, EE/CA Supplement, Amendment to the Explosives Safety Submission, and Action Memorandum documents.

<u>ADDRESS</u>	<u>NUMBER OF COPIES</u>
Commander US Army Engineering and Support Center Huntsville ATTN: CEHNC-OE-DC (Mr. Chason Smith) PO BOX 1600 Huntsville, Alabama 35807-4301	3
Commander	5

US Army Engineer District, Little Rock
ATTN: CESWL-PM (Ms. Margaret Morehead)
PO BOX 867
Little Rock, AK 72203

4.7 Schedule and Submittals. The Contractor shall submit deliverable data to the addresses contained in paragraph 4.13 in accordance with the following schedule.

<u>SUBMITTAL</u>	<u>DATE DUE</u>
	<i>(assumes 31 March 01 award)</i>
ASSHP (if necessary)	5 days prior to Site Visit
Site Visit Trip Report (if separate from TPP)	5 days after Site Visit
Draft Work Plan	1 May 01
Final Work Plan	15 June 01
Draft EE/CA Supplement Report	15 Sep 01
Draft Final EE/CA Supplement Report	30 Oct 01
Public Meeting	30 Nov 01
Final EE/CA Supplement Report	15 Jan 02
Amendment to Explosives Safety Submission	15 Jan 02
Draft Action Memorandum	15 Feb 02
Final Action Memorandum	15 Mar 02
Monthly Report	NLT 10th of following month
Meeting Minutes	NLT 10 days after each meeting

5.0 REFERENCES.

5.1 Applicable Data Item Descriptions (DIDs) in effect on the CEHNC OE website on the date this task order is awarded. An index of and hyperlink to all of the DIDs is at the Internet address;
<http://www.hnd.usace.army.mil/oew/policy/dids/didindx.html>.

5.2 Pertinent OE technical publications/information.

6.0 GOVERNMENT-FURNISHED MATERIALS.

6.1 DERP-FUDS Archive Search Report, Findings, Conclusions and Recommendation, Former Southwestern Proving Ground, Hope, Arkansas, dated December 1993. *Paper copy.*

6.2 Final Engineering Evaluation/Cost Analysis for Southwestern Proving Grounds, dated August

1997. *Digital copy.*

6.3 Final Engineering Evaluation/Cost Analysis Action Memorandum for Southwestern Proving Grounds, dated August 1997. *Digital copy.*

6.4 Explosives Safety Submission, Ordnance Removal Action, Former Southwestern Proving Ground, Hope, Arkansas, dated July 1997. *Paper copy.*

6.5 Ordnance Removal Action Report at the Former Southwestern Proving Ground, Hope, Arkansas, dated March 1999. *Paper copy.*

6.6 Final Removal Report, Site Specific Removal Action, Former Southwestern Proving Ground (SWPG), Hope, Arkansas, dated May 2000. *Paper copy.*

6.7 Final OE Geographic Information System (GIS) for the Former Southwestern Proving Ground, dated December 2000. *Paper copy (Users Manual and Database Plan). Digital copy (System files).*

6.8 Miscellaneous project files (both paper and electronic format) from the CEHNC OE Design Center Project Manager.

**APPENDIX B
LAND USE INFORMATION**

APPENDIX B LAND USE INFORMATION

CURRENT LAND USE INFORMATION

- Land Use Database - Center for Spatial Technologies at University of AR, Fall 1999.
- USGS Topographical Maps (Washington, Nashville, McNab, Hope, Pisgah, Blevins, McCaskill, Sheppard, Columbus) - Mapped, edited, and published by the U.S. Geological Survey; Culture and drainage in part compiled from aerial photographs taken 1948-1949; Topography by plane-table surveys 1950-1951; Polyconic projection, NAD27, 10,000-foot grid based on AR coordinate system, south zone. Maps edited 1978.
- Aerial Photographs - (2000) AR Digital Ortho Program (ADOP) (provided to them by Pixxures). 1-meter resolution, meet National Aerial Photography Program (NAPP), National Digital Ortho Program (NDOP), and USGS specifications.

Discussions with Ronald Smith, Arkansas Department of Environmental Quality (ADEQ), Restoration Advisory Board (RAB) member (870-777-7585): Mr. Smith indicated that there have been new homes built in the last 12-15 years southeast of Washington. In addition, the NRCS has been doing some flood control structure projects along the north end of the site. Interview conducted April 5, 2002.

FUTURE LAND USE INFORMATION

City of Hope, AR: The Planning and Development Department (Jeff Griffin, 870-777-6701) indicated that the Master Land Use Plan for the City of Hope was developed in 1971 and updated in 1981. There are no zoning restrictions outside city limits, but they do have extra jurisdiction for 3.5 miles from the city limits. There is some construction activity within the Hope Industrial Park (this does not change land use designation). There are no upcoming projects he knows of and no one has contacted their office concerning future changes or construction. He indicated we can assume land use will remain the same within their area/jurisdiction. Interview conducted March 11, 2002.

City of Washington, AR: The Mayor (Paul Henley, 870-777-7500) indicated that there are no residential areas in City of Washington affected by the former SWPG. No new residential developments are planned for this area that he knows of. He suggested contacting Ronald Smith, now with AR Dept. of Environmental Quality in Hope. He is also a RAB member and knows a lot about developments in the area. Interview conducted March 28, 2002.

Town of Ozan, AR: The Mayor (Willie Caragin Jr., 870-983-2820) The mayor indicated that there are no new construction activities planned in the areas near the former SWPG (that he knows of).

Most of the area is privately owned and none of the Town of Ozan area/development is on former SWPG property. Interview conducted March 28, 2002.

Town of McCaskill, AR: The Mayor (Huey Cox, 870-874-9829) indicated that there are no future land use changes planned for this area. Interview conducted March 11, 2002.

APPENDIX C
RECORD OF SIGNIFICANT TELEPHONE INTERVIEWS AND
INSTITUTIONAL CONTROL INTERVIEW RESULTS

TELEPHONE INTERVIEWS

PARSONS

Contact Report

Originator

Richard Satkin

Contact Date

8/14/02

Next Call

Contact

Organization:	Arkansas Dept of Envi. Quality
Department:	
Address 1:	
Address 2:	
City, State, Zip:	Ronald Smith (RAB member)
Contacts:	870.777.7585
Phone:	
FAX:	

Action Items (With Date)

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Summary of Contact

Ron stated that the federal monies have been approved for a rural water system that will run from Blevins east of Hwy 29 to Hempstead and Nevada County lines. It is possible that a spur will run into the SWPG to pick up some of the residences located northeast of Hudson Foods east of the WMA.

As a follow-up to the July RAB discussion on ordnance discoveries in OOU-1, Ron stated he spoke recently with his childhood friend, Rusty Pendergraff (870.773.3531 ext 2 (Farm Service Agency) who recalled finding ordnance in the area where SMI is located in the Hope Industrial Park. Ron also suggested contacting Gaylan May who grew up and row cropped the same area (870.777.2207).

Spoke to Gaylan May. Mr. May said he was at the SMI construction site frequently and never saw or heard about any ordnance discoveries. His father worked in the grounds when he was a child. He farmed in the area south of the firing line and reported that he never encountered any ordnance except for grenade shrapnel near the grenade pit. The grenade pit was a small concrete area about 3 – 4 feet long and 2 –3 feet deep and was located near the current SMI guard shack. He indicated that there are no remnants today remaining of the grenade pit. He also reported finding spent grenades and empty shells near the railroad about 300 – 400 yards south of the airport hangar that probably fell off during loading the railroad cars. Mr. May also disced a good part of the WMA about 20 years ago and indicated that he encountered a large quantity of ordnance. He reported that he heard ordnance exploding during burnings in the quail area. During the conversation, the IC questionnaire was completed.

Ron indicated that the Arkansas Game and Fish Commission owns 500 acres NW of Ozan in Section 30. The area may be converted to a duck rest area. If so, Ron indicated that dikes may need to be constructed. Spoke to Greg Mathis on August 14, 2002 who confirmed that the project was started about 2 months ago and they have been excavating the area using bulldozers. The area in near the west patrol road and was formerly a soybean field. I asked him if anyone has reported any ordnance discoveries during construction and he said not to his knowledge. He said he will fax a map showing the area. The map is attached and shows that the water fowl area is immediately outside the SWPG along the west side of the west patrol road in Section 30.

Stakeholders in OOU-5 include Boyd Morrow (870.983.2567) and Leroy Morrow (870.983.2881) in Sections 7, 8, 17, and 18, near Bombing Range 1. Spoke with Boyd Morrow. He owns 660 acres, his brother owns 640 acres. He hand planted pine trees about 15 years ago, and plans to have them harvested in about 7 –8 years. He stopped row cropping about 16 years ago. He reported that he had encountered cluster bombs filled with TNT when he plowed the area. He piled them up on a fence row and never had one explode. He knows now to leave ordnance alone and not to touch it. He said that most of the ordnance is buried. Someone would have to be digging or plowing to encounter any and that nobody plows anymore. During the conversation, the IC questionnaire was completed.

Tommy Love (870.983.2377) has lived in Washington for the past 40+ years and runs cattle on 300 acres of family property located adjacent to and south of the North Fork Ozan Creek in Section 17. About 15 –20 years ago, the area was disced. A tractor cuts the grass at the surface and when it is muddy there may be some minor ground disturbances. He does not know of anyone else in the area that discs the soil. Most people planted pine trees 15 years ago. He indicated that he had never encountered any ordnance. During the conversation, the IC questionnaire was completed.

James Knoll (870.874.2291) 295 acres in Section 9, 270 acres in Section 4, 88 acres in Section 5. Spoke with a female at this residence whom indicated they were not interested in speaking.

Kenneth Knoll (870.874.2617) lives north of Section 4. Spoke to his spouse and gave me his work number at the Soil Conservation Service (870.845.4121.ext 3). Kenneth moved to the area in 1973. He owns 360 acres in Sections 4, 33, and 34. His father James owns 550 acres in Sections 5, 8, and 9 the majority of which is within Bombing Range 1. Both families run cattle and disc the soil annually. Kenneth indicated about 1/3 of his acreage is disced annually and these areas are rotated. The discing ground disturbance may extend to a depth of 6 – 8 inches. At times he has encountered ordnance during discing and also when he cuts the grass with a dozer. Last year his father found a large ordnance item and Pine Bluff Arsenal responded. I asked him if he knew any other people in the area that disc or disturb the ground surface and he indicated that Brent Talley recently purchased property in Sections 4 and 5 and is also running cattle and discing the earth. He indicated that he desires to do more work on the land such as construct additional watering holes but hesitates because of the ordnance hazards. During the conversation, the IC questionnaire was completed.

Rene McMillan (870.777.2987) located in OOU-1 Section 5, since 1950s. Called two times and could not get to speak with Rene McMillan.

Tommy Montgomery (870.722.2238) Section 24 north of WMA. Called three times; there was no answering machine.

Sutton Enterprises raises cattle and is out of Shreveport.

The K-4 Farms tract in Section 23 is leased by Carol Rowe (Patricia Rowe's father-in-law) for raising cattle. Carol Rowe (870.983.2429 or 2757). Sections 26, 35, and 33 are leased by Pat Rowe.

Spoke with Mr. Carol Rowe. He owns approximately 1400 acres and leases another 600 acres. He grew up in the area. Most of his land is a combination of timber and grass a large portion of which was formerly row cropped. Other than planting timber, the only land disturbance is the clean out or maintenance of existing drainage ditches using low impact tract hoe or dozer. This maintenance is kept to a minimum and is necessary to avoid standing water. During the conversation, the IC questionnaire was completed.

Spoke with Patricia Rowe (870.983.2505) rowefarms@cei.net She owns 761 acres and raises hogs. The area was previously row cropped and she indicated if prices were to go way up she and many other landowners would plant row crops again. She uses hay for animal feed and cuts it at the ground surface. There are no ground disturbance activities anywhere on her property. She said occasionally landowners may dig to set fence posts. In the past many landowners would discard ordnance into the creeks.

PARSONS

Contact Report

Originator Richard Satkin

Contact Date 8/8/02

Next Call 8/12/02

Contact

Organization:	Deltic Timber Corporation
Department:	
Address 1:	P.O. Box 409
Address 2:	
City, State, Zip:	Waldo, AR 71770
Contacts:	Frank Wright / Lacey Green
Phone:	870.881.6445 / 870.693.5555 cell 510.1062
FAX:	

Action Items (With Date)

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Summary of Contact

Left message for Frank Wright on 8/8/02. Also, left message on 8/8/02 for J.D. Marshall.

Spoke with Frank Wright on 8/12/02. Mr. Wright said he was involved with the purchase of much of the property in the area about 20 – 30 years ago. All of which was obtained from private individuals. He referred me to Lacey Green (870.693.5555) in Waldo, AR who is the district forester and would be most familiar with daily operations and projections for planting and harvesting. If we need to go to a higher level he recommended Tim Zorsch (870.881.6423). Mr. Wright indicated that shrapnel in logs was a problem in the past at their mill in Magnolia, but most of those affected trees have been harvested. Saw damage is mitigated at the mill by the use of metal detectors that scan each log. Mr. Wright said that he knows of no accidents from ordnance and that the loggers know to mark the area and not pick up any suspicious items.

Provided the phone number of Brad Dreyer who is the district forester for International Paper (870.777.1361 ext. 21) and an alternate is Skip Tomlinson. (The Dreyer property was cleared by EODT during an ORA.). He also suggested that I contact purchasing at Weyerhaeuser (870.234.7774 or 7414) to get the name of the district forester.

Spoke with Lacey Green, District Forester for the area. He has been with Deltic for the past 10 years. I asked him if he is familiar with the boundaries of the former SWPG; he said yes. I told him our ownership maps indicated about 2700+ acres is owned by Deltic in the former SWPG and he said that is about right. Mr. Green said that all of the tracts have been cut within the past 10 years. There have been no accidents. He said that all the workers are informed of the potential UXO hazards and if anything is found they would call the sheriff. They have observed parts of hollow shells, fragments, etc. He knows of no incident where he had to call the sheriff, but he speculated that there were probably incidents before his time (over 10 years ago) when the sheriff was called.

They are currently developing a GIS. Within the next 2 years there is one 40 acre tract scheduled for thinning located in Section 33 10S, 25W. Most of the other tracts are scheduled about 5 years out.

Mr. Green described the process of planting and harvesting. No mechanical ripping is done in the former SWPG or south Arkansas; he knows of some ripping done in northern AR. A devil bar is used for hand planting of seedlings. The maximum hole depth is 16 inches. I asked if the planting locations are marked in advance. He said no and that in the field the planting is very haphazard.

The trees are cut aboveground using mechanized saws. Stump and roots are left behind. When the tree drops there will be some minor ground disturbance. A skidder then drags the tree to a "set area" or staging area where the trees are stacked and then loaded onto a truck. The set area is typically about ½ acre in size. If any

ordnance is found Mr. Green indicated it would likely be in the set area because the brush is cleared from the area and there is a lot of activity there. Deltic would use the same set areas they used in the past; ordnance may have been pushed to the edges of the set area. I asked Mr. Green what other areas would have some ground disturbance. He said the logging roads have to be cleared of brush for the logging operations.

PARSONS

Contact Report

Originator	Richard Satkin
Contact Date	8/8/02
Next Call	8/19/02

Contact

Organization:	International Paper
Department:	
Address 1:	
Address 2:	
City, State, Zip:	Hope, AR
Contacts:	Jerry Rogers / Brad Dreyer
Phone:	870.777.1361 ext 22 / 21
FAX:	

Action Items (With Date)

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Summary of Contact

Jerry Rogers attended the RAB meeting on July 24, 2002. Left a message.

Brad Dreyer is out week of August 12, 2002.

Spoke with Mike Curtis x 23 who was not familiar with the former SWPG. He referred me to Brad Dreyer.

Spoke with Brad Dreyer (Bradley.dreyer1@ipaper.com) who is in charge of the IP's timber interests in the former SWPG. I first inquired about any intrusive activities that are conducted on his personal property located north of WMA. He said he does some gardening and tilling in a small vegetable garden.

IP currently does logging, burning, and planting in the former SWPG. IP has done ripping in the past at the proving ground, but Mr. Dreyer stated that he did not foresee the need to do additional ripping in the future in the area. IP plans to do some logging within the year east of his property, and may replant another tract this fall (unspecified location). I told him that I will email a map and asked him to review it for accuracy and indicate any areas where IP plans to conduct activities in the next 5 years.

We discussed the intrusive nature of planting. He said that the planting activity has very little impact in using a dibble bar; it is a relatively very minor intrusive and not like using a sledge hammer. I told him that it still poses a risk to workers of unintentional detonation. Mr. Dreyer said he understood why the government spent money on cleaning up the residential areas, but feels that deep down it is a waste of taxpayers money to clean up the forested areas that are used for timber. These forests have all been harvested at least one time in the past without any incident. He also indicated that very few people use these areas. The people that use the area, such as hunters and hikers, do not generally conduct intrusive activities.

With respect to the safety of the timber workers, Mr. Dreyer stated that these people are very aware of the risks and accept that risk - life is full of risks. He said the timber workers would be more concerned with a tree falling on them rather than a bomb exploding.

PARSONS

Contact Report

Originator Richard Satkin

Contact Date 8/13/02

Next Call

Contact

Organization:	Potlatch Corporation
Department:	
Address 1:	P.O. Box 747
Address 2:	
City, State, Zip:	Prescott, AR 71857
Contacts:	Duane Leamons
Phone:	870.887.2746
FAX:	

Action Items (With Date)

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Summary of Contact

Initially spoke with Mike Sullivan, Director Corporate Communications in Spokane Washington (509.835.1516). Mr. Sullivan referred me to Jim Newberry (870.226.1207), Resource Manager for Arkansas and Nicholas (Nick) Koulianos (870.226.1179) as an alternate contact. Mr. Sullivan also provided me with the name of John Olson who is the V.P. for Resources in Arkansas and is located in the corporate Spokane office.

Jim and Nick are on vacation and will both return on Monday, 8/12/02.

Spoke with Nick Koulianos. He was not familiar with the former SWPG. He did indicate that Potlatch's environmental policy on guidelines for rutting is soil dependent. He referred me to the local land agent, Curtis Blankinship (870.226.1172) and Jim Newberry who returns on Wednesday.

Spoke with Curtis Blankinship who referred me to the Area Manager, Duane Leamons (870.887.2746). Mr. Blankinship was familiar with the hazards of UXO and expressed concern that he did not know the extent and depth of the UXO in the area. Mr. Blankinship said he will have Mr. Leamons contact me.

Spoke extensively with Duane Leamons (duane.learmons@potlatchcorp.com) . Mr. Leamons is the Area Manager and has been with Potlatch for 29 years. In the 1970s, he had contacted Pine Bluff Arsenal to remove shell that they had located. Since the 1970s, no one responded or followed up on any of their ordnance reports to Pine Bluff. I suggested that instead of contacting Pine Bluff that he call the local sheriff. He said he knows of the present location of three bombs in a ditch, but has given up on notifying Pine Bluff because of their response in the past.

Mr. Leamons is knowledgeable about the boundaries of the former SWPG and ordnance hazards. He indicated that all his employees in the area are informed of the ordnance hazard. Because of the presence of the ordnance, Potlatch does not rip any soils within the former SWPG boundaries. He explained that as a result the area is less profitable as some of the soils in the area would be ripped. Ripping improves the water retention of the soils.

Potlatch has purposely limited the amount of burning for site preparation in the area. There is some limited burning, but if there is any suspicion that ordnance may be present on the ground, they will not burn. He described an experience with a 1000-acre parcel located east of Ozan where numerous shells went off during a burn.

His biggest concern is with encountering ordnance when they restructure roads. Under normal maintenance clean gravel is hauled in and the road is bladed to a maximum depth of 4 inches. However, if there is extensive

erosion and restructuring required they may blade to a depth of 3 feet. They have started a new road maintenance program and now each road is visited at least twice per year.

Trees are on a 30 year or less rotation. All trees are planted by hand. The maximum hole depth is 12 inches. Mr. Leamons indicated that the Pine Bluff personnel had told him that there is only a slim chance that an ordnance item could detonate as a result of the planting activity. He described how the Pine Bluff personnel collected the ordnance items in the past and that the items were allowed to roll freely around in the back of a truck. As a result, it was his perception that the planting activity does not pose much of a hazard. He was very concerned about ripping and burning. I told him that there is a possibility that the planting activity could detonate an item if one was struck with a shovel or dibble.

Mr. Leamons indicated that during sawing there is a potential hazard if there is an ordnance item located at the ground surface next to a tree. It is their practice to saw the tree as close to the ground surface as possible. The steel saw is 3 feet in diameter and 1.5-inches thick and spins at very high rpm. If the saw hit an item it could detonate. There is a 500-foot exclusion zone from the sawing location to protect personnel from any sawteeth shards or fragments. The person controlling the saw sits in a enclosed cab. I suggested that the U.S. Army Corps of Engineers may be able to provide them with criteria for providing protection from unintentional detonation.

The saw is sometimes mounted on a skidder truck that is also used to drag the felled tree. The skidder truck uses wide and high floatation rubber tires; the ground pressure from the tire is less than 12 psi. He believed that there is a very small risk of initiating a detonation from the skid truck.

I asked Mr. Leamons if Potlatch had any immediate plans for additional planting or harvesting in the SWPG. He offered to mark up a map that shows some of their future activities for the next 3 years. Mr. Leamons also offered to review our map showing their holdings. He indicated that Potlatch has rights for another 15 years on the Fraser Land Company holdings.

PARSONS

Contact Report

Originator	Richard Satkin
Contact Date	8/13/02
Next Call	8/14/02

Contact

Organization:	Weyerhaeuser Corporation
Department:	
Address 1:	
Address 2:	
City, State, Zip:	Roger Harper / Jerry Lingo
Contacts:	870.286.4291 / 4322
Phone:	
FAX:	

Action Items (With Date)

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Summary of Contact

Spoke with Roger Harper, who was not very familiar with the former SWPG. He asked for a map with township and range overlay for orientation to be sent to roger.harper@weyerhaeuser.com. He would take it and discuss with others in the group. I sent the maps via email on August 13, 2002 and spoke with him on August 14, 2002. He recommended that I should speak directly to Jerry Lingo at 870.286.4322 and that he would email Jerry the maps.

Spoke with Jerry Lingo on August 14, 2002. He has been with Weyerhaeuser for 36 years. They sold their holdings in Sections 7 and 8 located in Bombing Range 1 to Deltic?. They still own the holdings in Sections 5 and 6 and in the sections to the north. The land in Sections 7 and 8 had many craters and in places the craters overlapped. There are a few craters present in the very southern portion of Section 5.

The do not have any current holdings in Section 19 near Range 8. They do have an 80 acre plot in Section 27 that was planted 8 – 10 years ago. He did not recall what type of site preparation was used there.

In Section 24, they own 240 acres located east of Range 6. They are currently thinning and chipping using a hydroaxe. This is not an intrusive activity. He contacted Pine Bluff about 15 years ago prior to conducting their work in this area. He has a letter from Pine Bluff and he thought that it indicated there is not much of a concern in that area. He recalls that they encountered ordnance in this area when they were preparing their fire lanes 15 years ago. The next planned activity in this section will not likely take place for another 7 – 8 years from now. In 15 years, they would likely clearcut Section 24. Trees are on a 30 –32 year cycle.

Mr. Lingo described different types of site preparation that may be used in the SWPG. These include: bedding, ripping, KG shearing, roll & chop. (Burning is performed after site preparation.) These site preparation activities are performed by independent contractors. With bedding the depth of disc penetration is between 10 –12 inches. There may be up to 4 discs, 2 mounted on each side of the bar. This creates a bed approximately 5 feet wide. With ripping the disc penetrates between 18 – 24 inches and there is only one disc used. The bedding operation although performed to a shallower depth compared to ripping, has a greater likelihood of contacting an ordnance item compared to ripping because of the larger number of discs used in bedding. I suggested that the U.S. Army Corps of Engineers may be able to provide them with design criteria for the enclosed cab to protect the independent operators from unintentional detonation during site preparation.

I asked Mr. Lingo about their employee safety program. He told me that they instruct all their personnel in the area about the potential ordnance hazards. I asked him to contact the local sheriff's department if any workers should come into contact with any ordnance.

PARSONS

Contact Report

Originator Richard Satkin

Contact Date 8/8/02

Next Call

Contact

Organization:	Arkansas Game and Fish Commission
Department:	
Address 1:	
Address 2:	
City, State, Zip:	
Contacts:	Greg Mathis
Phone:	877.777.5580
FAX:	

Action Items (With Date)

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Summary of Contact

Greg Mathis is the Supervisor for Region V. The Hope Upland – WMA Zone 360 (OOU-2) is located in Region V. [Ricky Chastain is the current Supervisor for Region VI (Hot Springs 877.525.8606) and was interviewed by ESE during preparation of the 1997 EE/CA regarding the OOU-2. During that time, Greg Mathis was his supervisor.] Greg Mathis reports to David Goad in Little Rock (800.364.4263).

Greg Mathis was not in today.

The following information was obtained from the their web site http://www.agfc.com/wma_lakes/wma_hope_upland.html

This 2115-acre area is owned by the Arkansas Game and Fish Commission.

The primary objective of this management area is to provide quality wildlife habitat and public hunting opportunities.

Upland mixed pine/hardwood stands dominates this area. A large food plot system is interspersed on the area. The area also includes a large number of firelanes that are annually planted in wheat and provide excellent browse.

Deer, quail, squirrel dove, and rabbits. This area is known for producing large bucks.

An intensive management habitat plan including forest prescriptions, prescribed burning and open land management is implemented on this area. This habitat management plan greatly benefits both game and nongame wildlife species.

This area provides excellent birdwatching opportunities

Quail can be found in relatively abundant numbers on this area.

This property was once included in the Southwestern Proving Grounds, a military ammunitions testing range in the early 1940's. Should you encounter any type of unexploded ordnance, please do not attempt to move or remove the ordnance yourself. Mark the location of the ordnance and contact the Southwest Regional Office of AGFC immediately.

Spoke with Greg Mathis this morning (August 12, 2002). I introduced myself and explained that I am working on behalf of the Corps of Engineers in Huntsville and Little Rock. He said he knew of Margaret Moorehead.

Mr. Mathis has been working at the WMA area for the past 30 years. He has run a tractor and disced over most of the entire area on a regular basis. He estimated that approximately 500 acres of the total 2115 acres is disced each spring and fall to a depth of approximately 6 inches for food plots and fire lanes. In the past, AGFC performed all the discing. Now they do about 1/3 and the rest is contracted. He stated that in the past 30 years he has not encountered any ordnance or has any of the contractors working the area reported any ordnance to him. I mentioned to him that another Contractor (ESE) had performed an investigation there in the late 1990s and had found ordnance on the surface. He said that you can probably find some if one had a metal detector.

He reported that extensive controlled burning is performed, timber harvesting, food plot planting, and hunting. No ripping of the soils is necessary for tree planting in the area. I asked if hunters restrict themselves mostly to trails. He said no. He has been over the entire area and that the entire area is accessible for hunting.

There are three main entrances to the WMA and all three are kept locked. Approximately 30 people per day visit at the peak time between October and November. The rest of the year there are about 10 people per day.

No permits are required for hunting. A gun permit is required only for the youth deer hunt. Squirrel, rabbit, quail are hunted on Tuesdays. Squirrel, rabbit, and dove are hunted Tuesday, Thursday, and Saturday.

There are potentially multiple contractors working the WMA and may include dirt work, food plot planting, and timber planting or harvesting.

I asked him if any of the contractors that work the WMA are briefed about the UXO hazards that may be present in the area. He said no, but there are some signs on the fence.

Mr. Mathis has sent a drawing of the WMA that includes delineation of the fire lanes.

Spoke to Mr. Mathis after reviewing the two drawings he mailed. The maps illustrate the location of handicap access trails in yellow located along the western portion of the WMA. He indicated that there are five parking areas located clockwise near plots 3A, 39, 41, 44, and 45. There is a gas pipeline running east-west across the area. In the northeastern corner there is an undisturbed plot where no management practices are allowed. Firelanes are shown throughout the entire area as dotted and dashed lines. Mr. Mathis indicated that the fence is in disrepair (approximately 1/2 mile in length) in the very southwestern corner near the former firing range to plot 81. He reiterated that he has never encountered ordnance along the firelanes or in any of the fields, however, there may be some in the intervening forested areas. I asked him if the management would be willing to allow the U.S. Army Corps of Engineers, if they thought it necessary, to conduct an ordnance cleanup in an environmentally safe manner. He said that would not be a problem, but again no ordnance had been found in the WMA and the Arkansas Game and Fish Commission would have the right of refusal.

INSTITUTIONAL CONTROL INTERVIEW RESULTS

RAB Member Interviews (based on the indicated questions):

Ronald Smith (870-777-7585). Interview conducted April 5, 2002.

1. How did you learn about the former Southwestern Proving Ground? *Growing up – the site is a part of life here and most locals know about the proving grounds.*
2. Do you remember reading about the former Southwestern Proving Ground in the newspaper? Seeing on television? Hearing about it on the radio? *You read about it in the newspapers from time to time. Have not seen it on television or heard it on radio.*
3. Have you ever received any printed material about the former Southwestern Proving Ground, e.g., fact sheet or brochure? *Probably, not sure.*
4. Have you ever visited the former Southwestern Proving Ground? *Yes*
5. How did you learn about unexploded ordnance? *Growing up*
6. Do you know what to do if you discover unexploded ordnance? *Yes, call the Sheriff.*
7. If you have children, do your children know what to do? *Probably not, kids are not as interested these days.*
8. Do you know the three R's of ordnance safety? (Explain if not known) *No*
9. How can awareness about unexploded ordnance at the former Southwestern Proving Ground be improved? *Increase publicity, use commercials on local TV station. Radio is not as effective since most people do not listen to local stations.*
10. How can safety at the former Southwestern Proving Ground be improved? *Signage*

Patricia Rowe (870-983-2505). Interview conducted April 8, 2002.

1. How did you learn about the former Southwestern Proving Ground? *Live in the site area – do not remember it being mentioned on deed title.*
2. Do you remember reading about the former Southwestern Proving Ground in the newspaper? Seeing on television? Hearing about it on the radio? *Yes (all 3)*
3. Have you ever received any printed material about the former Southwestern Proving Ground, e.g., fact sheet or brochure? *Yes*
4. Have you ever visited the former Southwestern Proving Ground? *Live there*
5. How did you learn about unexploded ordnance? *Grew up in the area.*
6. Do you know what to do if you discover unexploded ordnance? *Yes*
7. If you have children, do your children know what to do? *Yes, have communicated this with children.*
8. Do you know the three R's of ordnance safety? (Explain if not known) *No*
9. How can awareness about unexploded ordnance at the former Southwestern Proving Ground be improved? *Signs posted at entry points*

10. How can safety at the former Southwestern Proving Ground be improved? *Public awareness. The area of concern is the WMA – this is open to the public and has bombs. If there were ever a fire in this area, the Fire Department would not respond. Most people that live here know about the site. People from out of town have picked up items and carried them to officials. The recent clean-up activities have reiterated safety issues – in the past we used to move the items to ditches by hand – now we know not to touch them.*

Danny Watson (800-643-6448). Interview conducted April 17, 2002.

1. How did you learn about the former Southwestern Proving Ground? *Local newspaper, approximately one month prior to participating on the RAB.*
2. Do you remember reading about the former Southwestern Proving Ground in the newspaper? *Yes. Seeing on television? No. Hearing about it on the radio? Yes, I heard public service announcements on the radio after becoming involved in the RAB.*
3. Have you ever received any printed material about the former Southwestern Proving Ground, e.g., fact sheet or brochure? *No, but I have seen a color brochure (USACE) at the airport (located at the site).*
4. Have you ever visited the former Southwestern Proving Ground? *Yes.*
5. How did you learn about unexploded ordnance? *Word of mouth, and a friend who was a demolitions expert.*
6. Do you know what to do if you discover unexploded ordnance? *Yes, being in law enforcement for 15 years, I would call the sheriff first to complete a report, then let them take over.*
7. If you have children, do your children know what to do? *Two children, ages 17 and 20. As children, I am not aware if they ever found any ordnance, but they are aware of the ordnance and would assume that they knew what to do if it was ever found.*
8. Do you know the three R's of ordnance safety? (Explain if not known) *No.*
9. How can awareness about unexploded ordnance at the former Southwestern Proving Ground be improved? *More signs for hunters, especially at the areas accessible by road. As a school board member, I am not aware of any kid's activities or workshops held at the schools, but that would be an effective method of awareness. When there are surficial finds, the media sometimes does an article to increase awareness.*
10. How can safety at the former Southwestern Proving Ground be improved? *Making sure that ordnance is removed in the target areas, they should prioritize the funding to remove as much as possible in these areas. Currently, there is not much development. However, the potential is there if people knew that everything was removed or was given a "clean bill of health".*

Gale Temple (870-777-8777). Interview conducted April 17, 2002.

1. How did you learn about the former Southwestern Proving Ground? *Newspaper, shortly before joining the RAB.*
2. Do you remember reading about the former Southwestern Proving Ground in the newspaper? *Yes.* Seeing on television? *No.* Hearing about it on the radio? *No.*
3. Have you ever received any printed material about the former Southwestern Proving Ground, e.g., fact sheet or brochure? *No.*
4. Have you ever visited the former Southwestern Proving Ground? *Yes, not on an official visit, but passing through the area.*
5. How did you learn about unexploded ordnance? *Word of mouth when we first moved here 17 years ago.*
6. Do you know what to do if you discover unexploded ordnance? *Yes, contact the sheriff.*
7. If you have children, do your children know what to do? *Not school age and he has not found anything to the best of my knowledge, but would assume that he would know what to do if it was ever found.*
8. Do you know the three R's of ordnance safety? (Explain if not known) *No.*
9. How can awareness about unexploded ordnance at the former Southwestern Proving Ground be improved? *Most people are aware of the ordnance at the site, but printed material would increase awareness (brochures, fliers, fact sheets). Activities for kids would also be effective in raising awareness.*
10. How can safety at the former Southwestern Proving Ground be improved? *More awareness.*

Teresa Smith (870-777-1478). Interview conducted April 29, 2002.

1. How did you learn about the former Southwestern Proving Ground? *Raised there - known since childhood.*
2. Do you remember reading about the former Southwestern Proving Ground in the newspaper? *Yes.* Seeing on television? *No.* Hearing about it on the radio? *Yes.*
3. Have you ever received any printed material about the former Southwestern Proving Ground, e.g., fact sheet or brochure? *Not anything other than RAB materials. I have borrowed a book about the history of the site.*
4. Have you ever visited the former Southwestern Proving Ground? *Yes, 5 or 6 times a year - passing through patrol road as emergency manager best route.*
5. How did you learn about unexploded ordnance? *Parents and grandparents.*
6. Do you know what to do if you discover unexploded ordnance? *Yes.*
7. If you have children, do your children know what to do? *Yes.*

8. Do you know the three R's of ordnance safety? (Explain if not known) *No.*
9. How can awareness about unexploded ordnance at the former Southwestern Proving Ground be improved? *Brochures, civic groups, schools, emergency preparedness brochures, most aimed at kids.*
10. How can safety at the former Southwestern Proving Ground be improved? *Awareness.*

Patricia Rhodes. (870)777-8488. Interview conducted April 17, 2002.

1. How did you learn about the former Southwestern Proving Ground? *Lived there all my life, family worked there.*
2. Do you remember reading about the former Southwestern Proving Ground in the newspaper? *Yes.* Seeing on television? *No.* Hearing about it on the radio? *No.*
3. Have you ever received any printed material about the former Southwestern Proving Ground, e.g., fact sheet or brochure? *Received information from Margaret Morehead and I work with the historical society Sentimental Journey to SWPG and Museum.*
4. Have you ever visited the former Southwestern Proving Ground? *Frequently.*
5. How did you learn about unexploded ordnance? *Known all my life through family. My house was built in 1941 and there was a shortage of building material so they used extras from SWPG.*
6. Do you know what to do if you discover unexploded ordnance? *Yes - call authorities.*
7. If you have children, do your children know what to do? *Yes.*
8. Do you know the three R's of ordnance safety? (Explain if not known) *No.*
9. How can awareness about unexploded ordnance at the former Southwestern Proving Ground be improved? *We are hoping to get a grant for the display of maps, some ordnance at museum (airport) so it's available to the public. Also - make timber companies more aware and work more with kids and have more signage.*
10. How can safety at the former Southwestern Proving Ground be improved? *Hunter education classes, display, museum, signs - increase awareness.*

Interviews with SWPG Land Owners and Workers (based on the indicated questions):

Boyd Morrow (870-983-2657). Interview conducted August 14, 2002.

1. How did you learn about the former Southwestern Proving Ground? *Dad worked in Camden during the war and leaned about as a kid.*
2. Do you remember reading about the former Southwestern Proving Ground in the newspaper? *Yes.* Seeing on television? *No.* Hearing about it on the radio? *No.*
3. Have you ever received any printed material about the former Southwestern Proving Ground, e.g., fact sheet or brochure? *Yes*
4. Have you ever visited the former Southwestern Proving Ground? *I live here.*

5. How did you learn about unexploded ordnance? *Found it when I plowing for row crops. I stopped row cropping 16 years ago. Only found cluster bombs filled with TNT. Piled them on a fence row and never had one explode.*
6. Do you know what to do if you discover unexploded ordnance? *Yes – leave it alone now.*
7. If you have children, do your children know what to do? *Yes, run.*
8. Do you know the three R's of ordnance safety? (Explain if not known) *No.*
9. How can awareness about unexploded ordnance at the former Southwestern Proving Ground be improved? *No idea. Most is buried. If anyone finds it they would have to be digging and nobody plows anymore.*
10. How can safety at the former Southwestern Proving Ground be improved? *Pamphlets telling people don't touch it.*

Carol Rowe (870-983-2429). Interview conducted August 14, 2002.

1. How did you learn about the former Southwestern Proving Ground? *As a child 1 –2 years old growing up in the area. When I was a teenager, I would hear the bombs go off when there was a burn in the quail area.*
2. Do you remember reading about the former Southwestern Proving Ground in the newspaper? *Yes.* Seeing on television? *No.* Hearing about it on the radio? *No.*
3. Have you ever received any printed material about the former Southwestern Proving Ground, e.g., fact sheet or brochure? *Yes*
4. Have you ever visited the former Southwestern Proving Ground? *I live here.*
5. How did you learn about unexploded ordnance? *Just growing up in the area.*
6. Do you know what to do if you discover unexploded ordnance? *I respect it, but am not afraid of it..*
7. If you have children, do your children know what to do? *Yes, leave it alone.*
8. Do you know the three R's of ordnance safety? (Explain if not known) *No.*
9. How can awareness about unexploded ordnance at the former Southwestern Proving Ground be improved? *When those people got blown up that was the best awareness. There are always those idiots that can not be educated and will handle the ordnance.*
10. How can safety at the former Southwestern Proving Ground be improved? *Nothing.*

Tommy Love (870-983-2377). Interview conducted August 15, 2002.

1. How did you learn about the former Southwestern Proving Ground? *From his family.*

2. Do you remember reading about the former Southwestern Proving Ground in the newspaper? *No.* Seeing on television? *No.* Hearing about it on the radio? *No.*
3. Have you ever received any printed material about the former Southwestern Proving Ground, e.g., fact sheet or brochure? *No.*
4. Have you ever visited the former Southwestern Proving Ground? *He runs cattle on some family property in the northern portion immediately south of the North Fork Ozan Creek.*
5. How did you learn about unexploded ordnance? *When he came to the area in 1948, they were just turning the property over and he heard about it.*
6. Do you know what to do if you discover unexploded ordnance? *Yes. Leave it alone.*
7. If you have children, do your children know what to do? *They are grown up and don't spend time in that area.*
8. Do you know the three R's of ordnance safety? (Explain if not known) *No.*
9. How can awareness about unexploded ordnance at the former Southwestern Proving Ground be improved? *He doesn't know. He thought that the area was cleaned up.*
10. How can safety at the former Southwestern Proving Ground be improved? *He doesn't know.*

Kenneth Knoll (870-845-4121 ext. 3). Interview conducted August 15, 2002.

1. How did you learn about the former Southwestern Proving Ground? *Doesn't know.*
2. Do you remember reading about the former Southwestern Proving Ground in the newspaper? *Yes.* Seeing on television? *No.* Hearing about it on the radio? *No.*
3. Have you ever received any printed material about the former Southwestern Proving Ground, e.g., fact sheet or brochure? *Yes.*
4. Have you ever visited the former Southwestern Proving Ground? *He lives and works there.*
5. How did you learn about unexploded ordnance? *Doesn't know.*
6. Do you know what to do if you discover unexploded ordnance? *Yes.*
7. If you have children, do your children know what to do? *I hope so.*
8. Do you know the three R's of ordnance safety? (Explain if not known) *No.*
9. How can awareness about unexploded ordnance at the former Southwestern Proving Ground be improved? *He doesn't know.*
10. How can safety at the former Southwestern Proving Ground be improved? *Do more cleanup.*

Gaylan May (870-777-2207). Interview conducted August 15, 2002.

1. How did you learn about the former Southwestern Proving Ground? *Dad worked in the grounds. He heard bombs going off as a kid..*
2. Do you remember reading about the former Southwestern Proving Ground in the newspaper? *Yes. Seeing on television? Yes. Hearing about it on the radio? Yes.*
3. Have you ever received any printed material about the former Southwestern Proving Ground, e.g., fact sheet or brochure? *No, except about 4 –5 years ago the Corps invited him to the Holiday Inn to look over some maps.*
4. Have you ever visited the former Southwestern Proving Ground? *Yes.*
5. How did you learn about unexploded ordnance? *As a child.*
6. Do you know what to do if you discover unexploded ordnance? *Yes.*
7. If you have children, do your children know what to do? *Yes.*
8. Do you know the three R's of ordnance safety? (Explain if not known) *No.*
9. How can awareness about unexploded ordnance at the former Southwestern Proving Ground be improved? *Everyone should know about it. But sometimes you hear about some townspeople that either picked one up. People used to use the ordnance as weights for discing. He thought it was the Hartsfield family that got blown up under a tree trying to extract some bronze. Another time long ago there was an explosion in a foundry.*
10. How can safety at the former Southwestern Proving Ground be improved? *Advertisements in paper telling people not to pick it up.*

Agency/Company Interviews (based on the indicated questions):

Catherine Cook, City Manager, City of Hope (870-777-6701). Interview conducted April 4, 2002.

1. Has your agency ever received questions about the former Southwestern Proving Ground from the public? How recently? *No*
2. Do you know the appropriate person to contact for information about the former SWPG? *Yes – Margaret Morehead*
3. Do you have any suggestions or ideas on how public safety at SWPG can be improved? *Continue to work with Sentimental Journey and have a booth at the annual Watermelon Festival.*
4. Do you have any suggestions as to how your agency can help with public safety at SWPG? *We could distribute informational materials given to us by the Corp at the Visitors Center/Depot.*
5. Do you know what procedures to take if UXO/ordnance is encountered? *Yes, call Sheriff and do not touch item.*

Bo Watkins, Fire Department Chief, City of Hope (870-777-6702). Interview conducted April 4, 2002.

1. Has your agency ever received questions about the former Southwestern Proving Ground from the public? How recently? *No*
2. Do you know the appropriate person to contact for information about the former SWPG? *During clean-up activities only (gave him contact information for Margaret Morehead).*
3. Do you have any suggestions or ideas on how public safety at SWPG can be improved? *Additional signage at points of entry/roads.*
4. Do you have any suggestions as to how your agency can help with public safety at SWPG? *We could distribute informational materials given to us by the Corp when we do fire safety programs.*
5. Do you know what procedures to take if UXO/ordnance is encountered? *Yes.*

James Ross, Sheriff Department Chief, City of Hope (870-777-6727). Interview conducted April 4, 2002.

1. Has your agency ever received questions about the former Southwestern Proving Ground from the public? How recently? *Not recently, in 2000 or 2001 was latest.*
2. Do you know the appropriate person to contact for information about the former SWPG? *Call Pine Bluff Arsenal (gave him contact information for Margaret Morehead for public information questions).*
3. Do you have any suggestions or ideas on how public safety at SWPG can be improved? *No – people are aware of site and when encounter ordnance, they do not touch it.*
4. Do you have any suggestions as to how your agency can help with public safety at SWPG? *No.*
5. Do you know what procedures to take if UXO/ordnance is encountered? *Yes, we tape off the area, usually happens when a hunter or landowner uncovers item.*

John Lane, AR Game and Fish Commission, (870-777-5580). Interview conducted April 4, 2002.

1. Has your agency ever received questions about the former Southwestern Proving Ground from the public? How recently? *Yes, hunters found empty shells last October (2001).*
2. Do you know the appropriate person to contact for information about the former SWPG? *Yes, Margaret Morehead*
3. Do you have any suggestions or ideas on how public safety at SWPG can be improved? *No, the signs work well.*

4. Do you have any suggestions as to how your agency can help with public safety at SWPG? *Continue coordinating with the Corp, post signs.*
5. Do you know what procedures to take if UXO/ordnance is encountered? *Yes, call 911 and Margaret.*

Note: There are several bunkers in the Wildlife Management Area that the Corp may destroy. These bunkers provide roosting habitat for the R. big-eared bat (this is a Species of Concern). We recommend that these bunkers are not destroyed and they should be gated.

Joey Whitfield, Hempstead County Health Department, (870-777-2191). Interview conducted April 4, 2002.

1. Has your agency ever received questions about the former Southwestern Proving Ground from the public? *No*
2. Do you know the appropriate person to contact for information about the former SWPG? *No (gave him contact information for Margaret Morehead for public information questions).*
3. Do you have any suggestions or ideas on how public safety at SWPG can be improved? *No, we have never run across any questions or problems to date.*
4. Do you have any suggestions as to how your agency can help with public safety at SWPG? *We could provide information and map of site area to septic permittees.*
5. Do you know what procedures to take if UXO/ordnance is encountered? *Yes, call 911.*

Maggie Arington, AR State Forestry Commission, (870-533-4641). Interview conducted April 17, 2002.

1. Has your agency ever received questions about the former Southwestern Proving Ground from the public? *No*
2. Do you know the appropriate person to contact for information about the former SWPG? *No (gave her Margaret Morehead's contact information)*
3. Do you have any suggestions or ideas on how public safety at SWPG can be improved? *News Releases*
4. Do you have any suggestions as to how your agency can help with public safety at SWPG? *Could contact landowners within the area to disseminate information. Information on the site could also be included in Forestry Management Plans for areas within the site.*
5. Do you know what procedures to take if UXO/ordnance is encountered? *No (told her proper procedure – to call 911 or Sheriffs Office including the three R's of ordnance safety).*

David Whisenhunt, Farm Service Agency, (870-777-1603). Interview conducted April 9, 2002.

1. Has your agency ever received questions about the former Southwestern Proving Ground from the public? *No, row crop farmers have been dealing with the area for years and are used to it – they do not seem to have any concerns.*
2. Do you know the appropriate person to contact for information about the former SWPG? *No (gave him Margaret Morehead's contact information).*
3. Do you have any suggestions or ideas on how public safety at SWPG can be improved? *No – too large of an area to block off.*
4. Do you have any suggestions as to how your agency can help with public safety at SWPG? *No, everyone here is aware of issues and has had no new farmers inquire.*
5. Do you know what procedures to take if UXO/ordnance is encountered? *No (told him proper procedure – to call 911 or Sheriffs Office including the three R's of ordnance safety).*

Gerald Alexander, County Extension Agency, (870-777-5771). Interview conducted April 17, 2002.

1. Has your agency ever received questions about the former Southwestern Proving Ground from the public? *No, there were curiosity calls during removal actions at the site.*
2. Do you know the appropriate person to contact for information about the former SWPG? *No (gave him Margaret Morehead's contact information).*
3. Do you have any suggestions or ideas on how public safety at SWPG can be improved? *No*
4. Do you have any suggestions as to how your agency can help with public safety at SWPG? *No - sometimes people run across items when disking the ground, but most people know what to do.*
5. Do you know what procedures to take if UXO/ordnance is encountered? *Yes*

W. Curtis Blankenship, Potlatch Timber, (870-226-1172). Interview conducted April 19, 2002.

1. Has your company ever received questions about the former Southwestern Proving Ground from the public/employees? *Not recently, we have given permission for the Corp to go on the land. Employees know what's out there.*
2. Do you know the appropriate person to contact for information about the former SWPG? *Corp*

3. Do you have any suggestions or ideas on how public safety at SWPG can be improved?
We want to get the shells off our land out there, we have about 900 to 1,000 acres with employees on it and we hear the Corp says it costs too much money to clean up.
4. Do you know what procedures to take if UXO/ordnance is encountered? *Yes, call Sheriff or 911 or State troopers.*

Mr. Lacy Green, Deltic Timber Corporation, (870-693-5555). Interview conducted April 19, 2002.

1. Has your company ever received questions about the former Southwestern Proving Ground from the public/employees? *Yes, during logging operations*
2. Do you know the appropriate person to contact for information about the former SWPG? *Corp*
3. Do you have any suggestions or ideas on how public safety at SWPG can be improved? *No*
4. Do you know what procedures to take if UXO/ordnance is encountered? *Yes, we don't have an official safety program, there's about 3 of us that go there and we do have all the information and know about the site and what to do.*

Brad Dryer, International Paper, (870-777-1361). Interview conducted April 19, 2002.

1. Has your company ever received questions about the former Southwestern Proving Ground from the public/employees? *Not regarding ordnance*
2. Do you know the appropriate person to contact for information about the former SWPG? *Corp*
3. Do you have any suggestions or ideas on how public safety at SWPG can be improved? *Signs at all entrance points*
4. Do you have any suggestions as to how your company can help with public/employee safety at SWPG? *Everyone knows what to do if encounter items.*
5. Do you know what procedures to take if UXO/ordnance is encountered? *Call Sheriff*

Wanda Powell, Sentimental Journey to SWPG, (870-777-3523). Interview conducted April 5, 2002.

- There have been setbacks concerning the last two airshows (one was rained out and one cancelled in September 2002).
- The airshow is the main fundraiser, and activities have been limited due to cancelled shows.
- Still providing information to schools, just conducting less visits.
- Are continuing to distribute information about safety as supplied by the Corp.

APPENDIX D
BASIS FOR COST-TO-COMPLETE ESTIMATE

Table D.1 Basis for Cost-To-Complete of Recommended Clearance Actions

OOU	Site Description	Priority	Current Land Use	Clearance Depth	Clearance Cost per Acre	# Acres	Vegetation Terrain Modifier	Brush Clearing Cost Per Acre	Brush Clearing Cost	Subtotal Cost	USACE Oversight & Contracting Cost	Total Clearance Cost
OOU-2	WMA	1	77% forestry 21% farming	Fencing & IC signage	N/A	2,115	N/A	N/A	N/A	\$ 30,000	N/A	\$ 30,000
OOU-3	Residential areas NW of WMA	1	80% farming, 20% forestry	2 feet	\$ 14,780	60	1.00	\$ 500	\$ 30,000	\$ 916,800	\$ 91,680	\$ 1,008,480
OOU-3	Ranges Mortar, 2, 3, 6,8,10,11,12	1	86% forestry 12% farming	IC signage	N/A	8,200	N/A	N/A	N/A	\$ 1,000	N/A	\$ 1,000
OOU-3	Range 6 area	1,2,&3	75% forestry, 25% farming	2 feet	\$ 11,400	240	1.35	\$ 2,500	\$ 600,000	\$ 4,293,600	\$ 429,360	\$ 4,722,960
OOU-4	Range 14 area	1	Farming	2 feet	\$ 11,400	300	1.00	\$ 500	\$ 150,000	\$ 3,570,000	\$ 357,000	\$ 3,927,000
OOU-4	Ranges 14,15,16, 17,18,19	1,2,&3	59% forestry 38% farming	IC signage	N/A	5,800	N/A	N/A	N/A	\$ 1,000	N/A	\$ 1,000
OOU-3	TCRA Sites	1	Residential	4 feet	\$ 17,930	16	1.00	\$ -	\$ -	\$ 286,880	\$ 28,688	\$ 315,568
OOU-4	TCRA Sites	1	Residential, farming	4 feet	\$ 22,260	8	1.00	\$ -	\$ -	\$ 178,080	\$ 17,808	\$ 195,888
OOU-5	TCRA Sites	1	Residential	4 feet	\$ 22,260	9	1.00	\$ -	\$ -	\$ 200,340	\$ 20,034	\$ 220,374
OOU-6	TCRA Sites	1	Residential	4 feet	\$ 17,930	18	1.00	\$ -	\$ -	\$ 322,740	\$ 32,274	\$ 355,014
OOU-3	Range 10 area	2	Forestry	2 feet	\$ 11,400	310	1.35	\$ 2,500	\$ 775,000	\$ 5,545,900	\$ 554,590	\$ 6,100,490
OOU-3	Range 12 area	2	50% forestry, 50% farming	2 feet	\$ 11,400	310	1.20	\$ 2,500	\$ 775,000	\$ 5,015,800	\$ 501,580	\$ 5,517,380
OOU-3	Creekbed area between Ranges 10 & 12	2	Drainage	Surface	\$ 18,160	30	1.50	\$ -	\$ -	\$ 817,200	\$ 81,720	\$ 898,920
OOU-4	Middle Fork Ozan Creek creekbed (16,000 ft @ 20 ft width)	2	Drainage	Surface	\$ 5,000	7	1.35	\$ 500	\$ 3,650	\$ 52,925	\$ 5,293	\$ 58,218
OOU-4	South Fork Ozan Creek creekbed (13,500 ft @ 20 ft width)	2	Drainage	Surface	\$ 5,000	6	1.35	\$ 500	\$ 3,100	\$ 44,950	\$ 4,495	\$ 49,445
OOU-5	Old Dry Target Lake area	2	75% forestry, 25% farming	2 feet	\$ 14,780	70	1.35	\$ 2,500	\$ 175,000	\$ 1,571,710	\$ 157,171	\$ 1,728,881
OOU-5	Old Dry Target Lake area	2	59% forestry 39% farming	IC signage	N/A	3,335	N/A	N/A	N/A	\$ 1,000	N/A	\$ 1,000
OOU-3	Range 8 area	3	50% forestry, 50% farming	2 feet	\$ 11,400	230	1.20	\$ 2,500	\$ 575,000	\$ 3,721,400	\$ 372,140	\$ 4,093,540
OOU-3	Range 11 area	3	100% forestry	2 feet	\$ 11,400	135	1.20	\$ 2,500	\$ 337,500	\$ 2,184,300	\$ 218,430	\$ 2,402,730
OOU-3	EE/CA site 89 area	3	75% farming, 25% forestry	2 feet	\$ 14,780	40	1.00	\$ 500	\$ 20,000	\$ 611,200	\$ 61,120	\$ 672,320
OOU-3	EE/CA site 90 area	3	80% farming, 20% forestry	2 feet	\$ 14,780	40	1.00	\$ 500	\$ 20,000	\$ 611,200	\$ 61,120	\$ 672,320
OOU-3	EE/CA site 94 area	3	50% farming, 50% forestry	2 feet	\$ 14,780	40	1.20	\$ 2,500	\$ 100,000	\$ 809,440	\$ 80,944	\$ 890,384

Table D.1 Basis for Cost-To-Complete of Recommended Clearance Actions (Continued)

OOU	Site Description	Priority	Current Land Use	Clearance Depth	Clearance Cost per Acre	# Acres	Vegetation Terrain Modifier	Brush Clearing Cost Per Acre	Brush Clearing Cost	Subtotal Cost	USACE Oversight & Contracting Cost	Total Clearance Cost
OOU-3	EE/CA site 98 area	3	Forestry	2 feet	\$ 14,780	40	1.35	\$ 2,500	\$ 100,000	\$ 898,120	\$ 89,812	\$ 987,932
OOU-3	EE/CA site 99 area	3	Forestry	2 feet	\$ 14,780	40	1.35	\$ 2,500	\$ 100,000	\$ 898,120	\$ 89,812	\$ 987,932
OOU-4	Range 18 area	3	Farming	2 feet	\$ 11,400	270	1.00	\$ 500	\$ 135,000	\$ 3,213,000	\$ 321,300	\$ 3,534,300
OOU-4	Range 19 area	3	Farming	2 feet	\$ 11,400	240	1.00	\$ 500	\$ 120,000	\$ 2,856,000	\$ 285,600	\$ 3,141,600
OOU-3	Residential area on east side of OOU-3	4	Farming	2 feet	\$ 14,780	40	1.00	\$ 500	\$ 20,000	\$ 611,200	\$ 61,120	\$ 672,320
OOU-3	Residential area NW of WMA W of P1 area	4	80% forestry, 20% quarry	2 feet	\$ 11,400	120	1.35	\$ 2,500	\$ 300,000	\$ 2,146,800	\$ 214,680	\$ 2,361,480
OOU-5	Residential areas	4	80% farming, 20% forestry	2 feet	\$ 11,400	160	1.00	\$ 500	\$ 80,000	\$ 1,904,000	\$ 190,400	\$ 2,094,400
OOU-3	Fenceline and hedgerows surface clearance (500,000 ft @ 40-ft width)	5	Residential, farming, forestry	Surface	\$ 5,000	460	1.00	\$ -	\$ -	\$ 2,300,000	\$ 230,000	\$ 2,530,000
OOU-4	Fenceline and hedgerows surface clearance (100,000 ft @ 40-ft width)	5	Residential, farming, forestry	Surface	\$ 5,000	92	1.00	\$ -	\$ -	\$ 460,000	\$ 46,000	\$ 506,000
OOU-5	Fenceline and hedgerows surface clearance (100,000 ft @ 40-ft width)	5	Residential, farming, forestry	Surface	\$ 5,000	92	1.00	\$ -	\$ -	\$ 460,000	\$ 46,000	\$ 506,000
OOU-6	Buffer Area	5	67% forestry 31% farming	IC signage	N/A	22,000	N/A	N/A	N/A	\$1,000	N/A	1,000
TOTAL											\$	51,185,876
OOU-2	Food plot areas	1	Farming	1 foot	\$ 8,700	500	1.00	\$ -	\$ -	\$ 4,350,000	\$ 435,000	\$ 4,785,000
OOU-2	Intervening areas	1	Hunting	Surface	\$ 7,700	1,615	1.50	\$ -	\$ -	\$ 18,653,250	\$ 1,865,325	\$ 20,518,575

Notes:

1. Cost for clearance based on the USAESCH Cost Estimating Guide. Cost is based on manual digital geophysical mapping.
2. USACE Costs for Oversight and Contracting estimated at 15% of UXO clearance costs.
3. Item number is cross-referenced to Final EE/CA Appendix C Table B.

Table D.2 Estimated Cost for OE Construction Support

	Rate	Qty/Units	Cost
Labor			
Tech II	\$ 43.00	960 /hr	\$ 41,280.00
Tech III	\$ 51.00	960 /hr	\$ 48,960.00
A-E PM	\$ 85.00	60 /hr	\$ 5,100.00
A-E Admin	\$ 35.00	30 /hr	\$ 1,050.00
ODCs			
Per Diem	\$ 86.00	240 /da	\$ 20,640.00
Health/Safety supplies	\$ 50.00	24 wk	\$ 1,200.00
Telephone	\$ 200.00	6 mo	\$ 1,200.00
Camera	\$ 150.00	1 LS	\$ 150.00
Two trucks and gasoline	\$ 375.00	48 wk	\$ 18,000.00
Air Fare	\$ 350.00	4 /trip	\$ 1,400.00
Schonstedt	\$ 850.00	2 ea	\$ 1,700.00
			Subtotal
USACE Oversight and Contracting (15%)			\$ 21,102.00
			Total
			Rounded
			\$ 161,782.00
			\$ 160,000.00

Note: Cost based on providing two UXO-qualified technicians for six months.

APPENDIX E
OE DETECTION, RECOVERY, AND DISPOSAL TECHNOLOGIES

APPENDIX E

OE DETECTION, RECOVERY, AND DISPOSAL TECHNOLOGIES

E.1 INTRODUCTION

This appendix provides a description of potentially applicable OE detection, recovery, and disposal technologies including new and innovative approaches. The selection of a technology for the site should be determined during a site prove-out based on criteria developed during the planning stage of a removal action.

E.2 DESCRIPTION AND EVALUATION OF OE CLEARANCE TECHNOLOGIES

E.2.1 Introduction

Various technologies and approaches exist for the clearance of OE. An OE clearance operation has three distinct phases: detection, recovery, and disposal. A discussion of the techniques used in each of these phases is presented in the following paragraphs.

E.2.2 OE Detection

E.2.2.1 The detection of OE includes those methods and instruments that can be used to locate OE. The selection of the best technology depends on the project objectives, properties of the OE to be located, including type and depth, and the characteristics of the location where the OE is located, such as topography, vegetation, geology, and cultural features. The detection capabilities of geophysical instrumentation have improved during the past decade. However, the ability to discriminate anomalies caused by UXO from anomalies caused by nature, ordnance scrap and other scrap has not significantly improved, and is an area of on-going research and development efforts. The Ordnance Detection and Discrimination Study (ODDS) conducted at Fort Ord, California determined that the discrimination capability of the instruments tested was at best, minimal and that data processing can be used to prioritize digs but can't be used to eliminate anomalies from consideration as UXO (Parsons 2002b).

E.2.2.2 Detection technologies have two basic forms. One form, visual searching, has been successfully used in the Middle Fork Ozan Creek and South Fork Ozan Creek to locate OE in the creek. When performing a visual search of a site, the area to be searched is typically divided into five-foot lanes that are then systematically inspected for OE. A metal detector is sometimes used to supplement the visual search in areas where ground vegetation may conceal OE.

E.2.2.3 The other form of OE detection, digital geophysics, includes a family of detection instruments designed to locate OE. This family of instruments includes magnetic instruments, electromagnetic (EM) instruments, and ground-penetrating radar (GPR). The two geophysical methods most effective and commonly used in OE detection are magnetic and EM. Evidence

supporting the effectiveness of these methods is based upon tests sponsored by the Army Environmental Center at Jefferson Proving Ground (JPG), where the best munitions detection rates were obtained using ground-based electromagnetic devices and magnetometers. Other geophysical techniques, such as GPR, electrical resistivity methods, and seismic methods, have also been used in OE detection investigations. However, the successful use of these methods tends to be highly site specific, and generally requires more processing to evaluate the data.

E.2.2.4 The selection of a geophysical instrumentation for detecting ordnance should be based on the detection capabilities of an instrument. These detection capabilities are defined by a prove-out survey that takes into account site-specific factors that include ordnance type and depth of target, as well as terrain, vegetation, geology and cultural features.

E.2.2.5 The three types of magnetometers most often used to detect buried munitions (fluxgate, proton precession, and optically pumped) are described below.

E.2.2.6 **Fluxgate Magnetometers.** The most commonly used fluxgate magnetometer is the Schonstedt GA-52/Cx that was used at the former SWPG during the EE/CA and ORAs.

Advantages:

- Fluxgate magnetometers have long been a standard tool of EOD Units in mag & flag or mag & dig operations and in reacquiring anomalies for intrusive investigation;
- Instruments are light and compact and can be used in any traversable terrain; and
- No data processing is required.

Disadvantages:

- This technique is not capable of recording data, i.e., there is no opportunity to review or analyze the data at a later time;
- Anomaly selection is solely dependent on the detection of audible tones by the operator;
- These instruments are typically less sensitive than other magnetometers; and
- Although the Schonstedt GA-52/Cx had one of the highest detection rates in the ODDS, the instrument also required the most intrusive investigation because of the number of anomalies, and thus higher cost, to achieve those rates.

E.2.2.7 **Proton Precession Magnetometers.** An example of a commonly used proton precession magnetometer is the Geometrics G-856.

Advantages:

- These instruments are highly sensitive and portable; and
- They require only a moderate level of data processing.

Disadvantages:

- Sampling rates are limited to about 1 reading per second thereby limiting its usefulness to mostly measuring the diurnal variation at a base station; and
- Typically this device only measures the total magnetic field intensity.

E.2.2.8 **Optically Pumped Magnetometer**. Examples of commonly used optically pumped magnetometers are the Geometrics G-858, Geometrics G-822, and the Scintrex Smart Mag.

Advantages:

- Superior sensitivity, rapid sampling rate, and high quality digital signal output of this device makes it the best selection among magnetometers when digital data or digital post-processing is required;
- Relatively light and compact and can be easily used in open areas; and
- In the ODDS conducted at Ford Ord (Parsons 2002b), the Geometrics G-858 and Geonics EM-61 were consistently effective in finding the larger and deeper items compared to other instruments tested in the study.

Disadvantages:

- Affected by magnetic properties of native soils and rock with high ferrous content;
- Difficult maneuvering on hilly terrain; and
- Requires a moderate-high level of data processing.

E.2.2.9 The two types of EM techniques most commonly used for OE detection are time-domain electromagnetic (TDEM) and frequency-domain electromagnetic (FDEM) techniques.

E.2.2.10 **TDEM**. Examples of TDEM instruments are the Geonics EM61 and EM61-Hand Held (HH).

Advantages:

- The TDEM technique can provide a good compromise between detection depth and resolution;
- TDEM instruments can detect all types of metallic munitions including non-ferrous items; and
- The two EM sensors with small coils, the EM61-HH and GEM-3 evaluated in the ODDS (Parsons 2002b) detected the smaller, shallower items with greater success than the EM61 and G-858 which were more effective in finding the larger and deeper targets.

Disadvantages:

- Some coils sizes and configurations are cumbersome to maneuver in portable mode and requires moderate effort to use in open areas; and
- Requires a moderate-high level of data processing.

E.2.2.11 **FDEM**. Examples of commonly used FDEM instruments are the Geophex GEM2, Geophex GEM3 instruments and Geonics EM31-MK2.

Advantages:

- Effective at detecting small items;
- Less effective at detecting deeply buried, single items; and
- Detects both ferrous and non-ferrous metallic objects.

Disadvantages:

- Commonly used systems are not effective at detecting individual, deeply buried munitions;
- Requires a high level of data processing; and
- Data processing of the Geophex data is more time-intensive due to greater volume of data from multiple channels.

E.2.2.12 **Dogs**. Dogs are also widely used throughout the world particularly in Europe and the Far East to detect UXO.

Advantage:

- Dogs do not respond to metal scrap or inert practice OE items.

Disadvantages:

- Dogs cannot detect UXO below a few inches of the surface; and
- The animals require housing and special handlers, and are not readily available in the United States.

E.2.2.13 The geophysical instruments described above have been incorporated into a variety of configurations for purposes of OE detection. A geophysical system is defined as an arrangement of sensors used in conjunction with some mode of transport that facilitates geophysical mapping. In some systems, a navigational suite of tools for the purposes of geo-referencing the geophysical data may be included. The geophysical systems described below each have optimal conditions under which to be employed. This section discusses the following OE detection systems: analog, portable units, towed arrays, and airborne.

E.2.2.14 **Analog Detection (Mag & Flag)**. Hand-held analog metal detectors, typically either a flux-gate magnetometer or a FDEM induction instrument are the traditional means used to locate buried ordnance. A modulation in the audible tone's pitch is an indication that an OE target may have been detected. The operator must then decide whether to reject the target as background "noise" or to place a marker at the location of the anomaly for intrusive investigation. Mag & flag is particularly effective in areas where vegetation and terrain limit the use of larger geophysical instruments or systems. This system was used at the former SWPG during the EE/CA and ORAs.

Advantages:

- Analog detectors are the most portable of detectors;
- The mag & flag or mag & dig approach is effective (and recommended) in areas where there is insufficient size and mass difference between the UXO and other ferrous objects (metallic fragments) such that digital discrimination is ineffective; and
- For example, discrimination would not likely have been effective NW of the WMA (Y Grids) in discriminating between the abundant ordnance scrap and 20mm items.

Disadvantages:

- Analog detectors are unable to record data; and
- This feature leads to a subjective assessment of targets and does not allow for future data analysis.

E.2.2.15 **Portable Digital Mapping Systems.** Digital acquisition with portable units is a standard geophysical mapping technique. The most common instruments used for OE detection (e.g., cesium-vapor magnetometers and TDEM instruments) are specifically designed for operation by a single person. Usually the detection instrument is either carried or pulled.

Advantages:

- Portable systems offer high maneuverability in areas of rough terrain and/or moderate vegetation;
- A digital mapping system would allow a thorough evaluation and ranking of geophysical anomalies;
- The geophysical data could be used to further prioritize removal actions for a later date; and
- Digital discrimination may be more effective in OOU-5 where the size of the target ordnance items is relatively large.

Disadvantages:

- Portable systems require manual transport and survey acquisition is limited to the pace of the operator; and
- Additional costs are incurred for processing and evaluation of data.

E.2.2.16 **Towed Arrays.** A multi-sensor towed array typically consists of multiple adjacent sensors mounted on a platform, which is towed behind a vehicle. The application of towed arrays is generally limited to large open areas that allow an array of sensors to be towed over an area of interest. A commonly used towed array is the Multi-Towed Array Detector System (MTADS), which uses either EM61 sensors, G-858 sensors, or a combination of the two. Data are collected by towing the array, effectively searching a swath approximately equal to the width of the sensor array with each pass. On-board computers (either mounted to the tow platform or on the tow vehicle inside the cab) record data and can easily be monitored by the system operator. The

maximum speed at which the array is towed depends upon the terrain conditions and sampling rate of the detectors; speeds typically range between 4 to 6 miles per hour. Positional data are recorded utilizing automated navigation systems, which can also be used to assist the operator in navigating through the survey area.

Advantage:

- Towed arrays are capable of rapid acquisition over open areas; and
- It could potentially be used in some of the cleared pasture areas at the former SWPG.

Disadvantage:

- Towed arrays have limited maneuverability around obstacles and require wide-open flat terrain.

E.2.2.17 Airborne Systems. Due to survey altitudes, airborne magnetic systems have had limited use in OE detection. Airborne magnetic systems have mainly been used for reconnaissance or sites with large targets. TDEM systems are presently under development for airborne applications. Airborne systems should only be considered for sites with large open areas, flat topography and void of vertical obstacles. Commercially available airborne systems consist of magnetometer sensors placed within fiberglass booms mounted to the port, starboard, and forward sides of a helicopter. The sensor separation is approximately equal to the sensor height when flown above ground level (~2 m). Additional instrumentation used includes: a laser altimeter to record sensor altitude; a Differential Global Position System (DGPS) system to record positional data; and a fluxgate magnetometer to provide data compensation for the magnetic signature of the helicopter. An on-board computer records all data sampled.

Advantage:

- The airborne system is capable of very rapid acquisition over large areas.

Disadvantages:

- Airborne system detection rates are much lower in comparison to ground-based techniques;
- These systems are limited to sites with large open areas, flat topography and void of vertical obstacles;
- An airborne survey could potentially be conducted in large open areas such as portions of the Bombing Range and the Old Dry Lake Target Range; and
- The OE detection rate may be poor unless the large amount of surface fragments and clutter were removed prior to the survey.

E.2.3 OE Recovery

E.2.3.1 Once a site has been surveyed by either visual or geophysical means, the recovery of OE can begin following relocation of the anomaly. Physical relocation of the anomaly can either be accomplished by digitally uploading the selected anomaly coordinates into a navigation unit to navigate to the anomaly location; or by the use of surveyor's tapes to triangulate the anomaly

locations from known reference points, such as grid corner markers. Recovery operations can take the form of a surface-only clearance of OE, an intrusive (subsurface) clearance of OE, or a combination of the two. The decision on the degree of clearance operation (depth and lateral extent) to engage in is based on the nature and extent of the OE presence as well as the future use of the site.

E.2.3.2 During a surface clearance operation, exposed OE or suspected UXO is identified during the detection phase. Then the UXO are inspected, identified, and transported to a designated area for cataloging and eventual disposal. If it is determined during inspection that an item cannot be safely moved, the item would be destroyed in place.

E.2.3.3 During a subsurface clearance operation, buried OE or suspected UXO identified by the geophysical survey or other detection methods requires excavation for removal. Because the actual nature of the buried UXO/OE item cannot be determined without it being uncovered, non-essential personnel evacuations are necessary and may also include the use of engineering controls to ensure the safety of the operation. The excavation of the OE item then takes place with either hand tools or mechanical equipment depending on the suspected depth of the object. Once the OE item has been exposed, it is then inspected, identified, and transported to a designated area for cataloging and eventual disposal. If it is determined during the OE inspection that the item cannot be safely moved, it would be destroyed in place.

E.2.3.4 Evacuations are sometimes necessary when conducting intrusive investigations to minimize the risk of the operation. The evacuation area will be within a predetermined minimum separation distance (MSD) to ensure the safety of the operation. The MSD is initially based on the anticipated type of UXO that may be encountered and is adjusted for the actual identified UXO item prior to demolition activities. All non-essential/non-UXO personnel and the general public must be evacuated from the area and maintain their distance beyond the MSD during intrusive operations. The MSD may be reduced if appropriate engineering controls are applied, such as sandbag mounds and sandbag walls over and around the potential UXO item. However, evacuations may be required if excavations take place close to inhabited areas and engineering controls cannot reduce the MSD to preclude the need to evacuate. Available options will be explored, as appropriate, to minimize potential evacuations with the exception of compromising public safety.

E.2.3.5 Manual digging using hand tools is the most common method to recover ordnance. The use of mechanized equipment for ordnance recovery has been limited to areas containing small arms ammunition and thin-cased ordnance items (ex. smoke grenades) and ordnance with known fuzing. Current USAESCH policy for the mechanical excavation of OE items requires that the equipment stop at least one foot above the buried item and completed manually by a UXO-qualified technician.

E.2.3.6 A recent innovation in OE recovery is the use of remote-controlled mechanized equipment such as the Teleoperated Ordnance Disposal System (TODS) designed by OAO Robotics. These systems may be useful in areas where there is a high density of UXO because it eliminates the need for a UXO-qualified technician inside the hazard area, thereby providing safety for workers. Remote-controlled systems typically include a front-end loader with a rake

and sifter for excavation of the OE and a conveyer to transport the OE to a staging area for evaluation and final disposal. Systems also include a navigation and positioning component, usually a global positioning system as well as a video surveillance system for the operator stationed outside the MSD. These systems require open areas in order for the equipment to maneuver and an operator and maintenance person and a team of UXO-qualified personnel to dispose of the ordnance. The TODS has reportedly been used to clear small AP and anti-tank (AT) mines. Its ability to handle larger ordnance has not been proven. The use of the mechanized equipment for ordnance with point detonating and mechanical fuzing could result in an unintentional detonation and destruction of equipment.

E.2.4 OE Disposal

E.2.4.1 Disposal of recovered OE can take one of three different forms: off-site demolition and disposal; remote, on-site demolition and disposal; and in-place demolition and disposal. The decision regarding which of these techniques to use is based on the risk involved in employing the disposal option, as determined by the specific area's characteristics and the nature of the UXO/OE recovered.

E.2.4.2 If an OE item is transported off-site for destruction, the OE would be transported by either Army personnel or by a qualified UXO subcontractor. The OE is typically transported to an active military installation where it can be safely destroyed. The transportation of OE is performed in accordance with the provisions of 49 CFR 100-199, TM 9-1300-206, and applicable state and local laws. A Transportation Plan detailing the route and procedures used during the transportation is prepared and approved prior to engaging in any off-site OE transport to ensure all safety aspects of the movement have been addressed. Off-site transportation of OE for destruction was not necessary during this investigation as all items were designated as UXO and destroyed in place.

E.2.4.3 If UXO is discovered in proximity to occupied buildings it may not be possible to safely destroy the UXO item in place without the use of engineering controls. If a UXO item is safe to move, it can be moved to a remote part of the project site where demolition and disposal can safely take place. A countercharge can be used to destroy the UXO item.

E.2.4.4 Finally, a UXO item may be destroyed in place. This technique is typically employed when the UXO item cannot be safely moved to a remote location or if the UXO items are located in an area that is sufficiently remote. When employing this technique, procedures similar to those described above are used that will detonate the UXO item. When this technique is employed, engineering controls such as sandbag mounds and sandbag walls over and around the UXO item are often used to minimize the blast effects. Other engineering controls include fabricated steel open-front barricades or miniature open-front barricades.

E.2.5 Recommended OE Clearance Technologies

E.2.5.1 The geophysical systems and instruments described above each have their advantages and disadvantages. The high density of ordnance items and large variation in ordnance size at the former SWPG poses a significant challenge to the utility of digital geophysical mapping and potential ordnance discrimination. The very high density of ordnance items detected in the

former SWPG indicates that it may be difficult at best, to resolve or distinguish individual anomalies.

E.2.5.2 Portable digital geophysical mapping is most likely to be successful in OOU-4 and OOU-5. The ordnance in these areas is generally larger with a smaller range in type and size than ordnance found elsewhere and prior studies also reported a lower density of ordnance in these units. The detection capability is more likely to be improved from digital geophysical mapping and data processing in OOU-4 and OOU-5 where the depth of ordnance penetration is also greater. The digital geophysical mapping approach may also be useful where construction or other debris may be present, particularly around residences, to distinguish or resolve individual anomalies. In addition, the geospatial location and digital record of anomalies is considered an important aspect for the former SWPG because of the length of time that it will take to clean this site. The selection of a technology for the site should ultimately be determined during a site prove-out based on criteria developed during the planning stage of each removal action.