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August 27, 2013

Mr. Richard Meadows
U.S. Army Corps of Engineers
Huntington District (CELRH-PP-P)
502 8th Street Street
Huntington, WV 25701-2070

via FedEx

SUBJECT: SUBMITTAL OF FINAL SITE INSPECTION REPORT FOR FORMERLY USED DEFENSE SITES – MILITARY MUNITIONS RESPONSE PROGRAM
SITE: **WEST VIRGINIA MANEUVER AREA (WVMA)**
MRS02 WEST VIRGINIA MANEUVER AREA AMMUNITION DEPOT
RANDOLPH COUNTY, WEST VIRGINIA
FUDS PROPERTY NO.: G03WV0013
FUDS PROJECT NO.: G03WV001306
CONTRACT NO. W912PP-11-C-0007, TASK ORDER 0001

Dear Mr. Meadows:

Please find enclosed six (6) paperbound copies along with six (6) copies in PDF on CD-ROM of the Final Site Inspection Report for the MRS02 WVMA Ammunition Depot in Randolph County, WV for your records.

This document is prepared by Eco & Associates, Inc. (Eco) in conjunction with Parsons Infrastructure and Technology Group, Inc. (Parsons) under U.S. Army Corps of Engineers (USACE) Contract W912PP-11-C-0007, Task Order 0001.

Please do not hesitate to contact me at (714) 289-0995 if there are questions regarding the presentation of this document or its contents.

Sincerely,
ECO & ASSOCIATES, INC.

Mohammad Estiri, PhD
Project Director

cc: Mr. Brian Jordan, USACE, Albuquerque (1 hard copy & CD)
Ms. Laura Kelley, Parsons (1 hard copy & CD)
Ms. Lauren Ranker, Parsons (1 hard copy & CD)

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Enclosures

SITE INSPECTION REPORT

FORMERLY USED DEFENSE SITE
MILITARY MUNITIONS RESPONSE PROGRAM
SITE INSPECTION PHASE

•FINAL•

August 2013

West Virginia Maneuver Area
MRS02 West Virginia Maneuver Area Ammunition Depot
Randolph County, West Virginia

Contract No.: W912PP-11-C-0007
Task Order: 0001

FUDS Property No.: G03WV0013
FUDS Project No.: G03WV001306

Prepared for:
United States Army Corp of Engineers
Huntington District
502 8th Street
Huntington, West Virginia 25701

and

United States Engineering and Support Center
Hunstville, Alabama

CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Eco & Associates, Inc. (Eco) has completed the Final Site Inspection Report for the MRS02 West Virginia Maneuver Area Ammunition Depot in Randolph County, WV. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. The independent technical review verified compliance with established policy principles and procedures, using justified and valid assumptions. This included review of assumptions; methods, procedures, and material used in analyses; alternatives evaluated; appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing Corps policy.

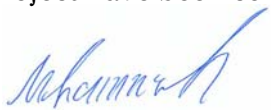
August 27, 2013

Eco Team Member(s)

Significant concerns and the explanation of the resolution are as follows:

None

As noted above, all concerns resulting from independent technical review of the project have been considered.



August 27, 2013

Eco Program Manager(s)

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ABBREVIATIONS AND ACRONYMS

‘	foot
“	inch
°	degree
ADR	Automatic Data Review
APPL, Inc.	Agriculture & Priority Pollutants Laboratories, Inc.
bgs	below ground surface
CA	California
CCV	continuing calibration verification
CELRD	USACE Great Lakes and Ohio River Division
CELRH	USACE Huntington District
CELRL	USACE Louisville District
CENWW	USACE Walla Walla District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Chain of Custody
CRREL	Cold Regions Research and Engineering Laboratory
CSEM	conceptual site exposure model
CSM	conceptual site model
CVI	Canaan Valley Institute
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DQO	data quality objective
DI	de-ionized
DSN	Dolly Sods North
DSSA	Dolly Sods Scenic Area
DSW	Dolly Sods Wilderness
EB	equipment blank
Eco	Eco and Associates, Inc
EDD	electronic data deliverable
EDR	Environmental Data Resources, Inc
ELAP	Environmental Laboratories Accreditation Program
ER	Engineer Regulation
FD	field duplicate
FUDS	Formerly Used Defense Site
GIS	Geographic Information Systems
GPS	Global Positioning System
HE	high explosive
HRS	Hazard Ranking System
ICAL	initial calibration
ICSA	interference check sample “a”
ICSAB	interference check sample “ab”
ICV	initial calibration verification
INPR	Inventory Project Report

J	Analyte detected, estimated concentration
LCS	laboratory control sample
LOD	limits of detection
MC	munitions constituents
MCL	maximum contaminant level
MD	munitions debris
MDL	method detection limit
MEC	munitions and explosives of concern
mm	millimeter
MMRP	Military Munitions Response Program
MNF	Monongahela National Forest
MQO	method quality objectives
MRS	Munitions Response Site
MRSPP	Munitions Response Site Prioritization Protocol
MS	matrix spike
MSD	matrix spike duplicate
N/A	not applicable
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCDC	National Climate Data Center
NELAC	National Environmental Laboratory Accreditation Conference
OE	Ordnance and Explosives
PA	Preliminary Assessment
PARCC	precision, accuracy, representativeness, comparability, and completeness
Parsons	Parsons Infrastructure and Technology Group, Inc.
PSAP	Programmatic Sampling and Analysis Plan
PSD	Public Service District
PWP	Programmatic Work Plan
QA	quality assurance
QC	quality control
QR	qualitative reconnaissance
QSM	Quality System Manual
RBC	Risk-Based Concentration
RI/FS	remedial investigation and feasibility study
RL	reporting limit
ROE	right-of-entry
RPD	relative percent difference
RR	Railroad
RSL	regional screening level
SDG	Sample Delivery Group
SI	site inspection
SLERA	screening level ecological risk assessment
SLRA	screening-level risk assessment
SOP	Standard Operation Procedure
SR	smoke round
SS-WP	Site-Specific Work Plan
SVT	site visit team
T&E	Threatened and Endangered
TCRA	time-critical removal action
TPP	technical project planning
U	analyte was analyzed for but not detected above the sample specific practical quantitation limit (PQL_sa)

U.S.	United States
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UXO	unexploded ordnance
WSA	Watershed Atlas
WV	West Virginia
WVDCH	West Virginia Division of Culture and History
WVDEP	West Virginia Department of Environmental Protection
WVDHHR	West Virginia Department of Health and Human Resources
WVDNR	West Virginia Division of Natural Resources
WVGES	West Virginia Geological and Economic Survey
WVMA	West Virginia Maneuver Area
WVWSC	West Virginia Water Science Center

GLOSSARY OF TERMS

inhabited structure	Permanent or temporary structures, other than military munitions related structures that are routinely occupied by one or more persons for any portion of a day.
military munitions	All ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the Department of Defense, the Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants; explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives and chemical warfare agents; chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges; and devices and components thereof.
munitions and explosives of concern (MEC)	Military munitions that may pose unique explosives safety risks, including unexploded ordnance, discarded military munitions, or munitions constituents present in high enough concentrations to pose an explosive or other health hazard.
munitions constituents (MC)	Any materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.
munitions debris (MD)	Remnants of munitions (e.g., penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal.
munitions response	Response actions, including investigation, removal actions, and remedial actions, to address the explosive safety, human health, or environmental risks presented by unexploded ordnance, discarded military munitions, or munitions constituents, or to support a determination that no removal or remedial action is required.

munitions response area	Any area on a defense site that is known or suspected to contain unexploded ordnance, discarded military munitions, or munitions constituents. Examples include former ranges and munitions burial areas. A munitions response area includes one or more munitions response sites.
munitions response site (MRS)	A discrete location within a munitions response area that is known to require a munitions response.
projectile	Object projected by an applied force and continuing in motion by its own inertia. This includes bullets, bombs, shells, grenades, guided missiles, and rockets.
unexploded ordnance (UXO)	Military munitions that have been primed, fuzed, armed, or otherwise prepared for action; that have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installation, personnel, or material; and that remain unexploded whether by malfunction, design, or any other cause.

EXECUTIVE SUMMARY

OBJECTIVE

The objective of this site inspection (SI) is to determine whether the West Virginia Maneuver Area (WVMA) Ammunition Depot Munitions Response Site (MRS) located within the WVMA/Dolly Sods Formerly Used Defense Sites (FUDS) (FUDS Property No. G03WV0013, FUDS Project No. G03WV001306, WVMA Ammunition Depot ["MRS02"]) in Randolph County, West Virginia, warrants further investigation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The WVMA Ammunition Depot was under military control from 1943 to 1944 and served as the main ammunition storage area during the operational period of the WVMA. The potential munitions stored at the ammunition depot include 155 millimeter (mm) high explosive (HE) projectiles; 105mm HE and smoke round (SR) cartridges; 81mm HE and SR cartridges; 75mm HE and SR shells; 60mm HE and SR shells; 4.2-inch HE and SR shells; 3.25-inch target rockets; fragmentation, smoke, and practice hand grenades; demolition charge blocks, demolition firing devices, blasting caps, time fuses, and general small arms ammunition (.22, .30, .38, .45, and .50 Caliber).

The SI at the former WVMA Ammunition Depot MRS was performed to confirm the MRS location and to evaluate evidence for the presence of munitions and explosives of concern (MEC), munitions debris (MD) and the presence of elevated metals concentrations that are consistent with the identified munitions constituents (MC) contaminants of concern at the FUDS. To accomplish this objective, qualitative reconnaissance (QR) and metals sampling were performed at the WVMA Ammunition Depot MRS within the WVMA/Dolly Sods FUDS.

TECHNICAL PROJECT PLANNING MEETING

The technical project planning (TPP) process determined that the collection of three surface soil samples would be sufficient to meet the SI project objectives. In addition, the TPP team concluded that surface water and sediment sampling would not be conducted due to a lack of flowing surface water at the MRS. The TPP team also concluded that biased soil samples would be collected from a depth of 2 feet below ground surface (bgs) using a hand auger. The samples were collected from that depth to avoid surficial soil that has been disturbed by flooding and agricultural operations. Because the samples were collected using a hand auger, they were collected as discrete samples rather than composite samples. The TPP team also established the screening levels to be used for the human health screening level risk assessment.

EVALUATION AND FINDINGS

The SI evaluation included soil sampling within the MRS boundary along 0.75 miles of QR (Figure ES.1). Agriculture & Priority Pollutants Laboratories, Inc (APPL, Inc.) in Clovis, California analyzed the samples for explosives and selected metals. No explosives were detected and no metals were detected above the selected background values.

There are no documented historical findings of MEC at the MRS, no MEC items were found during a previous field visit to the MRS, and no MEC items were observed during the 2012 site visit. In addition, no MD indicative of MEC was observed during previous site visits or during the 2012 site visit. Table ES.1 and Figure ES.1 summarize the results of the SI.

TABLE ES.1

SUMMARY OF RESULTS

WVMA AMMUNITION DEPOT MRS, RANDOLPH COUNTY, WEST VIRGINIA

MRS	ACREAGE	MEC ASSESSMENT[1]	METALS ASSESSMENT[2]	RECOMMENDATION
WVMA Ammunition Depot	4	**No** No MEC has been found at the MRS. No MD indicative of MEC has been observed within the MRS. Based on historical use, MEC is not suspected to remain at the MRS.	**No** No unacceptable risk to human health due to exposure to metals in surface soil has been identified.	No Further Action

Notes:

(1) "No" in this column indicates no confirmed MEC or MD indicative of potential MEC presence.
(2) "No" in this column indicates the absence of metals at levels indicating a potential risk to human health or ecological receptors, resulting in a recommendation for no further metals sampling for the MRS.

The types of ordnance represented by the suspected munitions have the potential to harm human receptors if they are contacted and are still functional. However, no MEC and no MD has been found at the MRS, and based on the known historic use of the WVMA Ammunition Depot MRS for munitions storage only, explosive hazards are not expected to remain at the MRS. No explosive safety risks are considered to be present at this MRS. Therefore, the MEC exposure pathway is incomplete at the WVMA Ammunition Depot MRS.

An exposure pathway for a chemical release is not considered complete unless all four of the following elements are present (U.S. Environmental Protection Agency [USEPA] 1989):

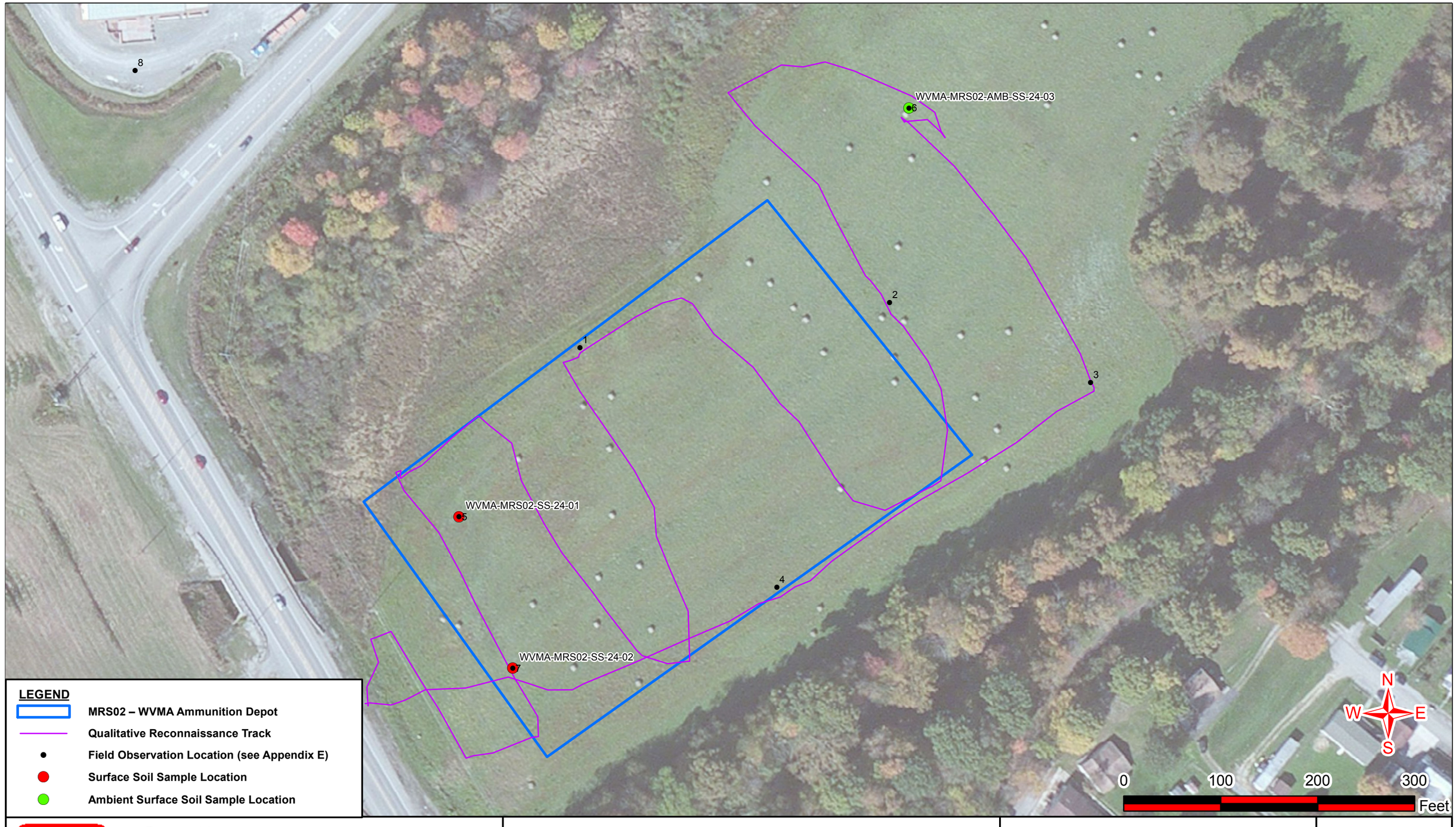
1. A source and mechanism for chemical release;
2. An environmental transport and/or exposure medium;
3. A receptor exposure point; and
4. A receptor and a likely route of exposure at the exposure point

No explosive compounds were detected in the soil samples collected at the WVMA Ammunition Depot MRS. Based on the QR conducted at the MRS, there is no evidence of munitions at the site. The maximum detected concentrations of the metals at MRS02 did not exceed the selected background concentrations. The WVMA Ammunition Depot MRS is not an important ecological place, and ecological receptors are not expected to be present at the site. Therefore, a screening level ecological risk assessment (SLERA) was not conducted for the WVMA Ammunition Depot MRS.

RECOMMENDATIONS

Based on the analytical results and exposure pathways evaluated during this SI, no further action is necessary at the WVMA Ammunition Depot MRS. Due to the fact that there is no suspected explosive safety risk at the MRS, a removal action is not warranted. As summarized in Table ES.1, the recommendation is based on the following:

- The known historic use of the WVMA Ammunition Depot MRS includes munitions storage only and there is no evidence of any release mechanisms that might result in explosive hazards remaining at the MRS.
- There are no documented historical findings or other evidence of MEC remaining at the MRS. No MD and no MEC items were found during a previous field visit to the MRS, and no MD and no MEC items were observed during the 2012 site visit.
- No explosives were detected and no metals were detected above the selected background values.



Prepared by:
Eco & Associates, Inc.
and
PARSONS

GENERAL SITE OVERVIEW
MRS02 – WVMA Ammunition Depot
MMRP West Virginia

PROJECT NO. Eco-11-452

DATED August 2013

FIGURE
ES.1

CHAPTER 1
INTRODUCTION

1.1 BACKGROUND

Eco and Associates, Inc. (Eco) received Contract No. W912PP-11-C-0007, Task Order No. 0001, from the United States Army Corps of Engineers (USACE) Engineering and Support Center, Huntsville to perform a site inspection (SI) of the West Virginia Maneuver Area (WVMA) Ammunition Depot Munitions Response Site (MRS), one of seven MRSs identified within the WVMA/Dolly Sods Formerly Used Defense Site (FUDS) Property No. G03WV0013. The 4-acre WVMA Ammunition Depot (MRS02) (FUDS Project No. G03WV001306) is included within the 2,180,367 acres acquired by the Department of the Army for military training during WWII. The WVMA Ammunition Depot MRS is located in Randolph County, in the City of Elkins near the southwest corner of the FUDS. The U.S. Geological Survey (USGS) map coordinates for the subject MRS are 38° 56' 51.12" N and 79° 51' 21.15" W. Figure 1.1 shows the site location of the MRS in relation to the WVMA FUDS, and Figure 1.2 shows the site location.

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

Pursuant to USACE Engineering Regulation (ER) 200-3-1 (USACE, 2004b) and the Management Guidance for the Defense Environmental Restoration Program (DERP) (March 2012), the USACE is conducting FUDS response activities. All work is performed in accordance with the following:

- The DERP statute (10 U.S. Code [USC] 2701 et seq.)
- The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, 42 USC 9601, et seq.)
- Executive Orders 12580 and 13016
- The National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 Code of Federal Regulations [CFR] Part 300)

The USACE is conducting SIs, as set forth in the NCP, to evaluate hazardous substance releases or threatened releases from eligible FUDS.

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

This report summarizes the work performed during the SI and describes any MEC and elevated metals concentrations that are consistent with the identified MC contaminants of

concern identified at the FUDS. The SI is limited exclusively to MEC and metals contamination issues and does not consider unrelated hazardous and toxic waste concerns that the FUDS may pose. Per ER 200-3-1 guidance for conducting an SI, "The SI is not intended as a full-scale study of the nature and extent of contamination or explosive hazards"; it only requires collection of sufficient and appropriate information as defined in the Technical Project Planning (TPP) Memorandum for this site (Appendix B).

1.2 PROJECT OBJECTIVES

The primary objective of the MMRP SI is to provide information regarding whether further response action under CERCLA is appropriate. The SI collects sufficient and appropriate information the USACE utilizes to determine whether further DoD action is warranted. The SI Report also provides the following:

1. Determination of the potential need for a removal action
2. Collection or development of additional data, as appropriate, for Hazard Ranking System (HRS) scoring by the U.S. Environmental Protection Agency (USEPA)
3. Collection of data, as appropriate, to characterize the release for effective and rapid initiation of the remedial investigation and feasibility study (RI/FS), if appropriate.

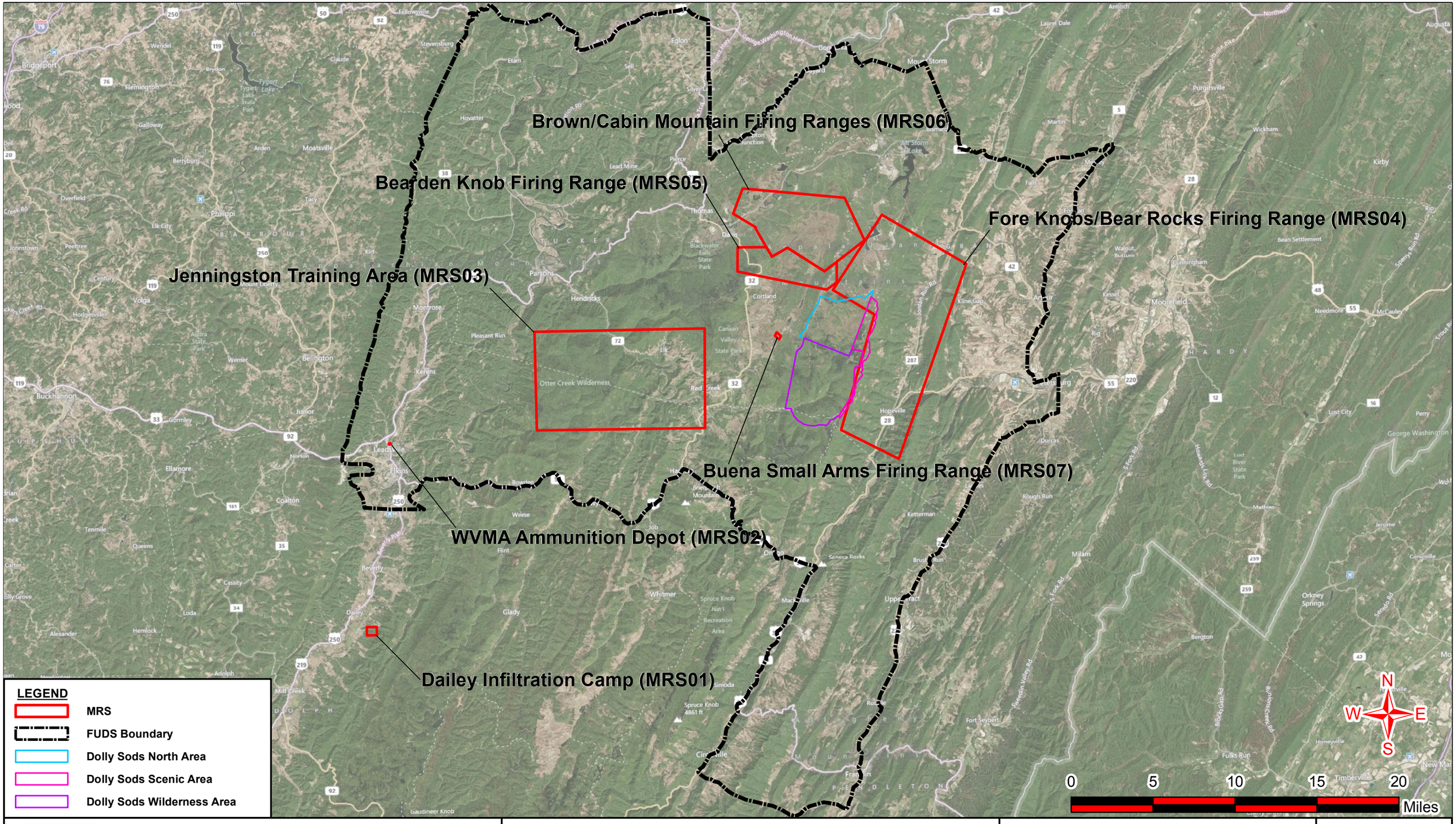
An additional objective of the MMRP SI is to collect the additional data necessary to complete the Munitions Response Site Prioritization Protocol (MRSPP).

1.3 PROJECT SCOPE

The primary project planning documents used to perform the SI include the Site-Specific Work Plan (SS-WP) Addendum for the WVMA Ammunition Depot MRS (Eco 2011b), the South Pacific Division Range Support Center Programmatic Work Plan (Parsons Infrastructure and Technology Group, Inc. [Parsons] 2010), and the Programmatic Sampling and Analysis Plan (PSAP [USACE 2005]). The performance work statement for this project is provided in Appendix A.

The USACE Huntington District (CELRH) held a TPP meeting on April 7, 2011 that included representatives of the CELRH, the USACE Walla Walla District (CENWW), the West Virginia Department of Environmental Protection (WVDEP), the U.S. Forest Service (USFS), the U.S. Fish and Wildlife Service (USFWS), the Canaan Valley Institute (CVI), Eco, and Parsons. A final TPP Memorandum was issued on September 22, 2011 (Eco 2011a).

The TPP Team determined that the comparison criteria for soil sample results would be the WVDEP Risk-Based Concentrations (RBCs), Table 60-3B in the Voluntary Remediation and Redevelopment Rule (60CSR3) supplemented with USEPA regional screening levels (RSLs) for residential soil. The comparison criteria for surface water samples would be the WVDEP Requirements Governing Water Quality Standards supplemented with USEPA RSLs for tap water. The comparison criteria for groundwater samples would be WVDEP Requirements Governing Water Quality Standards then WVDEP RBCs supplemented with USEPA maximum contaminant levels (MCLs), National Primary Drinking Water Standards and USEPA RSLs for tap water.



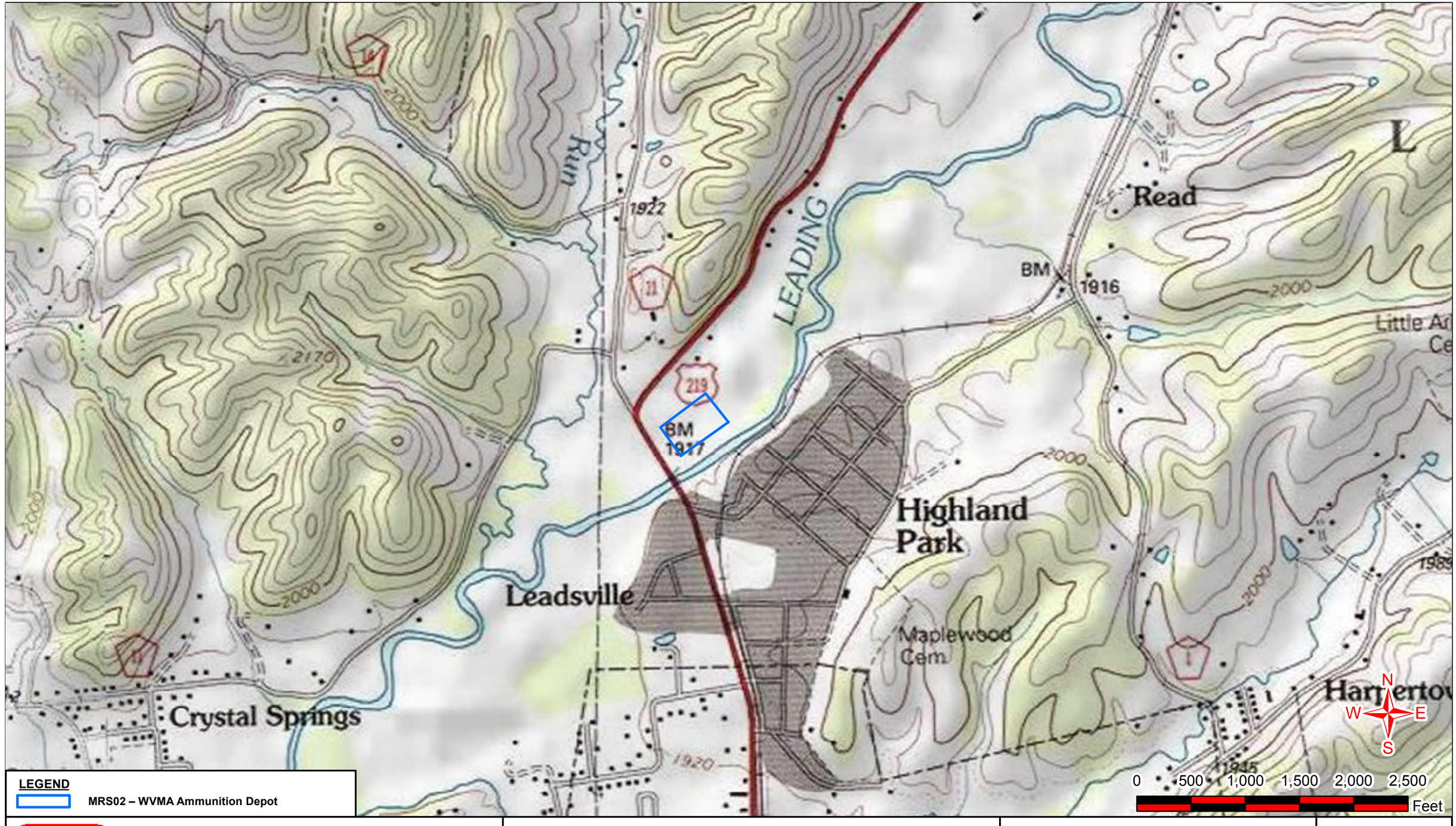
Prepared by:
Eco & Associates, Inc.
and
PARSONS

MRS Location Map
West Virginia Maneuver Area
FUDS Property No. G03WV0013

PROJECT NO. Eco-11-452

DATED August 2013

FIGURE
1.1



LEGEND

MRS02 – WVMA Ammunition Depot

Prepared by: Eco & Associates, Inc. and PARSONS	**SITE LOCATION** **MRS02 – WVMA Ammunition Depot** **MMRP West Virginia**	PROJECT NO. Eco-11-452 DATED August 2013	FIGURE 1.2

CHAPTER 2
PROPERTY DESCRIPTION AND HISTORY

2.1 SITE DESCRIPTION

The WVMA Ammunition Depot MRS is located in Randolph County, West Virginia. The site is located approximately 1.5 miles north of Elkins City Hall (Figure 1.1). The total FUDS acreage is 2,180,367 acres, including the 4-acre WVMA Ammunition Depot MRS. The FUDS acreage also includes six other MRSs, each covered by a different SI but listed under the same FUDS Property No. G03WV0013. The WVMA FUDS was used from 1943 to 1944 and was returned to the various private landowners and USFS in 1950. The land comprising the WVMA Ammunition Depot MRS is currently owned by private individuals and is utilized for agriculture.

2.2 SITE LOCATION AND SETTING

2.2.1 TOPOGRAPHY AND VEGETATION

The WVMA Ammunition Depot MRS is located within the Appalachian Plateau physiographic province (USGS 2002, West Virginia Geological and Economic Survey [WVGES]), 2004). Figure 2.1 shows the site and adjacent properties. The elevation of the site is approximately 1,916 feet above mean sea level. The MRS is bordered by Old Route 219 and a concrete company to the north, Leading Creek, the Western Maryland RR line, and residences to the south, vacant land to the east, and County Route 11/U.S. Route 219 with vacant land beyond to the west. The MRS is contained within the Elkins 7.5-minute topographic quadrangles (USGS 1995).

The majority of the WVMA Ammunition Depot MRS consists of relatively flat vacant agricultural land covered with grass and wildflowers. Vegetation observed during the SI was consistent with these descriptions, as shown in site photographs taken during the site visit (see Appendix E).

2.2.2 SOIL

In the area of the WVMA Ammunition Depot MRS, the soil types consist of Atkins silt loam, the Berks-Weikert complex, and Philo loam. In addition to the soil types listed above, an area of cut and fill is identified directly adjacent to County Route 219/86 along the northwest edge of the MRS (United States Department of Agriculture [USDA] 2011b).

Atkins silt loam is a poorly draining soil found in flood plains. It consists of silt loam and loam within the upper four feet of the surface with gravelly sandy loam to silty clay loam at depth. Loam is a soil type composed of various mixtures of silt, sand, and clay that generally contains greater than 60% silt and less than 40% clay. Atkins silt loam underlies the central portion of the MRS.

The Berks-Weikert complex is found on mountain slopes. The complex consists of channery silt loam with weathered and un-weathered bedrock at depth. Channery soils are soils that

contain more than 15% of flat rock fragments up to 6 inches long on their long axis. The Berks-Weikert complex underlies the extreme northern corner of the MRS.

The Philo loam is a moderately well drained soil found in flood plains. The soil consists of loam within the upper two feet with fine sandy loam at depth. Philo loam underlies the southern and southwestern portion of the MRS.

The TPP Team determined that this site may have been impacted by flooding in the mid-1980s. Therefore, the TPP Team decided that soil samples should be collected from a depth of 2 feet below the surface. Soil encountered at this depth at the proposed sample locations should consist of loam with the exception of the extreme northern portion of the MRS adjacent to County Route 219/86. The soil in this area consists of channery silt loam of the Berks-Weikert complex (USDA 2011b).

2.2.3 CLIMATE

The Allegheny Mountain Province has distinct seasons of approximate equal length. It has a humid continental climate with the exception of a marine modification in the lower panhandle. Average annual temperatures range from below 50°F (10°C) in the north to about 64°F (18°C) in the south to about 48°F (9°C) in areas of high altitude. Average annual precipitation varies from more than 80 inches in the high mountain areas to 35 inches in the valleys (National Climate Data Center [NCDC] 2007). Annual precipitation is plentiful and evenly distributed with short, infrequent periods of water deficit. Average high temperatures in the MRS region range from a high of approximately 82°F (28°C) in July to a low of approximately 18°F (8°C) in January. The temperatures in May, when field work was performed, ranged from a high of approximately 72°F (22°C) to a low of approximately 44°F (7°C) (Climate-Charts 2011).

2.2.4 SIGNIFICANT AND INHABITED STRUCTURES

There are no roads, foot trails, or building foundations present within the MRS (Figure 2.1). In addition, the site visit team (SVT) did not identify any inhabited structures within the MRS. The team observed numerous inhabited structures within two miles of the MRS, consisting of residential and commercial buildings along U.S. Route 219 and residential and agricultural buildings in and around the City of Elkins. Inhabited structures are permanent or temporary structures, other than military munitions-related structures, that are routinely occupied by one or more persons for any portion of a day.

2.2.5 DEMOGRAPHICS

The WVMA Ammunition Depot MRS is located in Randolph County in the City of Elkins, West Virginia. According to U.S. Census 2010, the population density of Randolph County is 27 persons per square mile. The census data indicate that up to 14,265 people live within an approximate 4-mile buffer of the WVMA Ammunition Depot MRS, with 22 of those people living within the census block covering the center of the MRS (Table 2.1). The SVT observed numerous inhabited structures within 2 miles of the MRS, mainly located within and surrounding the City of Elkins. However, the SVT did not identify any residences within the MRS boundaries (Figure 2.2). Based on the SVT's observations and the fact that the entire MRS consists of vacant agricultural land, it is assumed that no one actually lives within the area suspected of being the former ammunition depot (U.S. Census Bureau 2011).

TABLE 2.1

POPULATION WITHIN 4-MILE BUFFER OF THE
WVMA AMMUNITION DEPOT MRS

RANGE	ONSITE	0 TO ¼ MILE	¼ TO ½ MILE	½ TO 1 MILE	1 TO 2 MILES	2 TO 3 MILES	3 TO 4 MILES	TOTAL
MRS02	22	520	572	1,460	5,056	3,288	3,347	14,265

Source: U.S. Census 2010 data. The population within the FUDS, MRS, or any buffer area is determined using a conservative approach to calculate the population of an area by including the total number of people for any census block that falls within or overlaps the site boundary, MRS boundary, or buffer line.

2.2.6 CURRENT AND FUTURE LAND USE

The majority of the WVMA Ammunition Depot MRS is owned by private individuals and is used for agriculture. It is possible that land use could change from agricultural to residential or commercial use in the future.

2.3 SITE OWNERSHIP AND HISTORY

The former WVMA consisted of approximately 2,180,367 acres of land covering portions of Grant, Pendleton, Preston, Randolph, and Tucker counties in northeastern West Virginia generally near the town of Davis. Maneuver rights, secured by the Rents and Claims Board, Fifth Service Command, secured 350,416 acres of public lands (all part of the Monongahela National Forest [MNF]), 48,557 acres of leased property for inclusion in the Impact Area, and 1,781,394 acres of so-called "lesser interests". According to a warning order notice, dated March 26, 1945, these "lesser interests" were covered by "trespass agreements". The land owners had granted use of these lands to the Army verbally; there are no records that describe the "trespass agreements" or the areas that they covered (USACE 1990). A letter, dated July 15, 1943 from the Secretary of War to the Secretary of Agriculture stated that there is a military necessity for the use of portions of the MNF for Army Maneuver purposes. In a response letter dated August 4, 1943 from the Secretary of Agriculture to the Secretary of War, the Department of Agriculture grants permission for the Army to use all MNF land in Preston, Grant, Randolph, Tucker, and Pendleton counties in West Virginia, a total coverage of 341,266 acres (USACE 2009).

Based upon lease records and other information contained in the 2009 Preliminary Assessment (PA), areas where live artillery fire was conducted were informally designated the WVMA Impact Area. Therefore, the WVMA Ammunition Depot MRS is not within the WVMA Impact Area. A record of the lease agreements associated with the WVMA is contained in the PA (USACE 2009).

Prior to DoD use, the area was mainly used for logging and agriculture purposes. Extensive logging began during the late 1800s and slowed considerably in the late 1910s to early 1920s. Following DoD use, much of the area was the same as it had been prior to the maneuvers, reverting to agriculture uses (farming, grazing), recreational activities (hunting, fishing), mining, and timbering. Local family farms and grazing fields dotted the landscape prior to, during, and following DoD use, occupying most open areas including valley floors and bare mountaintops. Once logging in the area slowed, the land's primary use shifted to agricultural and recreational uses. Farming, grazing, hunting and fishing were all activities that flourished

prior to and following World War II. Today the area is used for a wide variety of outdoor activities including hiking, skiing, rock climbing, rafting, hunting, and fishing (USACE 2009).

Based on historical mapping, historical documentation, and a 2007 field visit, the 2009 PA determined that the WVMA Ammunition Depot served as the main ammunition storage area during the operational period of the WVMA. Based on historical photos in the PA, it appears that this area contained tents, which housed ordnance. The 2007 PA field visit revealed no outstanding markers, building foundations, or other evidence of the former depot. All munitions potentially used within the WVMA may have been stored at the depot; therefore, the potential munitions stored at the ammunition depot include 155mm HE projectiles; 105mm HE and SR cartridges; 81mm HE and SR cartridges; 75mm HE and SR shells; 60mm HE and SR shells; 4.2-inch HE and SR shells; 3.25-inch target rockets; fragmentation, smoke, and practice hand grenades; demolition charge blocks, demolition firing devices, blasting caps, time fuses, and general small arms ammunition (.22, .30, .38, .45, and .50 Caliber) (Table 2.2).

No MEC or MD has been found at the MRS.

2.4 SITE OPERATIONS AND WASTE CHARACTERISTICS

2.4.1 MUNITIONS RESPONSE SITE-SPECIFIC DESCRIPTION AND OPERATIONS

The WVMA Ammunition Depot MRS consists of 4 acres within a 2,180,367-acre FUDS (USACE 2009). The land is currently owned by private individuals and is used for agriculture. The PA indicates an MRSPP score of 7 for the WVMA Ammunition Depot MRS.

2.4.2 REGULATORY COMPLIANCE

The USACE is conducting the SI at the WVMA Ammunition Depot MRS as part of FUDS response activities pursuant to and in accordance with the guidance, regulations, and legislation listed in Subchapter 1.1.

2.5 PREVIOUS INVESTIGATIONS

It should be noted that there have never been any clearance operations conducted in the area of the WVMA Ammunition Depot MRS. Furthermore, there have been no historic MEC or MD observations within the WVMA Ammunition Depot MRS. DoD began ordnance clearance operations almost immediately after military use of the FUDS ended in 1944. Initial clearance operations in 1946 focused on known target areas that were located in the Dolly Sods region, a high plateau located in the eastern central portion of the WVMA. The property was returned to the private landholders and the USFS upon completion of the initial clearing operations. A follow-up operation in 1953 found and destroyed six live rounds but determined that the previous clearance operations were “good”. However, unconfirmed reports of encounters with ordnance by the public continued in the Dolly Sods area. Subsequent site reconnaissance and clearance operations conducted in 1984, 1991, and 1997 to 1998 continued to encounter ordnance. As before, the clearance operations were focused in the Dolly Sods Region in publicly used areas such as trails and campgrounds. Since then, recurring reviews of the clearance operations have been conducted to ensure that the previous operations continue to protect the safety of the public (USACE 2009).

As part of the USACE DERP FUDS program, a PA of the entire WVMA was prepared by the CELRH in 2009. Information used to prepare the PA included military records, historical

documents, historical newspaper reports, interviews with local residents, interviews with former Army officials stationed at the site, and historic aerial photographs. Based upon information researched for the PA, the former ammunition depot was believed to be located in an area currently occupied by the Mountain State Memorial Gardens cemetery, approximately 3 miles north of the current MRS. According to lease records, 4 acres of a 400 acre farm was leased to the Army by Victor Del Sordo. However, Del Sordo was unable to recall which 4 acres were leased. Historical photos taken in the area of the current cemetery show army activities but they appear to be related to vehicle storage. A site visit to the cemetery in 2007 did not reveal any evidence of army activity. Subsequently, the location shown in the TPP Memo documents was chosen as the most likely location for the former Ammunition Depot (CELRH 2009).

Based upon a review of the information above, the CELRH identified a total of 7 MRSs warranting further investigation including the WVMA Ammunition Depot MRS, which is the subject of this SI Report.

In December 2010, an Inventory Project Report (INPR) was prepared by the USACE Louisville District (CELRL) requesting approval of the on-going Dolly Sods MMRP project and proposing the 7 MRSs identified in the PA. The USACE Great Lakes and Ohio River Division (CELRD) granted approval of the Dolly Sods MMRP project and the 7 new MRSs in December 2010 including the WVMA Ammunition Depot MRS.

2.5.1 PRELIMINARY ASSESSMENT – FEBRUARY 2009

As stated above, a PA of the entire WVMA was prepared by the CELRH in 2009. Information used to prepare the PA included military records, interviews with former Army officials stationed at the site, historical documents, historical newspaper reports, interviews with local residents, and historic aerial photographs. In addition, a brief site visit to the area of the Ammunition Depot was conducted on September 12, 2007. No evidence of military use of the site was observed during the site visit. Based upon a review of the information above, the CELRH identified a total of 7 MRSs warranting further investigation including the WVMA Ammunition Depot MRS which is the subject of this SI Report.

The PA indicates a MRSPP score of 7 for the WVMA Ammunition Depot MRS. MRS Priority scoring ranges from 1 (highest priority, reserved for CWM sites) through 8 (lowest priority).

2.5.2 INVENTORY PROJECT REPORT – DECEMBER 2010

An INPR for the WVMA was prepared by the CELRL in December 2010. The INPR requested "after the fact" approval for the Dolly Sods MMRP project and proposed 7 new MMRP projects including the WVMA Ammunition Depot MRS described in this SI Report. In December 2010, the CELRD granted "after the fact" approval for the Dolly Sods MMRP project and approved the 7 new MMRP projects including the WVMA Ammunition Depot MRS.

2.5.3 ADDITIONAL WVMA ACTIVITIES

Additional activities including site visits, removal actions, and studies have been conducted for portions of the WVMA that did not include the areas of the WVMA Ammunition Depot MRS, as follows:

- Findings and Determination of Eligibility/Inventory Project Report – May 1990, January 1992 (USACE 1990, 1992)
- Feasibility Study Dolly Sods Wilderness: Final Workplan for Surface and Subsurface Investigation and On-Site Disposal of Ordnance (M&E 1991)
- Archives Search Report (ASR) – September 1995 (USACE 1995a, 1995b)
- Environmental Assessment of Ordnance Removal Action in the Dolly Sods Wilderness Area – September 1995 (NBE 1995)
- Environmental Assessment of Ordnance Removal Action in the Dolly Sods North Area – September 1997 (NBE 1997)
- Action Memoranda for OE Removal Actions – 1996 to 1997 (USACE 1996, 1997)
- Ordnance Removal Actions – DSW, DSN, and DSSA – 1997 to 1998 (NBE 1995, 1997)
- OE Recurring Review – June to August 2004 (USACE 2004c)

TABLE 2.2
SUSPECTED MUNITIONS
West Virginia Maneuver Area/Dolly Sods FUDS
WVMA Ammunition Depot MRS

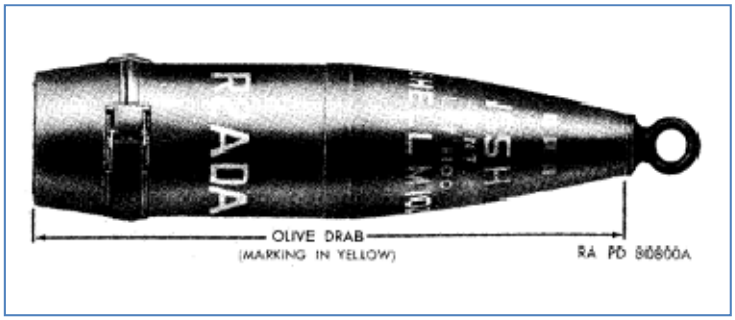
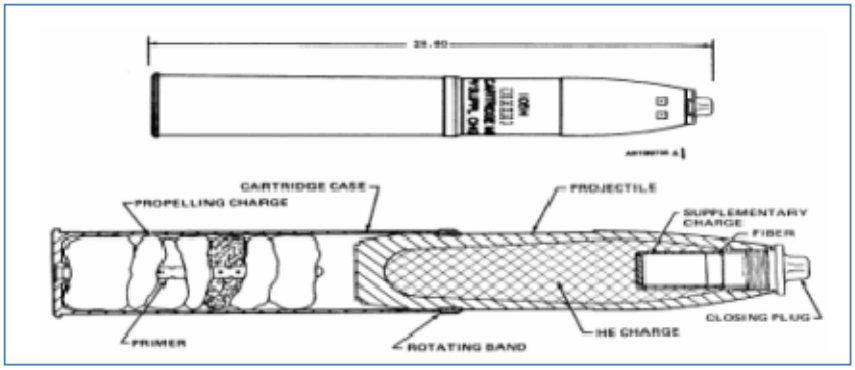
Munitions	Photograph/Diagram
Projectile, 155mm, HE, M102	
Cartridge, 105mm, HE, M1	
Cartridge, 105mm, Smoke, HC, M84	

TABLE 2.2
SUSPECTED MUNITIONS
West Virginia Maneuver Area/Dolly Sods FUDS
WVMA Ammunition Depot MRS

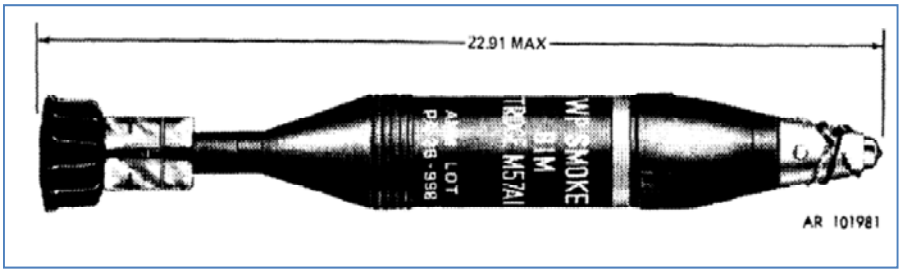
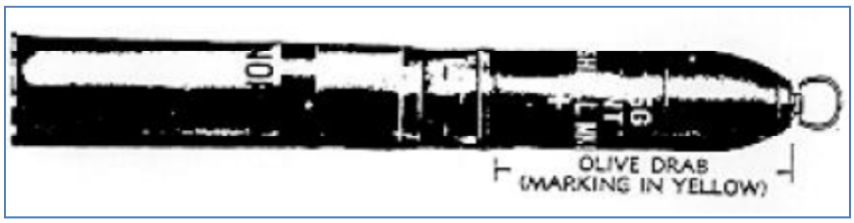
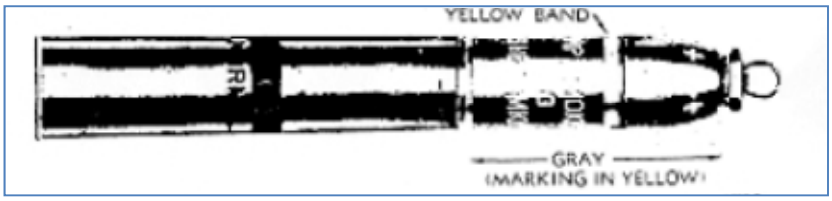
Munitions	Photograph/Diagram
Cartridge, 81mm, HE, M43	
Cartridge, 81mm, Smoke, WP, M57	
Shell, 75mm, HE, MkI	
Shell, 75mm, Smoke, WP, MkII	

TABLE 2.2
SUSPECTED MUNITIONS
West Virginia Maneuver Area/Dolly Sods FUDS
WVMA Ammunition Depot MRS

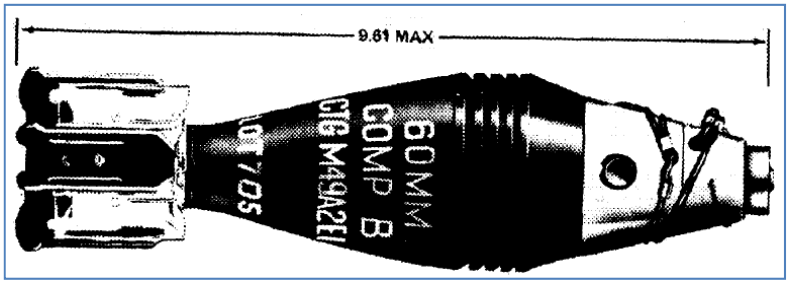
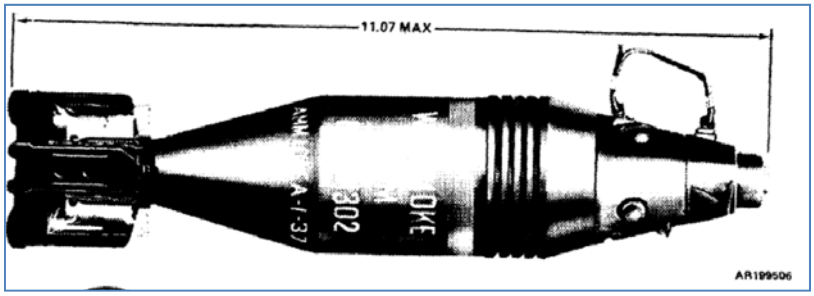
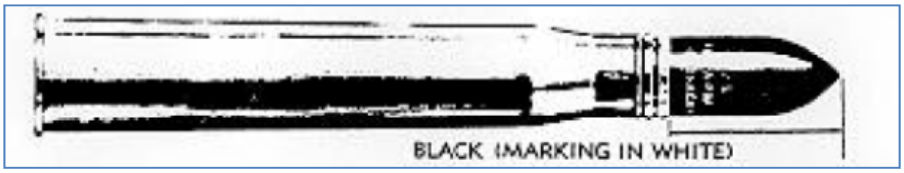
Munitions	Photograph/Diagram
Shell, 60mm, High Explosive (HE), M49A2	
Shell, 60mm, Smoke, White Phosphorous (WP), M302	
Cartridge, 57mm, AP-T, M70	

TABLE 2.2
SUSPECTED MUNITIONS
West Virginia Maneuver Area/Dolly Sods FUDS
WVMA Ammunition Depot MRS

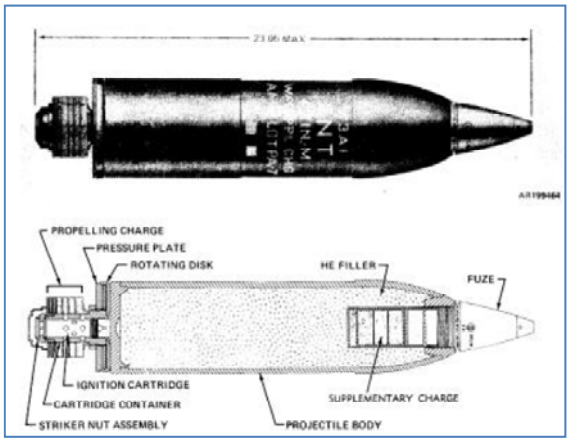
Munitions	Photograph/Diagram
Cartridge, 40mm, Armor Piercing-Tracer (AP-T), M81	
Shell, 4.2-inch, HE, M3, M3A1	

TABLE 2.2
SUSPECTED MUNITIONS
West Virginia Maneuver Area/Dolly Sods FUDS
WVMA Ammunition Depot MRS

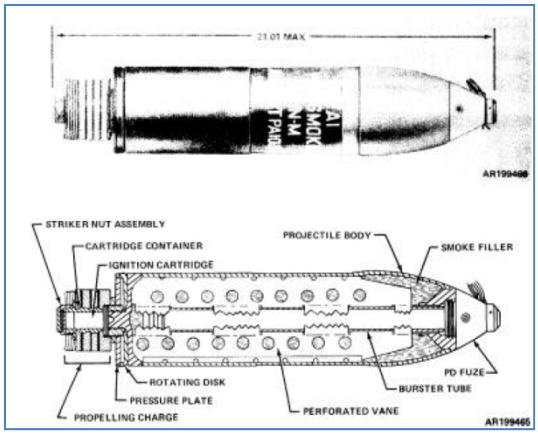
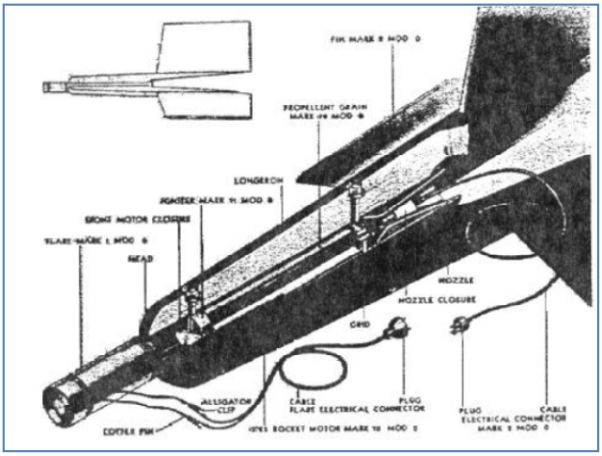
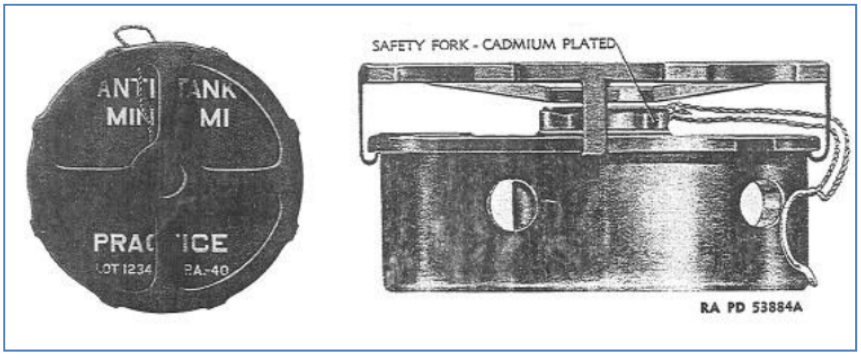
Munitions	Photograph/Diagram
Shell, 4.2-inch, Smoke, M2 (1918 – 1944)	
Rocket, 3.25-inch, Target, Mk 1 through Mk 4	
Mine, Antitank, Practice, M1	

TABLE 2.2
SUSPECTED MUNITIONS
West Virginia Maneuver Area/Dolly Sods FUDS
WVMA Ammunition Depot MRS

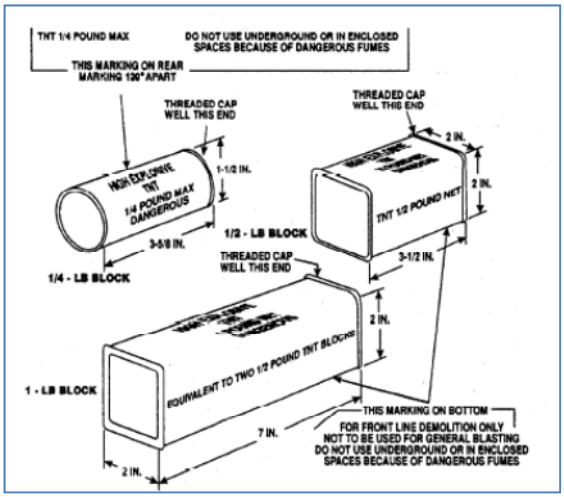
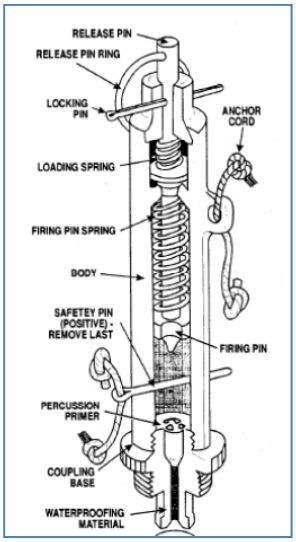
Munitions	Photograph/Diagram
Charge, demolition, block, ¼ lb, ½ lb, 1 lb	
Firing device, demolition, pull, M1	

TABLE 2.2
SUSPECTED MUNITIONS
West Virginia Maneuver Area/Dolly Sods FUDS
WVMA Ammunition Depot MRS

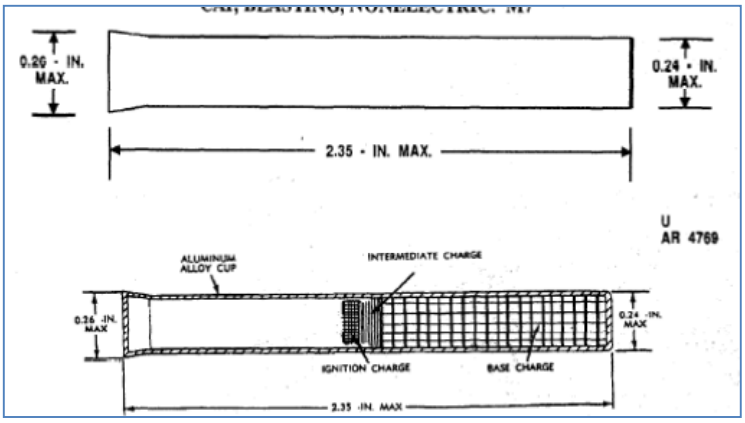
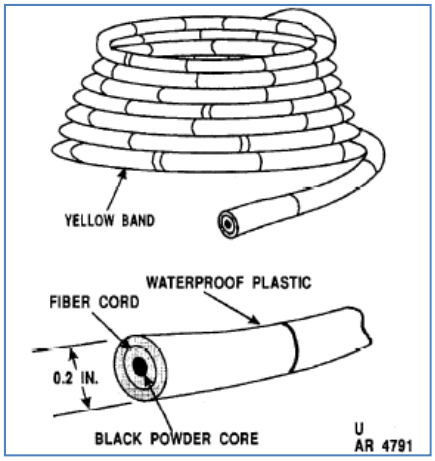
Munitions	Photograph/Diagram
Cap, blasting, non-electric, M7	
Fuse, blasting, time, M700	

TABLE 2.2
SUSPECTED MUNITIONS
West Virginia Maneuver Area/Dolly Sods FUDS
WVMA Ammunition Depot MRS

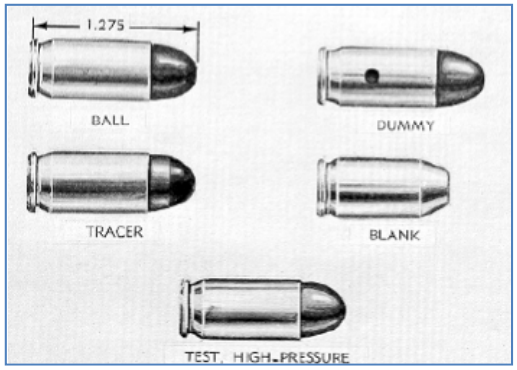
Munitions	Photograph/Diagram
Small arms, ammunition, general; Cartridge, .50 caliber, Machine Gun	
Small arms, ammunition, general; Cartridge, .45 caliber	

TABLE 2.2
SUSPECTED MUNITIONS
West Virginia Maneuver Area/Dolly Sods FUDS
WVMA Ammunition Depot MRS

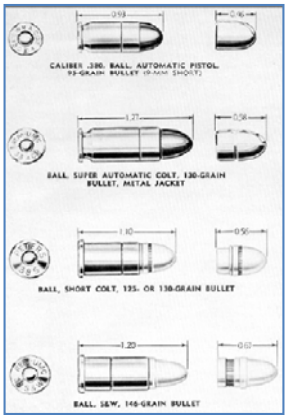
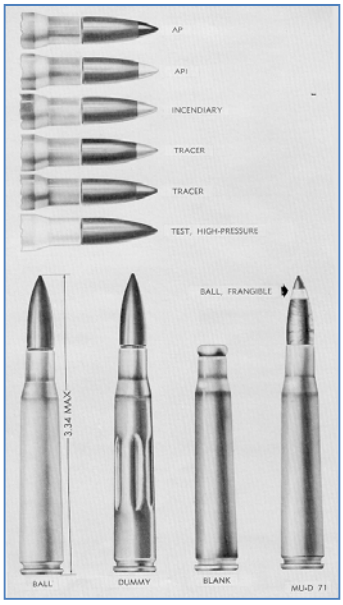
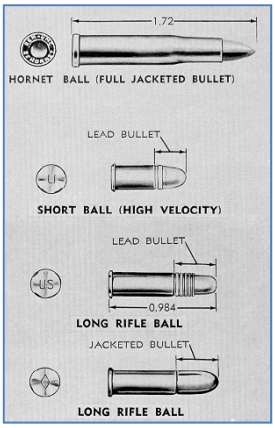
Munitions	Photograph/Diagram
Small arms, ammunition, general; Cartridge, .38 caliber	
Small arms, ammunition, general; Cartridge, .30 caliber (includes Carbine)	

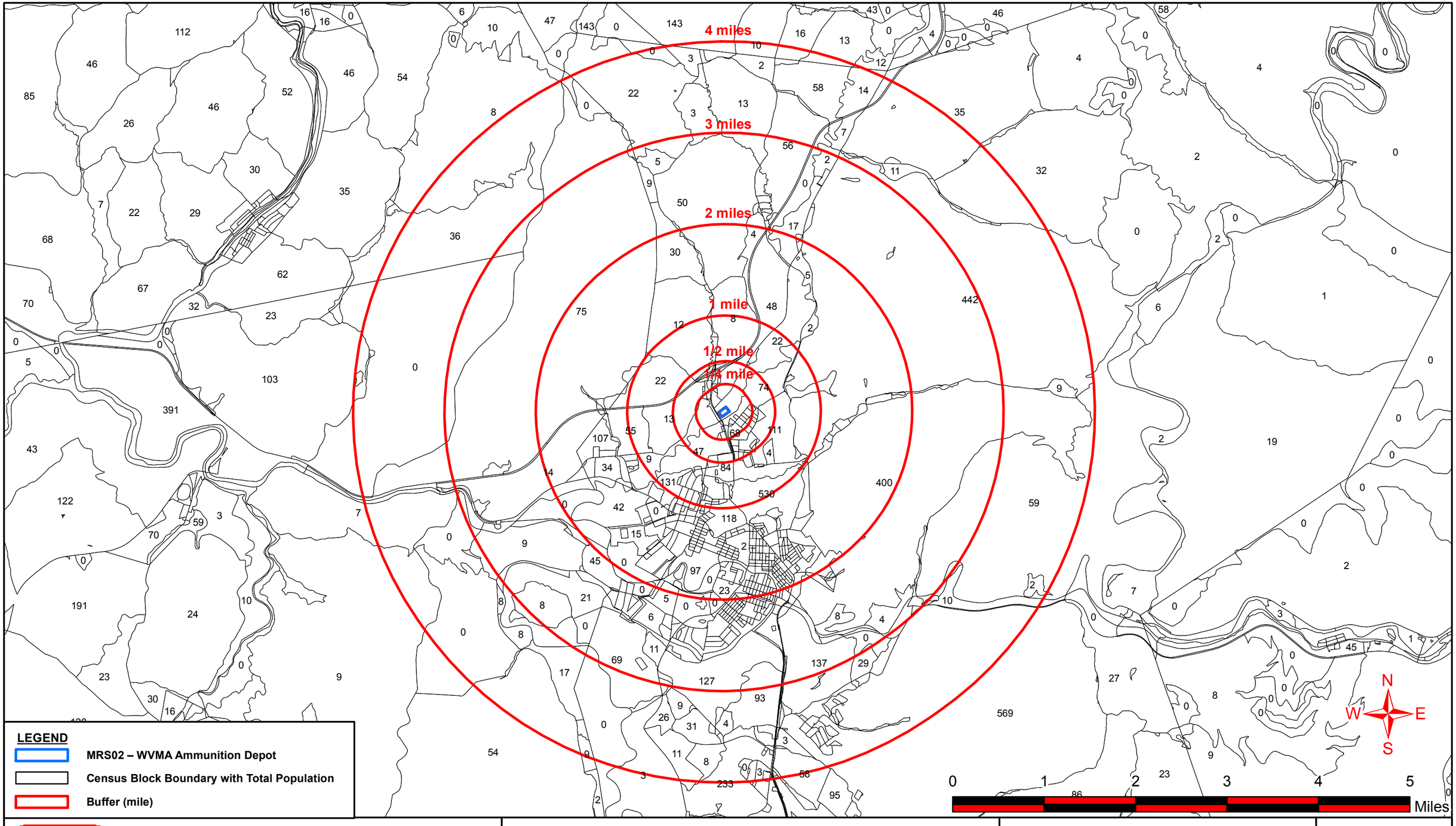
TABLE 2.2
SUSPECTED MUNITIONS
West Virginia Maneuver Area/Dolly Sods FUDS
WVMA Ammunition Depot MRS

Munitions	Photograph/Diagram
Small arms, ammunition, general; Cartridge, .22 caliber	

LEGEND

MRS02 – WVMA Ammunition Depot

Prepared by: Eco & Associates, Inc. and PARSONS	**SITE SETTING** **MRS02 – WVMA Ammunition Depot** **MMRP West Virginia**	PROJECT NO. Eco-11-452 DATED August 2013	FIGURE 2.1



Prepared by:

Eco & Associates, Inc.
and
PARSONS

CENSUS DATA

MRS02 – WVMA Ammunition Depot
MMRP West Virginia

PROJECT NO. Eco-11-452

DATED August 2013

FIGURE
2.2

CHAPTER 3
SITE INSPECTION TASKS

3.1 HISTORICAL RECORD REVIEW

A document review of the WVMA Ammunition Depot MRS was conducted. The historic information relevant to the WVMA Ammunition Depot MRS included the INPR and the PA. The findings of the historical review, including site use and potential munitions used, are described in Chapter 2.

3.2 TECHNICAL PROJECT PLANNING

The WVMA Ammunition Depot MRS falls under the purview of the CELRH, which facilitated a TPP meeting on April 7, 2011. Participants included representatives of the CELRH, CENWW, WVDEP, the USFS, the USFWS, CVI, Parsons, and Eco. The TPP Team developed the technical approach presented in the Final TPP Memorandum (Eco 2011 [see Appendix B of this report]). Key TPP findings and decisions are summarized below:

- The location of the WVMA Ammunition Depot MRS was described in the text and indicated in the figures of the PA for the site. The acreage for the MRS area was given; however, the specific shape and dimensions of the MRS were not illustrated. Based on the descriptions of the MRS in the PA, Parsons proposed an appropriate MRS boundary during the TPP Meeting. The TPP Team agreed that the proposed boundaries are acceptable based on lease documentation. The TPP Team also agreed that the MRS acreage of the proposed boundary as presented in the TPP meeting is acceptable, even though it differs from the acreage listed in the PA.
- The TPP Team agreed that portions of the MRS that are close to Leading Creek may not represent true DoD-era soil conditions due to historic flooding that occurred in approximately 1985. The TPP Team agreed that surface soil samples should be focused on higher ground, away from low areas around the stream. Additionally, the SVT should attempt to collect the soil samples from the A-horizon, which may be as deep as 2 feet bgs. The SVT collected soil samples from 2 feet bgs during the site investigation.
- Due to historic flooding, the soils along Leading Creek may contain metallic debris not related to DoD use. No samples were collected adjacent to Leading Creek.
- Analyses for perchlorate and white phosphorous are not required, per WVDEP direction. No analyses for perchlorate and white phosphorous were conducted during the SI.
- Ambient soil samples will be collected from the northern portion of the MRS, in a cleared area near the trees. The ambient soil sample was collected from the north central portion of the MRS.

- The TPP Team concurred that no known cultural or ecological resources exist within the MRS. The SVT did not encounter any cultural or ecological resources during the SI.
- The TPP Team agreed that surface water and sediment sampling was not warranted, based on the absence of surface water within the MRS. No surface water or sediment was sampled during the SI.
- Based on well data collected after the TPP Meeting, there are no wells within the WVMA Ammunition Depot MRS. No groundwater wells were encountered during the SI. Therefore, groundwater samples were not collected.To supplement the limited ambient data collected during the SI, the background values used for comparison include background concentrations obtained from the West Virginia Voluntary Remediation and Redevelopment Act Guidance Manual Version 2.1, Table 2-3: Natural Background Levels of Inorganics in Soil in West Virginia and Surrounding Areas. The applicable data are based on larger sample sizes (n • 10) leading to a more robust comparison. The background value used for comparison to the biased surface soil sample results is three times the mean background concentration obtained from West Virginia guidance, per United States Environmental Protection Agency (USEPA) guidance (USEPA, 1992).
- The proposed screening levels to be used for the human health risk assessment are described as follows:

  Soil – WVDEP RBCs, Table 60-3B in the Voluntary Remediation and Redevelopment Rule (60CSR3) supplemented with USEPA RSLs

3.3 NON-MEASUREMENT DATA COLLECTION

The WVGES and the USGS provided geological and hydrogeological data, including information about wells on and near the MRS. The West Virginia Water Science Center (WVWSC) provided well information for West Virginia (WVWSC 2011). The West Virginia Department of Health and Human Resources (WVDHHR) provided information regarding water well permits, wellhead protection areas, and surface water protection zones. Information regarding surface water intakes for drinking water systems in the area was provided by the USACE during preparation of the 2009 PA (USACE 2009).

According to the National Register Information System, National Historic Landmark Program, and National Heritage Area Program websites, no cultural or archaeological resources are known within the MRS. The West Virginia Division of Culture and History (WVDCH) lists no previously recorded archaeological sites within the MRS boundary (WVDCH 2011a). The SVT encountered no cultural resources during the QR.

The following printed and electronic information sources were consulted for the WVMA Ammunition Depot MRS:

- USGS – topographic maps
- USGS – *Ground Water Atlas of the United States*, http://pubs.usgs.gov/ha/ha730/index.html
- U.S. Fish and Wildlife Service (USFWS), National Wetlands Inventory – Wetlands Mapper, http://www.fws.gov/wetlands/Data/mapper.html

- USFWS, Endangered Species Program – Threatened and Endangered (T&E) Species System, http://ecos.fws.gov/tess_public/pub/stateListingIndividual.jsp?state=WV&status=listed
- USFWS, National Wildlife Refuge System – Refuge List by State, http://www.fws.gov/refuges/profiles/bystate.cfm
- USFS, http://www.fs.fed.us
- Natural Resources Conservation Service, http://websoilsurvey.nrcs.usda.gov/app/
- National Historic Landmarks Program – Lists of National Historic Landmarks, http://www.nps.gov/nhl/designations/listsofNHLs.htm
- National Heritage Areas Program – Explore Our National Heritage Areas, http://www.nps.gov/history/heritageareas/
- National Oceanic and Atmospheric Administration, http://coastalmanagement.noaa.gov
- National Park Service, http://www.nps.gov/applications/parksearch/geosearch.cfm
- National Register Information System, http://www.nr.nps.gov/

3.4 SITE-SPECIFIC WORK PLAN

The Site-Specific Work Plan (SS-WP) augments the Programmatic Work Plan (PWP) and Programmatic Sampling and Analysis Plan (PSAP), as warranted, to present pertinent site-specific information and procedural adjustments that could not be readily captured in the programmatic documents or that resulted from TPP Team agreements that required modifying the preliminary SI technical approach. The PWP and PSAP are umbrella documents that set overall programmatic objectives and approaches, whereas the SS-WP provides site-specific details and action plans. The PWP, PSAP, and SS-WP accompanied the SVT during SI activities.

The SS-WP includes the project description, the field investigation plan, the sampling and analysis plan, the environmental protection plan, and the accident prevention plan specific to the WVMA Ammunition Depot MRS. The field investigation plan developed a technical approach to guide sample collection and analysis for MEC and elevated metals concentrations that are consistent with the identified MC contaminants of concern to ensure that the results were sufficient to determine whether additional investigations or remedies are necessary for the MRS. Key elements of the technical approach include the conceptual site model (CSM) to help determine types of samples and their locations, data quality objectives (DQOs) to ensure that the data acquired are sufficient to characterize MEC and metals contamination at the FUDS, and QR to confirm known target locations and to evaluate the potential presence of MEC or elevated metals in those target locations.

The sampling and analysis plan discusses procedures for soil sample acquisition from locations biased toward the highest potential for MEC contamination; quality control (QC) and quality assurance (QA) for the sampling process; sample shipment to an approved, independent laboratory; and laboratory analysis of the samples. The environmental protection plan presents procedures for avoiding, minimizing, and mitigating potential

impacts on environmental and cultural resources during the site visit. The accident prevention plan supplements the programmatic accident prevention plan with site-specific emergency contact information and directions to the nearest hospital.

3.5 DEPARTURES FROM PLANNING DOCUMENTS

The following departures from the approved SS-WP Addendum were based on field conditions and/or right-of-entry (ROE) issues. The potential impact to the data quality for each departure from the plan is also discussed below.

- Sample WVMA-MRS02-SS-24-01 and duplicate sample WVMA-MRS02-SS-24-04 were moved approximately 100 feet southeast of the proposed sample location to avoid saturated areas along the northern edge of the MRS and to ensure that the samples were collected within property where ROE was granted. No impact on data quality is anticipated from this departure.
- Proposed QR was not conducted in the wooded area along the northwestern edge of the MRS due to ROE refusal by the property owner. The soil samples were collected with a hand auger, as specified in the SS-WP. However, because the samples were collected at a depth of two feet bgs, the samples were collected as discrete samples rather than using the Cold Regions Research and Engineering Laboratory (CRREL) seven-point wheel composite sampling technique.

CHAPTER 4
MUNITIONS AND EXPLOSIVES OF CONCERN FINDINGS

4.1 GENERAL INFORMATION

4.1.1 QUALITATIVE RECONNAISSANCE AND SAMPLE LOCATIONS

The primary task of the SI is to assess the presence of MEC, MD, and elevated metals concentrations. To assess the presence of MEC and MD, the SVT conducted QR by walking 0.75 miles on May 11, 2012. The presence of metals contamination was assessed by collecting and analyzing surface soil samples as outlined in the SS-WP.

The QR consisted of visual reconnaissance of the site surface to identify indicators of suspect areas, including earthen berms, distressed vegetation, stained soil, ground scars or craters, target remnants, and visible metallic debris. QR activities focused on the entire property, in search of evidence that the ammunition depot existed in the proposed location. Table 4.1 presents the MEC (including potential chemical constituents) potentially present at the site based on the PA and the QR. Appendix J includes the MEC CSM.

The TPP Team agreed to the location and the number of samples prior to the site visit. Some sample locations were changed, as described in Section 3.5 above. The unexploded ordnance (UXO) technician used a Schonstedt GA-52Cx magnetometer to screen each increment location before sampling. Per the PWP, the UXO technician III performed QC and battery checks prior to use to confirm that the instrument was working properly.

The SVT recorded field observations during the QR at significant site features. Figure 4.1 shows the QR route and observation locations. The observation location numbers correspond to the photo station numbers in the photograph documentation log in Appendix E. The QR route generally followed the proposed path. However, some QR transects were not conducted due to ROE refusal, as described in Section 3.5 above.

As shown in Appendix E, the SVT noted 8 observations throughout the SI, such as topography, soil color, drainage, and the presence of any barriers. Table 4.2 summarizes pertinent field observations. Appendix D includes related field forms.

TABLE 4.1
CHEMICAL COMPOSITION OF POTENTIAL MEC AND MUNITIONS CONSTITUENTS
West Virginia Maneuver Area/Dolly Sods FUDS Property No. G03WV0013
WVMA Ammunition Depot MRS

Munitions Type/ Model	Composition (Case and Filler) [2]	MC Analysis [1]
Projectile, 155mm, HE, M102	**Propellant:** Dibutylphthalate, Dinitrotoluene (DNT), Diphenylamine, Nitrocellulose[5] **Flash Reducer/Ignition Charge:** Potassium Nitrate, Potassium Sulfate, Sodium Nitrate, Sulfur **Primer [7]:** Aluminum, Antimony Sulfide, Barium Nitrate, Calcium Silicide, Copper, Lead Dioxide, Lead Styphnate, Nitrocellulose, PETN, Tetrazene, Zinc, Zirconium **Projectile/Rotating Band: Steel/Copper Alloy** - Carbon, Copper, Iron, Lead, Manganese, Phosphorus, Sulfur, Zinc **Projectile Filler: TNT or Amatol** - Ammonium Nitrate, TNT **Fuze, Projectile, PD, M46: Steel/Brass** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Fuze Filler:** Carbon, Copper, Mercury Fulminate, Potassium Nitrate, Sodium Nitrate, Tetryl, Zinc **Fuze Primer [7]:** Antimony Sulfide, Silicon carbide, Copper, Iron, Lead, Lead Azide, Potassium Chlorate, Sulfur, Zinc **Fuze, Projectile, PD, M47: Steel** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Fuze Filler:** Carbon, Copper, Lead Azide, Potassium Nitrate, Sodium Nitrate, Tetryl, Zinc **Fuze Primer [7]:** Antimony Sulfide, Silicon carbide, Copper, Iron, Lead, Lead Azide, Potassium Chlorate, Sulfur, Zinc **Fuze, Projectile, PD, M51 Steel** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Fuze Filler:** Tetryl **Fuze Primer [7]:** Antimony Sulfide, Silicon carbide, Copper, Lead Azide, Potassium Chlorate, Potassium Nitrate, Sodium Nitrate, Sulfur **Fuze, Projectile, Time Super Quick, M54: Aluminum Alloy, Copper Alloy –** Aluminum, Bizmuth, Copper, Iron, Lead, Silicon, Sulfur, Zinc **Fuze Filler:** Tetryl **Fuze Primer [7]:** Barium Nitrate, Copper, Lead Azide, Lead Styphnate, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Sodium Nitrate, Sulfur, Tetrazene **Fuze, Projectile, Mechanical Time (MT), M67: Aluminum Alloy, Copper Alloy –** Aluminum, Bizmuth, Copper, Iron, Lead, Silicon, Sulfur, Zinc	**Metals** Aluminum, Copper, Lead, Zinc **Explosives** As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.

TABLE 4.1
CHEMICAL COMPOSITION OF POTENTIAL MEC AND MUNITIONS CONSTITUENTS
West Virginia Maneuver Area/Dolly Sods FUDS Property No. G03WV0013
WVMA Ammunition Depot MRS

Munitions Type/ Model	Composition (Case and Filler) [2]	MC Analysis [1]
	Fuze Filler: Lead Azide, Tetryl **Fuze Primer [7]:** Barium Nitrate, Copper, Lead Azide, Lead Styphnate, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Sodium Nitrate, Sulfur, Tetrazene	
Cartridge, 105mm, HE, M1	**Cartridge Case: Copper Alloy -** Copper, Iron, Lead, Zinc **Propellant:** Dibutylphthalate, Dinitrotoluene[6], Diphenylamine, Lead Carbonate, Nitrocellulose[5] **Primer [7]:** Antimony sulfide, Carbon, Lead Thiocyanate, Potassium Chlorate, TNT **Projectile/Rotating Band: Steel, Copper Alloy** - Carbon, Copper, Iron, Lead, Manganese, Phosphorus, Sulfur. Zinc **Projectile Filler: Amatol or Composition B or TNT** - Ammonium Nitrate, Cyclotrimethylenetrinitramine (RDX), TNT **Fuze, Projectile, PD, M51 Steel** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Fuze Filler:** Tetryl **Fuze Primer [7]:** Antimony Sulfide, Silicon carbide, Copper, Lead Azide, Potassium Chlorate, Potassium Nitrate, Sodium Nitrate, Sulfur	**Metals** Copper, Zinc **Explosives** As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.
Cartridge, 105mm, Smoke, HC, M84	**Cartridge Case: Brass -** Copper, Iron, Lead, Zinc **Propellant:** Dibutylphthalate, Dinitrotoluene[6], Diphenylamine, Nitrocellulose[5] **Primer [7]:** Antimony Sulfide, Arsenic, Bismuth, Boron, Carbon, Lead Thiocyanate, Lead Carbonate, Potassium Chlorate, Potassium Nitrate, Sulfur, Tin, TNT **Projectile/Rotating Band: Steel, Copper Alloy** - Carbon, Copper, Iron, Lead, Manganese, Phosphorus, Sulfur. Zinc **Projectile Filler: Burster, Black Powder, White Smoke Mixture –** Aluminum Powder, Hexachloroethane, Iron Oxide, Nitrocellulose, Potassium Nitrate, Silicon, Sulfur, Zinc Oxide	**Metals** Aluminum, Copper, Zinc **Explosives** As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.

TABLE 4.1
CHEMICAL COMPOSITION OF POTENTIAL MEC AND MUNITIONS CONSTITUENTS
West Virginia Maneuver Area/Dolly Sods FUDS Property No. G03WV0013
WVMA Ammunition Depot MRS

Munitions Type/ Model	Composition (Case and Filler) [2]	MC Analysis [1]
	Fuze, Projectile, Time Super Quick, M54: Aluminum Alloy, Copper Alloy – Aluminum, Bizmuth, Copper, Iron, Lead, Silicon, Sulfur, Zinc **Fuze Filler:** Tetryl **Fuze Primer [7]:** Barium Nitrate, Copper, Lead Azide, Lead Styphnate, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Sodium Nitrate, Sulfur, Tetrazene	
Cartridge, 81mm, HE, M43	**Propelling Assembly: Kraft Paper, Steel** - Iron, Manganese, Paper, Phosphorus, Sulfur, Zinc **Propellant:** Diethylphthalate, Nitrocellulose[5], Nitroglycerin, Potassium Nitrate **Primer [7]:** Antimony Sulfide, Copper, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, TNT, Sulfur, Zinc **Projectile: Steel** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Projectile Filler: TNT or Comp B** - Cyclotrimethylenetrinitramine (RDX), TNT **Fuze, PD, M52, M525: Aluminum Alloy** - Aluminum, Copper, Iron, Lead, Magnesium, Zinc **Fuze Filler:** RDX , (Cyclotrimethylenetrinitramine), Tetryl **Fuze Primer [7]:** Antimony Sulfide, Barium Nitrate, Lead Azide, Lead Styphnate, Tetrazene	**Metals** Aluminum, Copper, Zinc **Explosives** As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.

TABLE 4.1
CHEMICAL COMPOSITION OF POTENTIAL MEC AND MUNITIONS CONSTITUENTS
West Virginia Maneuver Area/Dolly Sods FUDS Property No. G03WV0013
WVMA Ammunition Depot MRS

Munitions Type/ Model	Composition (Case and Filler) [2]	MC Analysis [1]
Cartridge, 81mm, Smoke, WP, M57	**Propelling Assembly: Kraft Paper, Steel** - Iron, Manganese, Paper, Phosphorus, Sulfur, Zinc **Propellant:** Diethylphthalate, Nitrocellulose[5], Nitroglycerin, Potassium Nitrate **Primer [7]:** Antimony Sulfide, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, TNT, Sulfur **Projectile: Steel** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Projectile Filler:** Aluminum, Barium Stearate, Copper, Magnesium, Nickel, Silicon, Tetryl, Tin, Titanium, White Phosphorus **Fuze, PD, M52, M525: Aluminum Alloy** - Aluminum, Copper, Iron, Lead, Magnesium, Zinc **Fuze Filler:** RDX , (Cyclotrimethylenetrinitramine), Tetryl **Fuze Primer [7]:** Antimony Sulfide, Barium Nitrate, Lead Azide, Lead Styphnate, Tetrazene	**Metals** Aluminum, Copper, Zinc **Explosives** As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.
Shell, 75mm, HE, MkI	**Cartridge Case: Copper** - Copper, Zinc **Propellant:** Dibutylphthalate, Dinitrotoluene[6], Diphenylamine, Nitrocellulose[5], Nitroglycerin, Sulfur, TNT **Primer [7]:** Antimony Sulfide, Barium Nitrate, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, TNT **Projectile: Steel** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Projectile Filler: Amatol, Tetryl, TNT** - Ammonium Nitrate, Tetryl, TNT **Fuze, Projectile, PD, M46: Steel** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Fuze Filler:** Carbon, Copper, Mercury Fulminate, Potassium Nitrate, Sodium Nitrate, Tetryl, Zinc **Fuze Primer [7]:** Antimony Sulfide, Silicon carbide, Copper, Iron, Lead, Lead Azide, Potassium Chlorate, Sulfur, Zinc	**Metals** Copper, Manganese, Mercury Fulminate, Zinc **Explosives** As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.

TABLE 4.1
CHEMICAL COMPOSITION OF POTENTIAL MEC AND MUNITIONS CONSTITUENTS
West Virginia Maneuver Area/Dolly Sods FUDS Property No. G03WV0013
WVMA Ammunition Depot MRS

Munitions Type/ Model	Composition (Case and Filler) [2]	MC Analysis [1]
Shell, 75mm, Smoke WP, MkII	**Cartridge Case: Copper** - Copper, Zinc **Propellant:** Dibutylphthalate, Dinitrotoluene[6], Diphenylamine, Nitrocellulose[5], Nitroglycerin, Potassium Chlorate **Primer [7]:** Antimony Sulfide, Barium Nitrate, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Sulfur, TNT **Projectile/Rotating Band: Steel/Copper Alloy** - Carbon, Copper, Iron, Lead, Manganese, Phosphorus, Sulfur, Zinc **Projectile Filler:** Tetryl, White Phosphorus **Fuze, Projectile, PD, M46: Steel/Brass** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Fuze Filler:** Carbon, Copper, Mercury Fulminate, Potassium Nitrate, Sodium Nitrate, Tetryl, Zinc **Fuze Primer [7]:** Antimony Sulfide, Silicon carbide, Copper, Iron, Lead, Lead Azide, Potassium Chlorate, Sulfur, Zinc	**Metals** Copper, Zinc **Explosives** As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.
Shell, 60mm HE, M49A2	**Propelling Assembly:** Kraft Paper, Steel - Iron, Manganese, Paper, Phosphorus, Sulfur, Zinc **Propellant:** Diethylphthalate, Nitrocellulose[5], Nitroglycerin, Potassium Nitrate **Primer [7]:** Antimony Sulfide, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, TNT **Projectile: Steel** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Projectile Filler:** TNT **Fuze, Point Detonating (PD), M52 series:** Aluminum Alloy, Zinc Alloy - Aluminum, Bismuth, Cadmium, Copper, Iron, Magnesium, Manganese, Nickel, Phosphorus, Silicon, Sulfur, Tin, Zinc **Fuze Filler:** Tetryl **Fuze Primer [7]:** Antimony Sulfide, Silicon carbide, Copper, Lead Azide, Potassium Chlorate, Zinc	**Metals** Aluminum, Copper, Zinc **Explosives** As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.

TABLE 4.1
CHEMICAL COMPOSITION OF POTENTIAL MEC AND MUNITIONS CONSTITUENTS
West Virginia Maneuver Area/Dolly Sods FUDS Property No. G03WV0013
WVMA Ammunition Depot MRS

Munitions Type/ Model	Composition (Case and Filler) [2]	MC Analysis [1]
Shell, 60mm, Smoke, White Phosphorus (WP), M302	**Propelling Assembly:** Kraft Paper, Steel - Iron, Manganese, Paper, Phosphorus, Sulfur, Zinc **Propellant:** Diethylphthalate, Dinitrotoluene, Diphenylamine, Nitrocellulose[5], Nitroglycerin, Potassium Nitrate **Primer [7]:** Antimony Sulfide, Lead Sulphocyanate, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Cyclotrimethylenetrinitramine (RDX), TNT **Projectile: Steel** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Projectile Filler:** Cyclotrimethylenetrinitramine (RDX), Stearic Acid, White Phosphorus **Fuze: Aluminum Alloy, Brass, Plastic** - Aluminum, Copper, Iron, Manganese, Plastic, Silicone, Zinc **Fuze Filler:** RDX, (Cyclotrimethylenetrinitramine), Stearic Acid, Tetryl **Fuze Primer [7]:** Antimony Sulfide, Barium Nitrate, Silicon carbide, Copper, Lead Azide, Lead Styphnate, Potassium Chlorate, Zinc	**Metals** Aluminum, Copper, Zinc **Explosives** As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS
Cartridge, 57mm, Armor Piercing–Tracer (AP-T), M70	**Cartridge Case:** Brass, Steel – Carbon, Copper, Iron, Manganese, Phosphorus, Sulfur, Zinc **Propellant:** Dibutylphthalate, Dinitrotoluene[6], Diphenylamine, Nitrocellulose[5] **Primer [7]:** Antimony Sulfide, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Sulfur, TNT, **Projectile:** Steel - Carbon, Iron, Manganese, Phosphorus, Sulfur **Tracer [8]:** Aluminum Alloy, Magnesium, Strontium Nitrate, Polyvinyl Chloride	**Metals** Copper, Zinc **Explosives** As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS

TABLE 4.1
CHEMICAL COMPOSITION OF POTENTIAL MEC AND MUNITIONS CONSTITUENTS
West Virginia Maneuver Area/Dolly Sods FUDS Property No. G03WV0013
WVMA Ammunition Depot MRS

Munitions Type/ Model	Composition (Case and Filler) [2]	MC Analysis [1]
Cartridge, 40mm, Armor Piercing-Tracer (AP-T), M81	**Cartridge case:** Brass - Copper, Iron, Lead, Zinc **Propellant:** Dibutylphthalate, Dinitrotoluene[6], Diphenylamine, Nitrocellulose[5], Nitroglycerin, Potassium Nitrate, Sulfur **Primer [7]:** Antimony Sulfide, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Sodium Nitrate, Sulfur, TNT **Projectile/Rotating Band:** Steel/Copper Alloy - Carbon, Copper, Iron, Lead, Manganese, Phosphorus, Sulfur, Zinc **Projectile Filler:** Solid steel **Tracer [8]:** Aluminum, Barium Peroxide, Calcium Resinate, Magnesium, Polyvinyl Chloride, Strontium Nitrate	**Metals** Copper, Zinc **Explosives** As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.
Shell, 4.2-inch, HE, M3, M3A1	**Propelling Charge:** Diethylphthalate, Ethyl Centralite, Nitrocellulose[5], Nitroglycerin, Potassium Nitrate **Primer [7]:** Antimony Sulfide, Barium Nitrate, Copper, Iron, Lead, Lead Styphnate, Nitrocellulose, Tetrazene, Zinc **Projectile/Rotating Disc: Steel/Copper Alloy –** Carbon, Copper, Lead Iron, Manganese, Phosphorus, Sulfur, Zinc **Projectile Filler:** TNT **Fuze, PD, M557: Steel** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Fuze Filler:** Tetryl **Fuze Primer [7]:** Antimony Sulfide, Silicon carbide, Copper, Iron, Lead Azide, Lead Thiocyanate, Potassium Chlorate, TNT, Zinc	**Metals** Copper, Zinc **Explosives** As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.

TABLE 4.1
CHEMICAL COMPOSITION OF POTENTIAL MEC AND MUNITIONS CONSTITUENTS
West Virginia Maneuver Area/Dolly Sods FUDS Property No. G03WV0013
WVMA Ammunition Depot MRS

Munitions Type/ Model	Composition (Case and Filler) [2]	MC Analysis [1]
Shell, 4.2-inch, Smoke, M2 (1918 – 1944)	**Propelling Charge:** Diethylphthalate, Ethyl Centralite, Nitrocellulose[5], Nitroglycerin **Primer [7]:** Antimony Sulfide, Barium Nitrate, Lead Styphnate, Potassium Nitrate, Tetrazene **Projectile: Steel** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Projectile Filler: FM or FS Smoke** - Chlorsulfonic Acid, Sulfur trioxide, Titanium Tetrachloride **Fuze:** Aluminum, Copper, Iron, Lead Azide, Magnesium, Manganese, Nickel, Potassium Chlorate, Silicon, Tin, Zinc, Tetryl **Fuze Primer [7]:** Antimony Sulfide, Silicon carbide	**Metals** Aluminum, Copper, Zinc **Explosives** As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.
Rocket, 3.25-inch, Target, Mk 1 through Mk 4	**Rocket Motor: Steel** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Propellant:** Diazodinitrophenol, Nitrocellulose[5], Nitroglycerin, Potassium Chlorate, Potassium Nitrate, Potassium Perchlorate **Flare:** Aluminum, Barium Nitrate, Hexachlorbenzene, Magnesium, Potassium Perchlorate	**Metals** Aluminum **Explosives** As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.
Mine, Antitank, Practice, M1	**Case: Steel (Inert)** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Fuze, Practice, M1:** Aluminum, Carbon, Copper, Iron, Zinc **Fuze Filler:** Nitrocellulose[5], Nitroglycerin, Potassium Chlorate, Red Phosphorus, **Primer [7]:** Potassium Nitrate, Sulfur	**Metals** N/A **Explosives** As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.

TABLE 4.1
CHEMICAL COMPOSITION OF POTENTIAL MEC AND MUNITIONS CONSTITUENTS
West Virginia Maneuver Area/Dolly Sods FUDS Property No. G03WV0013
WVMA Ammunition Depot MRS

Munitions Type/ Model	Composition (Case and Filler) [2]	MC Analysis [1]
Charge, demolition, block, ¼ lb, ½ lb, 1 lb	**Case**: **Cardboard, Steel** - Carbon, Iron, Manganese, Phosphorus, Sulfur **Filler**: Trinitrotoluene (TNT)	**Metals** [3] N/A **Explosives** [4] As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.
Firing device, demolition, pull, M1	**Case: Steel -** Carbon, Iron, Manganese, Phosphorus, Sulfur **Primer** [7]**:** Antimony Sulfide, Barium Nitrate, Carbon, Iron, Lead Styphnate, Manganese, Phosphorus, Sulfur, Tetrazene	**Metals** [3] N/A **Explosives** [4] As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.
Cap, blasting, non-electric, M7	**Case: Aluminum Alloy –** Aluminum, Chromium, Copper, Iron, Magnesium, Silicon, Zinc **Filler**: RDX **Primer** [7]**:** (Ignition and Intermediate charges): Lead Azide, Lead Styphnate	**Metals** [3] Aluminum, Chromium, Copper, Magnesium, Zinc **Explosives** [4] As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.
Fuse, blasting, time, M700	**Case: Polyethylene Plastic** **Filler:** Potassium Nitrate, Sulfur	**Metals** [3] N/A **Explosives** [4] As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.

TABLE 4.1
CHEMICAL COMPOSITION OF POTENTIAL MEC AND MUNITIONS CONSTITUENTS
West Virginia Maneuver Area/Dolly Sods FUDS Property No. G03WV0013
WVMA Ammunition Depot MRS

Munitions Type/ Model	Composition (Case and Filler) [2]	MC Analysis [1]
Small arms ammunition, general: Cartridge, .50 caliber, Machine Gun	**Cartridge case: Brass –** Copper, Zinc **Propellant:** Calcium Carbonate, Dibutylphthalate, Diphenylamine, Dinitrotoluene[6], Nitrocellulose[5], Nitroglycerin, Potassium Nitrate, Potassium Sulfate, Sodium Sulfate **Primer [7]:** Aluminum Powder, Antimony Sulfide, Barium Nitrate, Calcium Silicide, Copper, Iron, Lead, Lead Styphnate, Lead Thiocyanate, Potassium Chlorate, PETN, Tetrazene, Zinc **Projectile**: Antimony, Carbon, Copper, Iron, Lead, Manganese, Molybdenum, Sodium Carbonate Monohydrate, Silicon, Sulfur, Zinc **Tracer [8]:** Barium Peroxide, Calcium Resinate, Magnesium Powder, Polyvinyl Chloride, Potassium Perchlorate, Strontium Nitrate, Strontium Oxalate, Strontium Peroxide, Zinc Stearate	**Metals [3]** Antimony, Copper, Lead **Explosives [4]** A full explosives panel will be analyzed for from media collected at this MRS.
Small arms ammunition, general: Cartridge, .45 caliber	**Cartridge case:** Copper Alloy – Copper, Iron, Lead, Zinc **Propellant:** Diphenylamine, Dinitrotoluene[6], Nitrocellulose[5], Nitroglycerin, Potassium Nitrate, Potassium Sulfate **Primer [7]:** Antimony Sulfide, Barium Nitrate, Calcium Silicide, Copper, Iron, Lead Styphnate, Lead Thiocyanate, Nitrocellulose[5], PETN, Potassium Chlorate, Tetrazene, Trinitrotoluene (TNT), Zinc **Projectile**: Antimony, Carbon, Copper, Iron, Lead, Manganese, Phosphorus, Silicon, Sulfur, Zinc	**Metals [3]** Antimony, Copper, Lead **Explosives [4]** A full explosives panel will be analyzed for from media collected at this MRS.
Small arms ammunition, general: Cartridge, .38 caliber	**Cartridge case:** Copper Alloy – Copper, Iron, Lead, Zinc **Propellant:** Dinitrotoluene[6], Diphenylamine, Ethyl Centralite, Nitrocellulose[5], Nitroglycerin, Potassium Sulfate **Primer [7]:** Aluminum Powder, Antimony Sulfide, Barium Nitrate, Calcium Silicide, Copper, Iron, Lead Oxide, Lead Styphnate, Nitrocellulose[5], PETN, Tetrazene, Zinc **Projectile**: Antimony, Copper, Iron, Lead, Zinc	**Metals [3]** Antimony, Copper, Lead **Explosives [4]** A full explosives panel will be analyzed for from media collected at this MRS.

TABLE 4.1
CHEMICAL COMPOSITION OF POTENTIAL MEC AND MUNITIONS CONSTITUENTS
West Virginia Maneuver Area/Dolly Sods FUDS Property No. G03WV0013
WVMA Ammunition Depot MRS

Munitions Type/ Model	Composition (Case and Filler) [2]	MC Analysis [1]
Small arms ammunition, general: Cartridge, .30 caliber (includes carbine)	**Cartridge case:** Copper Alloy – Copper, Iron, Lead, Zinc **Propellant:** Calcium Carbonate, Copper, Dibutylphthalate, Diphenylamine, Dinitrotoluene[6], Ethyl Centralite, Lead, Iron, Nitrocellulose[5], Nitroglycerin, Potassium Nitrate, Sodium Sulfate, Zinc **Primer [7]:** Aluminum Powder, Antimony Sulfide, Barium Nitrate, Copper, Iron, Lead, Lead Styphnate, PETN, Tetrazene, Zinc **Projectile**: Antimony, Carbon, Copper, Iron, Lead, Manganese, Silicon, Sulfur, Zinc **Tracer [8]:** Barium Peroxide, Calcium Resinate, Magnesium Powder, Polyvinyl Chloride, Strontium Nitrate, Strontium Oxalate, Strontium Peroxide, Zinc Stearate	**Metals [3]** Antimony, Copper, Lead **Explosives [4]** A full explosives panel will be analyzed for from media collected at this MRS.
Small arms ammunition, general: Cartridge, .22 caliber	**Cartridge case:** Copper Alloy – Copper, Iron, Lead, Zinc **Propellant:** Dibutylphthalate, Diphenylamine, Nitrocellulose[5], Nitroglycerin **Primer [7]:** Antimony Sulfide, Barium Nitrate, Calcium Silicide, Copper, Iron, Lead, Lead Styphnate, Nitrocellulose[5], Pentaerythritol Tetranitrate (PETN), Tetrazene, Zinc **Projectile**: Antimony, Copper, Iron, Lead, Zinc	**Metals [3]** Antimony, Copper, Lead **Explosives [4]** A full explosives panel will be analyzed for from media collected at this MRS.

TABLE 4.1
CHEMICAL COMPOSITION OF POTENTIAL MEC AND MUNITIONS CONSTITUENTS
West Virginia Maneuver Area/Dolly Sods FUDS Property No. G03WV0013
WVMA Ammunition Depot MRS

Munitions Type/ Model	Composition (Case and Filler) (2)	MC Analysis (1)

Notes:

(1) MC selected for analysis are typically non-essential nutrient metals and indicative of known or suspected DOD munitions used at this MRS.

(2) MC not selected for analysis are essential nutrient metals, Semi-Volatile Organic Compounds (SVOCs) or materials that represent a very small percentage of the munitions weight.

(3) Lead, antimony, and copper have been selected as programmatic SI "indicator" heavy metals and reflect general former small arms range evaluation strategy and parallel the screening level decision-making objectives of SI. This 3-metals list was developed based on an extensive review of historical SAR studies, fate and transport mechanisms (specifically as they relate to shallow surface soil sampling), compositional prevalence, toxicity, environmental persistence and reactivity, and representativeness. This baseline list may be augmented, as appropriate, following TPP based on justifications of unique site specific considerations such as soils, geology, vegetation, topography, hydrology, land use, or ammunition type.

(4) A full Explosives panel will be analyzed for from media collected at known firing points of small arms ranges and ambient samples. As a conservative measure, all explosives will be included when analyzing for explosive MC.

(5) Nitrocellulose is not considered toxic, has no risk-based screening values and there are no chemical analysis techniques that quantify nitrocellulose separately from the natural common essential nutrient nitrate. Based on this, nitrocellulose analysis will not be conducted during this SI.

(6) Dinitrotoluene products include: 2,4-and 2,6-dinitrotoluene; 2-Amino-4,6-dinitrotoluene; 2-and 3-nitrotoluene; 4-Amino-2,6-dinitrotoluene; 4-nitrotoluene.

(7) Primer materials represent a very small percentage of the munition's weight. Therefore, analysis of primer constituents will not be conducted. However, if a primer constituent is associated with a larger component of the munition, then analysis of that constituent may be conducted.

(8) Tracer element materials represent a very small percentage of the munitions weight and is consumed while the projectile travels to the target, therefore, tracer element constituents will not be analyzed for at this MRS (if a tracer element constituent is associated with a larger component of the munition it may be analyzed for).

(9) Munitions listed are potential. No MEC have been found within the MRS.

Source: Munitions information was supplied by the 2009 INPR, Munitions Items Disposition Action System (MIDAS) database, and USACE Range Operations Reports RO-01.

TABLE 4.2
SUMMARY OF QUALITATIVE RECONNAISSANCE OBSERVATIONS
WVMA AMMUNITION DEPOT MRS, RANDOLPH COUNTY, WV

MRS	MEC	MD	OTHER OBSERVATIONS
WVMA Ammunition Depot	None observed	None observed	Potential wetlands were observed south of the wooded area along the northwest edge of the MRS. The wetlands appear to drain toward a culvert beneath County Route 11 at the southwestern edge of the MRS. Numerous areas throughout the MRS contained rectangular areas with minimal vegetation. The rectangular areas are approximately 3 feet by 4 feet. The SVT concluded that the rectangular areas are the result of hay bales that were cut from the field and stored on the ground.

4.2 DATA QUALITY OBJECTIVES

4.2.1 INTRODUCTION

DQOs are qualitative and quantitative statements that clarify study objectives and specify the type and quality of the data necessary to support decisions. The development of DQOs for a specific site takes into account factors that determine whether the quality and quantity of data are adequate for project needs, such as data collection, uses, types, and needs. While developing these DQOs in accordance with the process presented in Chapter 3, paragraph 3.1.2 of the PWP, Eco followed the Guidance on Systematic Planning Using the Data Quality Objectives Process (USEPA 2006).

The goal of the TPP process is to achieve stakeholder, USACE, and applicable state and federal regulatory concurrence with the DQOs for a given site. The TPP Team approved the WVMA Ammunition Depot MRS DQOs at the TPP meeting on April 7, 2011. Appendix B of this SI Report presents the TPP documentation, including the DQO worksheets agreed to at the meeting. The updated DQO worksheets for the MRS are included in this chapter after the appropriate DQO discussions.

As stated in Subchapter 1.2 of this SI Report, data must be sufficient to do the following: 1) determine whether a removal action is necessary, 2) enable HRS scoring by the USEPA, 3) characterize the release for RI/FS initiation, and 4) complete the MRSPP.

DQOs cover four project objectives that SI data must satisfy: 1) evaluate potential presence of MEC, 2) evaluate potential presence of elevated metals concentrations that are consistent with the identified MC contaminants of concern, 3) collect data needed to complete MRSPP scoring sheets, and 4) collect information for HRS scoring.

4.2.2 MUNITIONS AND EXPLOSIVES OF CONCERN DATA QUALITY OBJECTIVE

The MEC DQO was achieved by evaluating potential presence of MEC within the WVMA Ammunition Depot MRS boundary. The SVT searched for visual evidence of MEC and MD along the QR transects. They identified no MEC and no MD in the WVMA Ammunition Depot MRS. Table 4.3 presents the MEC DQOs.

4.2.3 MUNITIONS CONSTITUENTS DATA QUALITY OBJECTIVE

The MC DQO was achieved by evaluating the potential presence of elevated metals within the MRS boundary. Table 4.1 summarizes the MC associated with the ordnance potentially stored at the WVMA Ammunition Depot MRS. The TPP Team agreed on the list of analytes for sample analysis based on the munitions potentially stored at the site. Chapter 5 presents the metals sampling and analysis results. Appendix G presents the QA and QC reports generated during the data validation process. No concerns regarding data quality were noted. Table 4.4 presents the MC DQOs.

4.2.4 MUNITIONS RESPONSE SITE PRIORITIZATION PROTOCOL DATA QUALITY OBJECTIVE

The MRSPP DQO was achieved by obtaining sufficient information to complete the MRSPP scoring sheets. Specific input data were collected, and the three modules for the MRSPP were populated as part of the SI. Appendix K includes the scoring sheets. Table 4.5 presents the MRSPP DQOs.

4.2.5 HAZARD RANKING SYSTEM DATA QUALITY OBJECTIVE

The HRS DQO was achieved by including information in the SI report necessary for the USEPA to populate the HRS score sheets. Source documents for the HRS information include the INPR and the PA; the metals sampling results reported in Chapter 5 of this SI Report; and information from local and state agencies regarding population, groundwater wells, and drinking water wells. Table 4.6 presents the HRS DQOs.

4.3 WVMA AMMUNITION DEPOT MUNITIONS RESPONSE SITE

4.3.1 HISTORICAL USE OF MILITARY MUNITIONS

The WVMA Ammunition Depot MRS consists of 4 acres within a 2,180,367-acre FUDS. Historical records, summarized in the 2009 PA, indicate that the WVMA Ammunition Depot MRS was used from 1943 to 1944 for storage of munitions used at the WVMA. The potential munitions stored at the ammunition depot included 155mm HE projectiles; 105mm HE and SR cartridges; 81mm HE and SR cartridges; 75mm HE and SR shells; 60mm HE and SR shells; 4.2-inch HE and SR shells; 3.25-inch target rockets; fragmentation, smoke, and practice hand grenades; demolition charge blocks, demolition firing devices, blasting caps, time fuses, and general small arms ammunition (.22, .30, .38, .45, and .50 Caliber) (USACE 2009).

4.3.2 INSPECTION ACTIVITIES

To assess potential MEC contamination within the WVMA Ammunition Depot MRS, the SVT conducted approximately 0.75 miles of QR within the MRS (Figure 4.1). The team did not observe any MEC or MD or any other features of interest.

Surface soil samples were collected as planned and described in the approved SS-WP, except for those deviations from the plan described in Section 3.5 above. Biased surface soil samples are generally collected in proximity to suspected or observed munitions, or suspected storage areas. No evidence of munitions or suspected storage areas were observed by the SVT; therefore, samples were collected at locations where munitions storage was likely to have occurred based on historical information. See Figure 5.2 for sample locations.

The SVT collected 8 observations during the site visit (see Appendix E). No MEC or MD indicative of MEC was observed during the SI (see Appendix D). The SVT identified several features within the MRS that included the following:

- Hay bales
- Rectangular impressions in grass left by hay bales
- Potential wetlands

No archeological or cultural resources were identified during the site visit.

TABLE 4.3

MEC DATA QUALITY OBJECTIVE WORKSHEET

SITE: **West Virginia Maneuver Area/Dolly Sods FUDS**

PROJECT: **MMRP Site Inspection/WVMA Ammunition Depot MRS**

DQO Element Number *	DQO Element Description *	Site-Specific DQO Statement	Objective met? (Y or N)
Intended Data Use(s):			
1	Project Objective(s) Satisfied	Evaluate potential presence of munitions or explosives of concern (MEC)	Y
Intended Need Requirements:			
2	Data User Perspective(s)	Risk, remedy	Y
3	Contaminant or Characteristic of Interest	MEC, munitions debris	Y
4	Media of Interest	N/A	N/A
5	Required Locations or Areas	WVMA Ammunition Depot MRS	Y
6	Number of Samples Required	N/A	N/A
7	Reference Concentration of Interest or Other Performance Criteria	Visual identification of MEC or munitions debris during qualitative reconnaissance (QR)	Y
Appropriate Sampling and Analysis Methods:			
8	Sampling Method	QR with magnetometer (Schonstedt) for avoidance	Y
9	Analytical Method	N/A	N/A

* Refer to EM 200-1-2, Paragraph 4.2.1

TABLE 4.4

MC DATA QUALITY OBJECTIVE WORKSHEET

SITE: **West Virginia Maneuver Area/Dolly Sods FUDS**

PROJECT: **MMRP Site Inspection/WVMA Ammunition Depot MRS**

DQO Element Number*	DQO Element Description*	Site-Specific DQO Statement	Objective Met? (Y or N)
Intended Data Use(s):			
1	Project Objective(s) Satisfied	Evaluate potential release of elevated metals concentrations that are consistent with the identified munitions constituents (MC) contaminants of concern.	Y
Intended Need Requirements:			
2	Data User Perspective(s)	Risk, remedy	Y
3	Contaminant or Characteristic of Interest	See CSM	Y
4	Media of Interest	Surface soil	Y
5	Required Sampling Locations or Areas and Depths	Samples were collected as determined by the TPP Team. Soil sample depth is 24 inches.	Y
6	Number of Samples Required	2 discretionary biased surface soil samples and 1 ambient surface soil sample.	Y
7	Reference Concentration of Interest or Other Performance Criteria	Human health selected values for soil are from the USEPA 'protection for groundwater' risk-based screening levels, supplemented with USEPA Region 3 Screening Levels.	Y

TABLE 4.4

MC DATA QUALITY OBJECTIVE WORKSHEET

SITE: **West Virginia Maneuver Area/Dolly Sods FUDS**

PROJECT: **MMRP Site Inspection/WVMA Ammunition Depot MRS**

DQO Element Number*	DQO Element Description*	Site-Specific DQO Statement	Objective Met? (Y or N)
Appropriate Sampling and Analysis Methods:			
8	Sampling Method	Discrete samples, rather than CRREL 7-point wheel samples, using hand auger in accordance with the SS-WP, PSAP and PSAP Addendum	Y
9	Analytical Method	Explosives: soil samples were dried, sieved, and ground with pestle and mortar according to SW846-8330A and analyzed by HPLC according to SW846-8330B Selected metals: samples were dried and sieved according to SW846-3050B and analyzed by ICP according to SW846-6010B pH: SW846-9045D	Y

* Refer to EM 200-1-2, Paragraph 4.2.1

TABLE 4.5
MRSPP Data Quality Objective Worksheet

Site: West Virginia Maneuver Area/Dolly Sods FUDS
Project: MMRP Site Inspection/WVMA Ammunition Depot MRS
DQO Statement Number: 3 of 4

Module	Table #	Table Description	Known Data	Current Data Gap	Data Source
Explosive Hazard Evaluation (EHE)	1	Munitions Type	X		Historical records or field findings
	2	Source of Hazard	X		Historical maps
	3	Location of Munitions	X		Historical records or field findings
	4	Ease of Access	X		Field findings
	5	Status of Property	X		Historical records
	6	Population Density	X		U.S. Census Bureau
	7	Population Near Hazard	X		Field findings
	8	Types of Activities/Structures	X		Regional zoning
	9	Ecological and/or Cultural Resources	X		State Historic Preservation Office
	10	Determining the EHE	X		Scores from Tables 1 through 9
Chemical Warfare Materiel (CWM) Hazard Evaluation (CHE)	11	CWM Configuration	X		Historical records or field findings
	12	Sources of CWM	X		Historical records or field findings
	13	Location of CWM	X		Historical records or field findings
	14	Ease of Access	X		Historical records or field findings
	15	Status of Property	X		Historical records
	16	Population Density	X		U.S. Census Bureau
	17	Population Near Hazard	X		Field findings
	18	Types of Activities/Structures	X		Regional zoning
	19	Ecological and/or Cultural Resources	X		State Historic Preservation Office
	20	Determining the CHE	X		Scores from Tables 11 through 19
Health Hazard Evaluation (HHE)	21	Groundwater Data	X		N/A
	22	Surface Water - Human Endpoint	X		N/A
	23	Sediment - Human Endpoint	X		N/A
	24	Surface Water - Ecological Endpoint	X		N/A
	25	Sediment - Ecological Endpoint	X		N/A
	26	Surface Soil	X		Surface soil sampling results
	27	Supplemental Contaminant Hazard Factor	X		All MC sampling results
	28	Determining the HHE	X		Scores from Tables 21 through 27
	29	MRS Priority	X		Scores from Tables 10, 20, and 28
	A	MRS Background Information	X		DoD databases

TABLE 4.6
HRS Data Quality Objective Worksheet

Site: West Virginia Maneuver Area/Dolly Sods FUDS
Project: MMRP Site Inspection/WVMA Ammunition Depot MRS

Data Description	Known Data	Current Data Gap	Data Source
Source Type	X		Historical records or field findings
Estimated Volume or Area	X		Field findings
Hazardous Substance	X		Constituents of suspected munitions
Groundwater Sample Concentration		X	N/A
Groundwater Use	X		Well records and municipal data
Surface Water Sample Concentration		X	N/A
Surface Water Pathways	X		Field findings
Soil Sample Concentration	X		Sample results
Soil Pathways	X		Field findings
Sensitive Environments	X		State Historic Preservation Office, U.S. Fish and Wildlife Service, various government agencies
Attractiveness/Accessibility	X		Field findings and land use records

LEGEND

- MRS02 – WVMA Ammunition Depot
- Qualitative Reconnaissance Track
- Field Observation Location (see Appendix E)

Prepared by:
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QUALITATIVE RECONNAISSANCE AND FIELD OBSERVATIONS
MRS02 – WVMA Ammunition Depot
MMRP West Virginia

PROJECT NO. Eco-11-452

DATED August 2013

FIGURE
4.1

CHAPTER 5
EXPOSURE PATHWAYS AND RECEPTORS

5.1 INTRODUCTION

This chapter evaluates the potential presence of exposure pathways and receptors, based on site-specific conditions. It is necessary to evaluate site-specific conditions and land use to assess risks posed to potential receptors under current and future land use scenarios. Exposure pathways for groundwater, surface water and sediment, soil, and air are evaluated. The conceptual site exposure model (CSEM) for the WVMA Ammunition Depot MRS (Appendix J) summarizes which potential receptor exposure pathways are (or may be) complete and which are (and are likely to remain) incomplete. An exposure pathway is not considered to be complete unless all four of the following factors are present (USEPA 1989). An example regarding a hypothetical groundwater pathway is included.

Exposure Factor	Example
Source and mechanism for contaminant release	A site has known MEC from which metals have leached and contaminated surface soil.
Environmental transport and/or exposure medium	Elevated metals concentrations that are consistent with the identified MC contaminants of concern in soil at the site is mobile and can contaminate groundwater.
Point of exposure at which the contaminant can interact with a receptor	A well drawing from the contaminated aquifer is located at the site.
Receptor and a likely route of exposure at the exposure point	A residential use of groundwater from the on-site well as a source of drinking water.

In this hypothetical example, all four factors are present and, therefore, the groundwater exposure pathway is complete. If any single factor was not present (e.g., metals were not present in soil, or the resident obtained drinking water from another source), the pathway would be incomplete.

This chapter presents the information required to evaluate whether exposure pathways at the site are complete. It also addresses those metals that require further consideration in a SLRA. Chapter 6 assesses the potential significance of complete pathways (i.e., whether there is an unacceptable risk).

5.2 GENERAL INFORMATION

General information regarding the geology, hydrogeology, and hydrology of the WVMA/Dolly Sods FUDS is presented below, followed by a discussion of MRS-specific characteristics and sampling results from the WVMA Ammunition Depot MRS.

5.2.1 REGIONAL GEOLOGIC AND HYDROGEOLOGIC SETTING

The WVMA/Dolly Sods FUDS is located to the west of the Allegheny Front with approximate centralized coordinates of latitude 39° 07' 08" N and longitude 79° 27' 09" W. The Allegheny Front is a complex boundary between two geologic provinces in the Appalachian Highlands. The geology changes abruptly from the folded and faulted surficial strata of the Valley and Ridge province to the east and the gentler faulted strata of the Appalachian Plateaus province to the west. East of the Allegheny Front the strata are found to dip steeply on the limbs of many anticlines, many of which are asymmetrical, with more steeply dipping to overturned western limbs. West of the Front the strata dip much less steeply, usually less than 30 degrees and surface faulting is rare. This western side of the Front forms a high plateau of essentially horizontal strata and is capped predominantly with resistant sandstones and conglomerates. Spruce Knob, located approximately 15 miles south of the FUDS, is the tallest mountain in the Alleghenies and West Virginia's highest elevation at 4,861 feet (WVGES 2004).

The WVMA Ammunition Depot MRS is situated in the Tygart Valley, which occupies an eroded anticline in the Allegheny Mountain Section of the Appalachian Plateaus physiographic province (USGS 2002). The anticline has a core of Devonian Brallier shale and siltstone and a rim of Mississippian Pocono Sandstone and Greenbrier Limestone. The MRS and lower slopes of the surrounding mountains are made up of the Brallier Formation, consisting of Devonian beds of olive-gray to dark, thickly laminated marine shale with siltstone and thin sandstone lenses. The slopes and ridges of Cheat Mountain to the east and Laurel Mountain to the west of the MRS are composed of siltstone and sandstone of the Devonian aged Chemung Group and sandstone, limestone, and shale of the Pocono Group and Greenbrier Group of Mississippian age (USGS 2012).

In 1980, a hydrologic study was conducted in the Tygart Valley to locate groundwater supplies to supplement surface water supplies during periods of low surface flow and drought conditions. The study concluded that sufficient groundwater supplies existed to develop a water system capable of supplying up to 200 gallons per minute. However, most of the groundwater is contained in the alluvial deposits. Wells developed in the underlying shale units have highly variable yields with the highest yields obtained from wells in extensively fractured units and sand and gravel lenses within the shale. The study noted that the most desirable water is located within 100 feet of the surface with salty water located below 140 feet (Hobba 1980).

5.2.2 REGIONAL GROUNDWATER USE

Drinking water in the area of the WVMA Ammunition Depot MRS is supplied by the Elkins Public Service District (PSD) using surface water as a source. The surface water is obtained from an intake on the Tygart River.

The USEPA indicated that there are seven surface water intakes within 15 miles of the MRS, and that no tribal drinking water sources are within 4 miles of the MRS (USEPA 2012). Three wellhead protection areas and/or Zones of Critical Concern, as defined by the WVDHHR are located within 4 miles of the MRS (WVDHHR 2012).

The WVMA Ammunition Depot MRS overlies a Devonian shale unit that is not considered a principle aquifer but may yield sufficient quantities of groundwater if fractured (USGS 2012). There are 51 water wells within a 4-mile buffer of the MRS boundary. No wells are located within the MRS boundaries. Based on the well report, the groundwater depths ranged from 3 feet to 21.67 feet within the 4-mile buffer (Environmental Data Resources, Inc. [EDR] 2012). Groundwater was encountered at a depth of 2 feet bgs during the site inspection however.

The SVT did not observe any inhabited structures within the MRS. However, there are many (26 or more) inhabited structures within 2 miles of the MRS, primarily consisting of residential and commercial buildings in the City of Elkins.

5.2.3 REGIONAL HYDROLOGIC SETTING

Because of the size of the WVMA/Dolly Sods FUDS, it spans five watersheds within the larger Monongahela and Potomac groundwater basins: the Tygart Valley watershed, the Cheat watershed, the Youghiogheny watershed, the North Branch Potomac watershed, and the South Branch Potomac watershed (Watershed Atlas [WSA] 2011).

The WVMA Ammunition Depot MRS lies within the Tygart Valley. The valley is drained by the Tygart Valley River and its tributaries, and is part of the Monongahela River drainage system. There were wetlands encountered outside the MRS, on the northwest and southeast sides of the MRS during the SI. The southeast edge of the MRS is bordered by Leading Creek, a tributary of the Tygart Valley River. Leading Creek is not within the MRS boundaries.

The USEPA indicated that seven surface water intakes are within 15 miles of the MRS, and that no tribal drinking water sources are within 4 miles of the MRS (USEPA 2012).

5.2.4 REGIONAL SENSITIVE ENVIRONMENTAL RESOURCES

According to the USFWS T&E Species System database, the State of West Virginia supports 17 federally listed T&E species consisting of 11 animals and 6 plants (USFWS 2011b). The USFWS Elkins, West Virginia (WV) Office indicates there are 17 T&E species occurring in the Allegheny Mountains including: running buffalo clover (*Trifolium stoloniferum*), shale barren rock cress (*Arabis serotina*), small whorled pogonia (*Isotria medeoloides*), northeastern bulrush (*Scirpus ancistrochaetus*), Harperella (*Ptilimnium nodosum*), Virginia Spiraea (*Spiraea virginiana*), Virginia big-eared bat (*Corynorhinus townsendii virginianus*), Indiana bat (*Myotis sodalis*), Gray bat (*Myotis grisescens*), Clubshell (*Pleurobema clava*), Fanshell (*Cyprogenia stegaria*), Pink mucket (*Lampsilis abrupt*), Northern riffleshell (*Epioblasma torulosa rangiana*), Cheat Mountain salamander (*Plethodon nettingi*), flat-spired three-toothed snail (*Triodopsis platysayoides*), James spinymussel (*Pleurobema collina*), and the West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*). Federally designated endangered (or threatened) species include the bald eagle (*Haliaeetus leucocephalus*) and the Cheat Mountain salamander (*Plethodon nettingi*). Globally rare and imperiled species include an isopod (*Caecidotea sinuncus*), tall larkspur (*Delphinium exaltatum*), eastern small-footed bat (*Myotis lebii*), Allegheny woodrat (*Neotoma magister*), Timber Ridge cave beetle (*Pseudanophthlmus*

hadenoecus), and the South Branch Valley cave millipede (*Pseudotremia princeps*). Two other endangered species, the gray wolf (*Canis lupus*) and the eastern cougar (*Puma concolor couguar*), are believed to be extirpated from the region during the late 1800s or early 1900s (USDA 2006). In addition to the species identified above, the West Virginia Wildlife Diversity Program lists 397 endangered, threatened, or rare plant species and 491 rare, threatened, or endangered animal species occurring in West Virginia (West Virginia Division of Natural Resources [WVDNR] 2011).

The WVMA Ammunition Depot MRS consists of private land used for agriculture. There are no federally designated critical habitats located within the MRS (USFWS 2011). The MRS is not within a national park, national forest, state, or county park (USFWS 2011d, National Park Service 2011a, USFS 2011). Because there are no known caves or karst areas within the MRS, the species of bats and cave inhabiting animals listed above are not likely to be encountered on the site. In addition, the MRS is not considered suitable habitat for the West Virginia northern flying squirrel or the Cheat Mountain salamander. The Flat-spired three-toothed snail is found only in the Cheat River gorge located approximately 38 miles north of the site and is not anticipated to be encountered. The remaining animal species listed are found in larger river systems and are not anticipated to inhabit the area of the WVMA Ammunition Depot MRS.

The USFWS Wetlands Mapper, through the National Wetlands Inventory, was used to identify wetlands within the WVMA Ammunition Depot MRS (USFWS 2011c). Wetlands are land areas that are transitional between terrestrial and deep-water habitats in which the water table usually is at or near the surface or in which the land is covered by shallow water. Although wetlands were observed by the SVT, there are no mapped wetlands located in the MRS. Leading Creek, located outside the MRS near the southeastern boundary, is considered a riverine type wetland.

Based on the above information and a review of the Army Checklist for Important Ecological Places (Department of the Army 2005b), the WVMA Ammunition Depot MRS is not classified as an important ecological place. The determinations regarding important ecological places pertain to whether ecological receptors are present at the site. If a site is determined to be an important ecological place, ecological receptors are present and a SLERA will be conducted if there is an observed release of potential elevated metals. The SVT observed no T&E species during the site visit. Sensitive environments were not impacted by the SI effort and all QR and SI field efforts were performed to minimize any intrusion in sensitive areas.

5.2.5 SAMPLING LOCATIONS AND ANALYTICAL METHODS

Direct release of metals from munitions activities at the WVMA Ammunition Depot MRS would have been to soil, with potential migration to surface water, sediment, groundwater, or air (through re-suspended soil particulates). The TPP Team agreed that surface soil samples would be collected from the MRS using a hand auger. The soil samples were collected with a hand auger, as specified in the SS-WP. However, because the samples were collected at a depth of two feet bgs, the samples were collected as discrete samples rather than using the CRREL seven-point wheel composite sampling technique. The TPP team agreed that surface water and sediment sampling was not warranted, based on the absence of surface water within the MRS. Groundwater wells were not identified within the MRS

(Figure 5.1); therefore, no groundwater samples were collected. No air samples were collected as part of this SI, in accordance with TPP Team decisions.

On May 11, 2012, the SVT conducted QR and surface soil sampling at the WVMA Ammunition Depot MRS. The team collected two biased surface soil samples (WVMA-MRS02-SS-24-01 and WVMA-MRS02-SS-24-02), along with one associated field duplicate (FD) sample (WVMA-MRS02-SS-24-04) from within the MRS. The actual location of the ammunition depot is not known, so these sample locations were selected in the areas most likely to contain the ammunition depot, and therefore in the areas with the highest likelihood of the presence of MEC or metals contamination (Eco 2011b). Due to a lack of ROE for the north portion of the property, soil samples WVMA-MRS02-SS-24-01 and WVMA-MRS02-SS-24-04 were moved south of the proposed location to be within the portion of the property where ROE was granted. No MEC, MD, or evidence of metals contamination was observed during the site visit, and subsurface metal anomalies were not detected within the MRS. One ambient surface soil sample (WVMA-MRS02-AMB-SS-24-03) was collected from the northeast portion of the MRS away from the anticipated location of the ammunition depot. The team also collected one equipment blank water sample to verify that the hand auger was sufficiently decontaminated between samples. Appendix F includes the sample results.

APPL, Inc. in Clovis, California (CA) analyzed all of the soil samples and the equipment blank for explosives (Method SW846-8330B) and selected metals (Method SW846-6010B). Selected metals included antimony, copper, lead, manganese, zinc, and mercury.

The UXO Technician III used a Schonstedt GA-52Cx magnetometer to screen and approve each potential soil sample location prior to final location selection and sample collection. Per the Final PWP (Parsons 2010), the UXO Technician III checked the magnetometer against a known piece of metal and performed battery checks each day to confirm that it was working properly. The surface soil sample collection procedures presented in the Final PWP (Parsons 2010), the Final PSAP (USACE 2005), and the Final PSAP Addendum (Parsons 2006) were followed. The soil samples were collected with a hand auger, as specified in the SS-WP. However, because the samples were collected at a depth of two feet bgs, the samples were collected as discrete samples rather than using the CRREL seven-point wheel composite sampling technique. The actual Global Positioning System (GPS) coordinates for the center point of each surface soil sample location were recorded and updated in the Geospatial Information Systems (GIS) database (Appendix H). Figure 5.2 shows the sample locations and identification numbers. Table 5.1 indicates the rationale behind the sample locations. Appendix D includes the field notes and field forms for the site visit.

5.2.6 DATA QUALITY ASSESSMENT

The samples were shipped to APPL, Inc. for analysis. APPL, Inc. is certified under the DoD Environmental Laboratories Accreditation Program (ELAP) and the National Environmental Laboratory Accreditation Conference (NELAC). The laboratory submitted the soil and water chemical data to Eco under Sample Delivery Group 67746. The data are presented in Appendix F. Parsons validated and assessed the data in accordance with the guidelines outlined in the PSAP (consisting of the field sampling plan and the quality assurance project plan) for the MMRP SI Program (USACE 2005a) and the PSAP Addendum (Parsons 2006). The data validation indicates that the laboratory correctly performed the analyses and that no data were rejected. Appendix G presents the data validation summary reports.

As stated in Section 4.7 of the SS-WP (Eco 2011b), any U-flagged value is treated as “not detected”, and is assumed to not be present in the sample. In some cases, the PQL is greater than the screening value. This is common in some analyses due to sample preparation and analytical limitations. This could lead to a situation where the analyte is present at a concentration greater than the screening value, but is reported as "not detected or estimated" leading to an underestimate of risk. However, such occasions are expected to be rare and are not likely to drive the recommendation for the SI. For this SI, the PQLs did not exceed the selected screening values.

5.2.7 BACKGROUND/AMBIENT CONCENTRATIONS

Due to the variability of naturally occurring metals in the area and to supplement the single ambient sample (per media) collected during the SI, the TPP Team agreed to use the background concentrations obtained from the West Virginia Voluntary Remediation and Redevelopment Act Guidance Manual Version 2.1, Table 2-3: Natural Background Levels of Inorganics in Soil in West Virginia and Surrounding Areas to augment the ambient sample results. The applicable data are based on larger sample sizes (n • 10) leading to a more robust comparison. The background value used for comparison to the biased surface soil sample results will be three times the mean background concentration obtained from West Virginia guidance, per United States Environmental Protection Agency (USEPA) guidance (USEPA, 1992).

The ambient surface soil sample (WVMA-MRS02-AMB-SS-24-03) was collected from the northeast corner`` of the MRS, away from the anticipated location of the ammunition depot. The SVT observed no MD or evidence of DoD use near the ambient sample location or within the MRS. The sample was analyzed for explosives and selected metals (antimony, copper, lead, manganese, mercury, and zinc).

The ambient sample results were used to represent naturally occurring metals concentrations at the WVMA Ammunition Depot MRS. No explosive compounds were detected in the ambient sample. Table 5.2 summarizes the metals concentrations detected in the collected ambient sample. These concentrations were then compared to the maximum detected metals concentrations found in the biased-location samples obtained within the WVMA Ammunition Depot MRS, along with the background data discussed above.

TABLE 5.1
SAMPLING RATIONALE
WVMA AMMUNITION DEPOT MRS, RANDOLPH COUNTY, WV

Sample ID	Sample Coordinates (Decimal Degree)		Medium	Analysis (1)	Potential Munitions	Rationale
	Longitude	Latitude				
WVMA-MRS02-SS-24-01	-79.856398	38.947506	Soil	Explosives, Selected metals	Small arms, general: Cartridges: .22 cal, .30 cal (includes carbine), .38 cal, .45 cal, .50 cal, machine gun Cartridge: 40mm, armor piercing – tracer (AP-T), M81; 57mm, AP-T, M70 Shell: 60mm, high explosive (HE), M49A2; 60mm, smoke, white phosphorus (WP), M302; 75mm, HE, MkI; 75mm, smoke, WP, MkII Cartridge: 81mm, HE, M43; 81mm, smoke, WP, M57; 105mm, HE, M1; 105mm, smoke, hexachloroethane (HC), M84 Shell: 4.2-inch, HE, Mm3, M3A1; 4.2-inch, smoke, M2 (1918 – 1944) Projectile, 155mm, HE, M102 Mine, antitank, practice, M1 Rocket, 3.25-inch, target, Mk1 through Mk4 Demolition Block, charge, 1/4 lb., 1/2 lb., 1 lb. Firing Device, demolition, pull, M1 Cap, blasting, non-electric, M7 Fuse, blasting, time, M700	Sample location was moved slightly southeast to avoid ROE conflict. Will help support appropriate recommendation.

TABLE 5.1
SAMPLING RATIONALE
WVMA AMMUNITION DEPOT MRS, RANDOLPH COUNTY, WV

Sample ID	Sample Coordinates (Decimal Degree)		Medium	Analysis (1)	Potential Munitions	Rationale
	Longitude	Latitude				
WVMA-MRS02-SS-24-02	-79.856209	38.947071	Soil	Explosives, Selected metals	Small arms, general: Cartridges: .22 cal, .30 cal (includes carbine), .38 cal, .45 cal, .50 cal, machine gun Cartridge: 40mm, armor piercing – tracer (AP-T), M81; 57mm, AP-T, M70 Shell: 60mm, high explosive (HE), M49A2; 60mm, smoke, white phosphorus (WP), M302; 75mm, HE, MkI; 75mm, smoke, WP, MkII Cartridge: 81mm, HE, M43; 81mm, smoke, WP, M57; 105mm, HE, M1; 105mm, smoke, hexachloroethane (HC), M84 Shell: 4.2-inch, HE, Mm3, M3A1; 4.2-inch, smoke, M2 (1918 – 1944) Projectile, 155mm, HE, M102 Mine, antitank, practice, M1 Rocket, 3.25-inch, target, Mk1 through Mk4 Demolition Block, charge, 1/4 lb., 1/2 lb., 1 lb. Firing Device, demolition, pull, M1 Cap, blasting, non-electric, M7 Fuse, blasting, time, M700	Sample was collected in proposed location based on where munitions storage was likely to have occurred within the MRS. Will help support appropriate recommendation.
WVMA-MRS02-AMB-SS-24-03	-79.854741	38.9488643	Soil	Explosives, Selected metals	None	Sample was collected from proposed location, upgradient from area suspected to be used by DoD for storage of munitions.

TABLE 5.2

SUMMARY OF BACKGROUND CONCENTRATIONS IN SOIL

WVMA AMMUNITION DEPOT MRS, RANDOLPH COUNTY, WV

Analytes	WVMA-MRS02-AMB-SS-24-03[1]	Selected Background Concentration[2]
Metals	mg/kg	
Antimony	**0.22J**	2.3
Copper	**13**	66
Lead	**9.6**	50
Manganese	**210**	2300
Mercury	**0.040J**	0.42
Zinc	**52**	180

(1) Ambient sample analytical results. Detections are bolded.
(2) Selected background concentration is 3x site-specific ambient sample.
J Analyte detected, estimated concentration.

5.2.8 ESTABLISHING AN OBSERVED RELEASE

As explained in Subchapter 5.1, an exposure pathway for a chemical release is not considered complete unless metals have been released to environmental media. To make this determination, analytical results for metals in the soil presented in Table 5.4 are evaluated using several criteria. For an analyte to be considered to have been released due to munitions-related activities at the WVMA Ammunition Depot MRS, it is necessary for the following conditions to be true:

- The analyte is detected in the sample medium; and
- The analyte is present above the selected background concentration; and
- The analyte is a potential constituent of the munitions formerly used at the site (see Table 4.1).

The metals analyzed were evaluated against these criteria to determine whether metals may have been released. Only analytes that meet the conditions above are evaluated further in the SLRA in Chapter 6. Any detection of explosives at the site is evidence of a potential release of metals and is evaluated in the SLRA.

The above method is consistent with the process described in Chapter 5, Observed Release, of the HRS Guidance Manual (USEPA 1992). The HRS Guidance Manual process for establishing an observed release "requires documenting that the concentration of at least one hazardous substance in a release sample is significantly increased above its background level, and that the substance in the release can be attributed to the site" (USEPA 1992). The method described above both confirms whether an analyte is present above background concentrations and whether that analyte is a potential constituent of the munitions formerly used at the site, meeting both criteria defined in the guidance.

5.3 WVMA AMMUNITION DEPOT MUNITIONS RESPONSE SITE

This subchapter of the SI Report evaluates pathways for the WVMA Ammunition Depot MRS. The analysis of each pathway is described in detail. The related CSEM for the MRS is provided in Appendix J.

5.3.1 HISTORICAL MUNITIONS CONSTITUENTS INFORMATION

The WVMA Ammunition Depot MRS consists of 4 acres. No historical metals-related groundwater, surface water, soil, or air sampling has been documented at this MRS.

5.3.2 GROUNDWATER EXPOSURE PATHWAY

Groundwater can serve as a contaminant transport mechanism that may affect surface water bodies, drinking water supplies, vegetation, and sensitive environments such as wetlands. The likelihood of exposure is influenced by such factors as the mass and concentration of metals in soil at the ground surface that can be transported to the groundwater, site-specific geology, climate, and the expected future land use.

5.3.2.1 Geologic and Hydrogeologic Setting

The geologic and hydrogeologic settings at the WVMA Ammunition Depot MRS are described in Subchapter 5.2.1.

5.3.2.2 Releases and Potential Releases to Groundwater

There are no known releases or potential releases of metals to groundwater at the WVMA Ammunition Depot MRS. Groundwater would not have been directly affected by activities associated with the MRS. If there were releases of metals to soil as a result of the munitions-related activities, it is possible that the constituents could leach to groundwater, which ranges from 3 ft bgs to 21.67 ft bgs within the 4-mile buffer of the MRS (EDR 2012), and was encountered by the SVT at 2 ft bgs during soil sampling within the MRS.

5.3.2.3 Groundwater Exposure Pathway and Receptors

A water well data report included in Appendix L lists 51 groundwater wells within 4 miles of the WVMA Ammunition Depot MRS (EDR 2012), as shown on Figure 5.1 and listed in Table 5.3. The report lists no wells within the WVMA Ammunition Depot MRS. The SVT observed no wells within the MRS during the site visit.

TABLE 5.3
GROUNDWATER WELLS WITHIN 4-MILE BUFFER OF THE WVMA AMMUNITION DEPOT MRS
WVMA AMMUNITION DEPOT MRS, RANDOLPH COUNTY, WV

DISTANCE FROM SITE	TOTAL
Onsite	0
0 to ¼ mile	0
¼ to ½ mile	3
½ to 1 mile	1
1 to 2 miles	7
2 to 3 miles	13
3 to 4 miles	27
Site to 4 miles	51

Detailed well information is included in Appendix L.

As shown in Table 2.1, the 2010 census data indicate that 14,265 people live within a 4-mile radius of the WVMA Ammunition Depot MRS. The census data also indicate that 22 people potentially live within the WVMA Ammunition Depot MRS, as shown in Table 2.1 and on Figure 2.2 (U.S. Census Bureau 2010). The majority of the MRS is vacant agricultural land owned by private individuals. The MRS is bordered by Old Route 219 and a concrete company to the north, Leading Creek, the Western Maryland Railroad (RR) line, and residences to the south, vacant land to the east, and County Route 11/U.S. Route 219 with vacant land beyond to the west. The SVT observed no inhabited structures within the MRS boundary. However, abundant (26 or more) inhabited structures were observed within 2 miles of the MRS, mainly located within and surrounding the City of Elkins. Known site users are farmers and private land owners.

Groundwater would not have been directly affected by munitions activities; however, metals in soil could leach to groundwater given the shallow depth to groundwater in the WVMA Ammunition Depot MRS. Based on the current and future land use of this MRS, potential receptors include commercial/industrial workers (farmers), and site visitors (e.g. landowners and trespassers). These receptors are not expected to conduct intrusive activities that would result in exposure to shallow groundwater at the MRS. Additionally, there are no groundwater wells within the MRS, so human receptors would not come into contact with groundwater via groundwater wells. The site is not an ecologically important place; therefore, ecological receptors are not considered to be present at the site.

5.3.2.4 Groundwater Sampling Locations and Methods

As discussed in Subchapter 5.2.5, groundwater wells were not identified within the MRS; therefore, no groundwater samples were collected.

5.3.2.5 Groundwater Sampling Analytical Results

Not applicable; no groundwater samples were collected during the SI at the WVMA Ammunition Depot MRS.

5.3.2.6 Groundwater Exposure Pathway Conclusions

There are 51 groundwater wells within 4 miles of the WVMA Ammunition Depot MRS, none of which are within the MRS. Groundwater beneath the site would not have been directly affected by activities at the site. Metals were not detected in surface soil at this MRS at concentrations above the background levels. Therefore, the groundwater exposure pathways are incomplete for human receptors at the MRS.

5.3.3 SURFACE WATER AND SEDIMENT EXPOSURE PATHWAYS

Surface water can serve as a contaminant transport mechanism that may affect surface water bodies, sediment, drinking water supplies, vegetation, and sensitive environmental areas such as wetlands. The likelihood of exposure is influenced by such factors as the mass and concentration of metals in soil at the ground surface that can be transported to the surface water and sediment through runoff and erosion.

5.3.3.1 Hydrologic Setting

There are no perennial surface water bodies within the WVMA Ammunition Depot MRS. Wetlands are not mapped or documented within the MRS; however, the SVT observed what appeared to be wetland areas in the north and south portions of the MRS, as well as on adjacent property to the east. Surface water in this area drains to the south, toward Leading Creek, or toward a culvert beneath County Route 11 at the southwestern edge of the MRS. As described in Subchapters 5.2.2 and 5.2.3, seven surface water intakes are within 15 miles of the MRS, and no tribal drinking water sources are within 4 miles of the MRS (USEPA 2012).

5.3.3.2 Releases and Potential Releases to Surface Water and Sediment

The lack of perennial surface water within the WVMA Ammunition Depot MRS would prevent metals migration from surface soil to surface water and sediment within the MRS. It is anticipated if contamination occurred within the MRS, it would be localized and not affect Leading Creek, just south of the MRS. Based on historical documents for the WVMA Ammunition Depot MRS, the purpose of the former ammunition depot was to provide a storage area for all of the ordnance and munitions used at the former WVMA (USACE 2009). The SVT found no MD, MEC items, subsurface metal anomalies, or other evidence of military use during the site visit. Based on the observations, there are no known direct releases of metals to surface water and sediment at the WVMA Ammunition Depot MRS.

5.3.3.3 Surface Water and Sediment Exposure Pathway and Receptors

There are no perennial surface water bodies present at the WVMA Ammunition Depot MRS. Based on the absence of surface water, it is unlikely that commercial/industrial workers (farmers), and site visitors (private land owners and trespassers) at this MRS could be exposed to metals via these pathways. The WVMA Ammunition Depot is not an important ecological place; therefore, ecological receptors are not expected to be present at this MRS (Subchapter 5.2.4).

5.3.3.4 Surface Water and Sediment Sampling Locations and Methods

Neither surface water nor sediment sampling was performed during the SI at the WVMA Ammunition Depot MRS because no perennial surface water bodies are within the MRS.

5.3.3.5 Surface Water and Sediment Sampling Analytical Results

Neither surface water nor sediment sampling was performed during the SI at the WVMA Ammunition Depot MRS because no perennial surface water bodies are within the MRS.

5.3.3.6 Surface Water and Sediment Exposure Pathway Conclusions

Surface water and sediment samples were not collected from the WVMA Ammunition Depot MRS due to the absence of perennial surface water. Based on the current and future land use of the WVMA Ammunition Depot MRS, potential human receptors include commercial/industrial workers (farmers), and site visitors (private land owners and trespassers). The WVMA Ammunition Depot MRS is not an important ecological place; therefore, ecological receptors are not expected to be present at the MRS. Due to the absence of perennial surface water at this MRS, the surface water and sediment pathways are incomplete for all potential receptors.

5.3.4 SOIL EXPOSURE PATHWAY

Potential soil exposure pathways may include incidental ingestion, dermal contact, and inhalation of re-suspended soil particulates by human receptors. Contamination in soil can also leach to groundwater and migrate to surface water and sediment via runoff and erosion. Subchapters 5.3.2 and 5.3.3 discuss the groundwater and surface water/sediment exposure pathways, respectively. The likelihood of exposure is influenced by such factors as the mass and concentration of metals in soil exposed at the ground surface; site-specific geology, hydrogeology, climate; and the expected future land use.

5.3.4.1 Physical Source Access Conditions

Access to the WVMA Ammunition Depot MRS is obtained from Old Highway 219 to the north, Highway 219 to the west, or from the vacant land east of the property. The SVT encountered no barriers to control access to the WVMA Ammunition Depot MRS. The WVMA Ammunition Depot MRS can be easily accessed by trespassers; therefore, the MRS is considered "accessible".

5.3.4.2 Actual or Potential Contamination Areas

Prior to the SI, there were no known metals contamination areas within the WVMA Ammunition Depot MRS. Military activities could have directly affected soil at the site. The areas within the MRS with the highest probabilities for contamination are the areas where munitions may have been stored (Figure 2.1). The location of the MRS is estimated, based on reviews of historical documents identified in the INPR and the PA.

5.3.4.3 Soil Exposure Pathways and Receptors

The soil exposure pathway accounts for the potential risk to human receptors at or near the WVMA Ammunition Depot MRS that may come into contact with potentially contaminated soil. Human receptors may come into contact with metals in soil via dermal contact,

incidental ingestion, or inhalation of re-suspended soil particulates. Ecological receptors are not considered to be present at this MRS (Subchapter 5.2.4). Based on the site use, census data, and the SVT observations listed in Subchapter 5.3.2.3, the potential receptors likely present at the WVMA Ammunition Depot MRS are commercial/industrial workers (farmers), and site visitors (private land owners and trespassers).

5.3.4.4 Soil Sampling Locations and Methods

The TPP Team agreed to collect two biased surface soil samples, one ambient surface soil sample, and associated QC samples within the WVMA Ammunition Depot MRS during the SI. Both of the biased samples (WVMA-MRS02-SS-24-01 and WVMA-MRS02-SS-24-02), along with one FD (WVMA-MRS02-SS-24-04) and the ambient sample (WVMA-MRS04-AMB-SS-24-03), were collected during the May 2012 site visit. Sample WVMA-MRS02-SS-24-01 and FD WVMA-MRS02-SS-24-04 were moved approximately 100 feet southeast from the proposed sample location to avoid saturated areas in the northern portion of the MRS and to ensure that the samples were collected within property where ROE was granted. Samples WVMA-MRS02-SS-24-02 and WVMA-MRS02-AMB-SS-24-03 were collected from the proposed locations. As described in Subchapter 5.2.5 of this report, the UXO technician III used a Schonstedt GA-52Cx magnetometer to screen all soil sample locations before sample collection. No MD or MEC items were found and no subsurface metal anomalies were detected during the site visit. The soil samples were collected with a hand auger, as specified in the SS-WP. However, because the samples were collected at a depth of two feet bgs, the samples were collected as discrete samples rather than using the CRREL seven-point wheel composite sampling technique. The coordinates for each sample location were recorded and uploaded to the GIS database. Figure 5.2 shows the sample locations and identification numbers. Table 5.1 indicates the rationale behind the sample locations. Appendix D includes the field notes and field forms for the site visit.

All of the surface soil samples were analyzed for explosives and metals (antimony, copper, lead, manganese, mercury, and zinc). The ambient surface soil sample was analyzed for explosives to verify that the sample location represents ambient soil conditions at the MRS. The analytical results from the ambient sample are used to estimate background concentrations of naturally occurring metals in the surface soil at the site (Subchapter 5.2.7).

5.3.4.5 Soil Sampling Analytical Results

Results for the soil sample analysis are listed in Table 5.4 and are included in Appendix F. These results were evaluated using the criteria described in Subchapter 5.2.8. The source evaluation for the MRS is presented in Table 5.5. There were no detections of explosives in the surface soil samples collected from the MRS, so the source evaluation was performed for metals only.

TABLE 5.4
SUMMARY OF VALIDATED ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED IN MAY 2012
West Virginia Maneuver Area/Dolly Sods FUDS
WVMA Ammunition Depot MRS

Date Sampled: 05/11/2012

Sample ID: / Analytes	Human Health Screening Values [1]	WVMA-MRS02-AMB-SS-24-03*	WVMA-MRS02-SS-24-01	WVMA-MRS02-SS-24-04**	WVMA-MRS02-SS-24-02
Explosives – SW8330B	**mg/kg**				
1,3,5-Trinitrobenzene	2200 [2]	0.090 U	0.090 U	0.090 U	0.090 U
1,3-Dinitrobenzene	6.1 [2]	0.40 U	0.40 U	0.40 U	0.40 U
2,4,6-Trinitrotoluene (TNT)	19 [2]	0.30 U	0.30 U	0.30 U	0.30 U
2,4-Dinitrotoluene	1.6 [2]	0.070 U	0.070 U	0.070 U	0.070 U
2,6-Dinitrotoluene	61 [2]	0.040 U	0.040 U	0.040 U	0.040 U
2-Amino-4,6-dinitrotoluene	150 [3]	0.50 U	0.50 U	0.50 U	0.50 U
2-Nitrotoluene	2.9 [2]	0.50 U	0.50 U	0.50 U	0.50 U
3-Nitrotoluene	6.1 [2]	0.50 U	0.50 U	0.50 U	0.50 U
4-Amino-2,6-dinitrotoluene	150 [3]	0.50 U	0.50 U	0.50 U	0.50 U
4-Nitrotoluene	30 [2]	0.50 U	0.50 U	0.50 U	0.50 U
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	5.5 [2]	0.50 U	0.50 U	0.50 U	0.50 U
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	240 [2]	0.50 U	0.50 U	0.50 U	0.50 U
Nitrobenzene	4.9 [2]	0.50 U	0.50 U	0.50 U	0.50 U
Nitroglycerin	6.1 [2]	0.50 U	0.50 U	0.50 U	0.50 U
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	3800 [2]	0.50 U	0.50 U	0.50 U	0.50 U
Pentaerythritol Tetranitrate (PETN)	120 [3]	2.5 U	2.5 U	2.5 U	2.5 U

TABLE 5.4
SUMMARY OF VALIDATED ANALYTICAL RESULTS FOR SOIL SAMPLES COLLECTED IN MAY 2012
West Virginia Maneuver Area/Dolly Sods FUDS
WVMA Ammunition Depot MRS

Date Sampled: 05/11/2012

Sample ID: / Analytes	Human Health Screening Values [1]	WVMA-MRS02-AMB-SS-24-03*	WVMA-MRS02-SS-24-01	WVMA-MRS02-SS-24-04**	WVMA-MRS02-SS-24-02
Metals – SW6010B/7471A	**mg/kg**				
Antimony	31 [2]	**0.22 J**	**0.12 J**	**0.29**	**0.18 J**
Copper	3100 [2]	**13**	**8.7**	**8.5**	**13 J**
Lead	400 [2]	**9.6**	**9.4**	**9.4**	**8.7 J**
Manganese	3330 [2]	**210**	**270**	**370**	**250 J**
Mercury	23 [2]	**0.04 J**	**0.041 J**	**0.036 J**	**0.031 J**
Zinc	23000 [2]	**52**	**40**	**40**	**40 J**
Percent Moisture	**%**				
Moisture, percent		27	27	25	23

QA Notes and Qualifiers:

Detections are bolded

(NO CODE) Confirmed identification
U - Analyte was analyzed for but not detected above the sample specific practical quantitation limit (PQL_sa)
J - Analyte detected, estimated concentration.

NA - Not analyzed

(1) Human health screening levels for soil and sediment used from WVDEP Risk-Based Concentrations (RBCs), Table 60-3B in the Voluntary Remediation and Redevelopment Rule (60CSR3) May 1, 2012 (http://www.dep.wv.gov/dlr/oer/voluntarymain/Documents/60CSR3%20VRRA%20filed%204-11-12.pdf) supplemented with USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites for Soil, May 2012 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/pdf/master_sl_table_run_MAY2012.pdf).
(2) WVDEP Risk-Based Concentrations (RBCs), Table 60-3B in the Voluntary Remediation and Redevelopment Rule (60CSR3) May 1, 2012 (http://www.dep.wv.gov/dlr/oer/voluntarymain/Documents/60CSR3%20VRRA%20filed%204-11-12.pdf)
(3) WVDEP RBC not available. Used USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites for Soil ,May 2012 (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/pdf/master_sl_table_run_MAY2012.pdf).

TABLE 5.5

SOIL SOURCE EVALUATION

WVMA AMMUNITION DEPOT MRS, RANDOLPH COUNTY, WV

Analyte	Maximum Detected Site Concentration	3x WV VRRP Background Value[1]	Exceeds Background Concentration?	Potential Metal Contamination[2]?	SLRA Required?	Primary reason for exclusion from SLRA
Metals	**mg/kg**					
Antimony	0.29	2.3	No	**Yes**	No	Not detected above background
Copper	13J	66	No	**Yes**	No	Not detected above background
Lead	9.4	50	No	**Yes**	No	Not detected above background
Manganese	370	2300	No	**Yes**	No	Not detected above
Mercury	0.041J	0.42	No	**Yes**	No	Not detected above
Zinc	40	180	No	**Yes**	No	Not detected above background

Notes: (1) From West Virginia Voluntary Remediation and Redevelopment Act Guidance Manual Version 2.1. Table 2-3: Natural Background Levels of Inorganics in Soil in West Virginia and Surrounding Areas. http://www.dep.wv.gov/dlr/oer/voluntarymain/documents/vrra%20guidanceversion2-1.pdf
(2) Potential metal contamination as listed in Table 4.1.
J Analyte detected, estimated concentration.

As shown in Table 5.4, six metals (antimony, copper, lead, manganese, mercury, and zinc) were detected in the surface soil samples collected from the WVMA Ammunition Depot MRS. The maximum detected concentrations of these metals did not exceed background concentrations.

5.3.5 SOIL EXPOSURE PATHWAY CONCLUSIONS

Potential receptors for soil at the WVMA Ammunition Depot MRS include commercial/industrial workers (farmers) and site visitors (private land owners and trespassers). These receptors may be exposed to surface soil through dermal contact, incidental ingestion, and inhalation of re-suspended particulate matter. Ecological receptors are not considered to be present at this MRS. The maximum detected concentrations of these metals did not exceed background concentrations. Therefore, surface soil exposure pathways are incomplete for all receptors.

5.3.6 AIR EXPOSURE PATHWAY

The air exposure pathway accounts for hazardous substance exposure in gaseous or particulate form through the air. Airborne transport of contaminants can be an exposure pathway for human receptors. No air sampling has been performed at this site, and none was performed for this SI.

5.3.6.1 Climate

Subchapter 2.2.3 discusses climate.

5.3.6.2 Releases and Potential Releases to Air

There are no known direct releases of metals to air at the WVMA Ammunition Depot MRS. The occurrence of windblown soil particulates may be expected at the site. Releases of metals contamination via this pathway are possible through re-suspension of surface soil particulates.

5.3.6.3 Air Exposure Pathway and Receptors

Because there are no known volatile contaminants associated with the munitions used at the WVMA/Dolly Sods FUDS, the only remaining air exposure pathway would be via the inhalation of re-suspended soil particulates. Based on the known current and future uses of the land at the WVMA Ammunition Depot MRS, the potential human receptors that are likely present at the WVMA Ammunition Depot MRS are commercial/industrial workers (farmers) and site visitors (private land owners and trespassers). The WVMA Ammunition Depot MRS is not an important ecological place; therefore, ecological receptors are not expected to be present at the MRS.

5.3.6.4 Air Sampling and Monitoring Locations and Methods

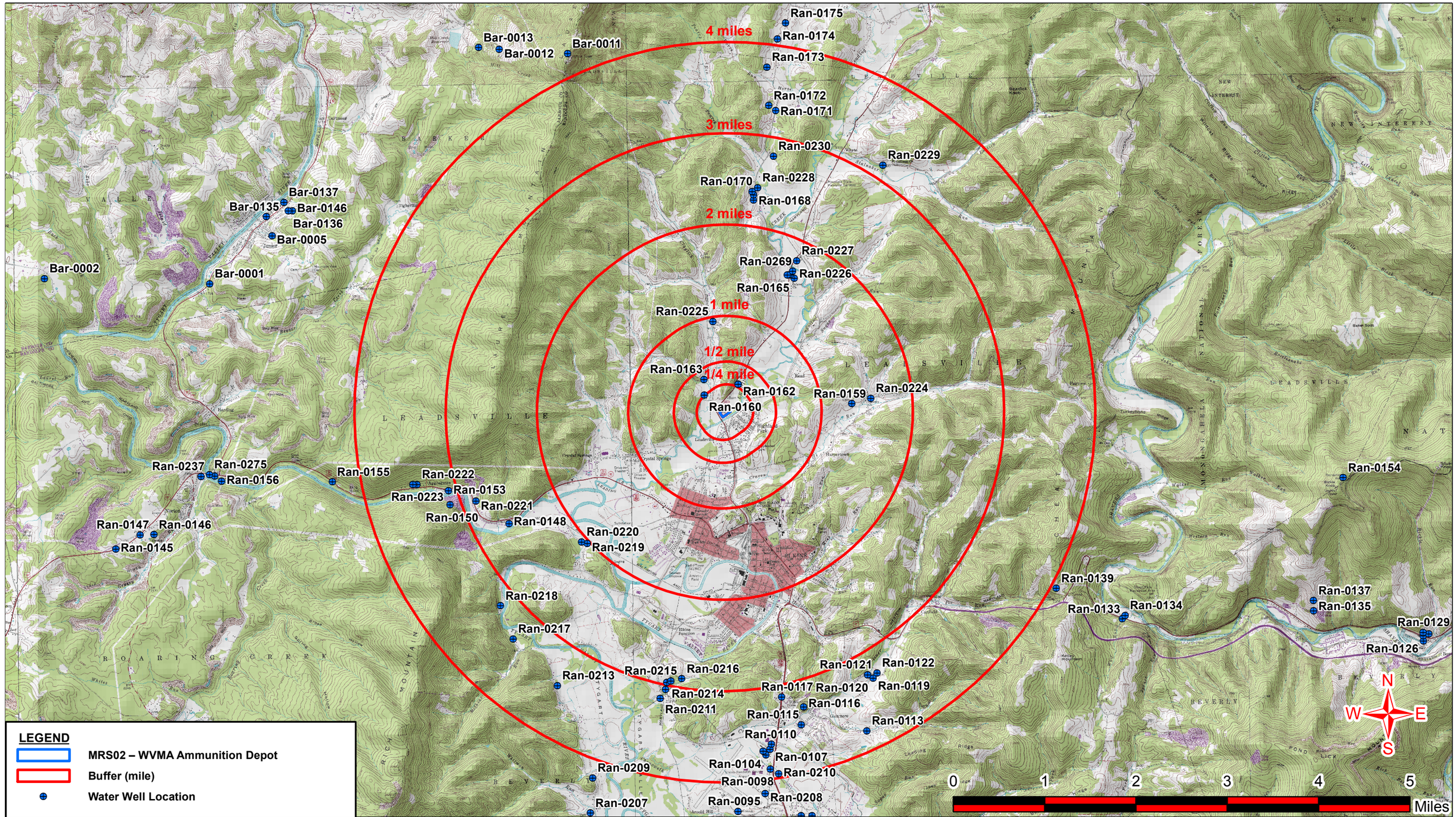
There is no historical record of air sampling at the WVMA/Dolly Sods FUDS. Air sampling was not conducted as part of the SI within the WVMA Ammunition Depot MRS.

5.3.6.5 Air Sampling Analytical Results

Not applicable; no air sampling was conducted as part of the SI at the WVMA Ammunition Depot MRS.

5.3.6.6 Air Exposure Pathway Conclusions

As discussed in Subchapter 5.3.4.5, no metals were detected in surface soil at concentrations above the selected background criteria. Based on these results, the air exposure pathway is incomplete for all receptors present at the WVMA Ammunition Depot MRS. The air exposure pathway for human receptors is assessed through the soil exposure pathway, as the screening values for human receptors include inhalation.



Prepared by:

Eco & Associates, Inc.
and
PARSONS

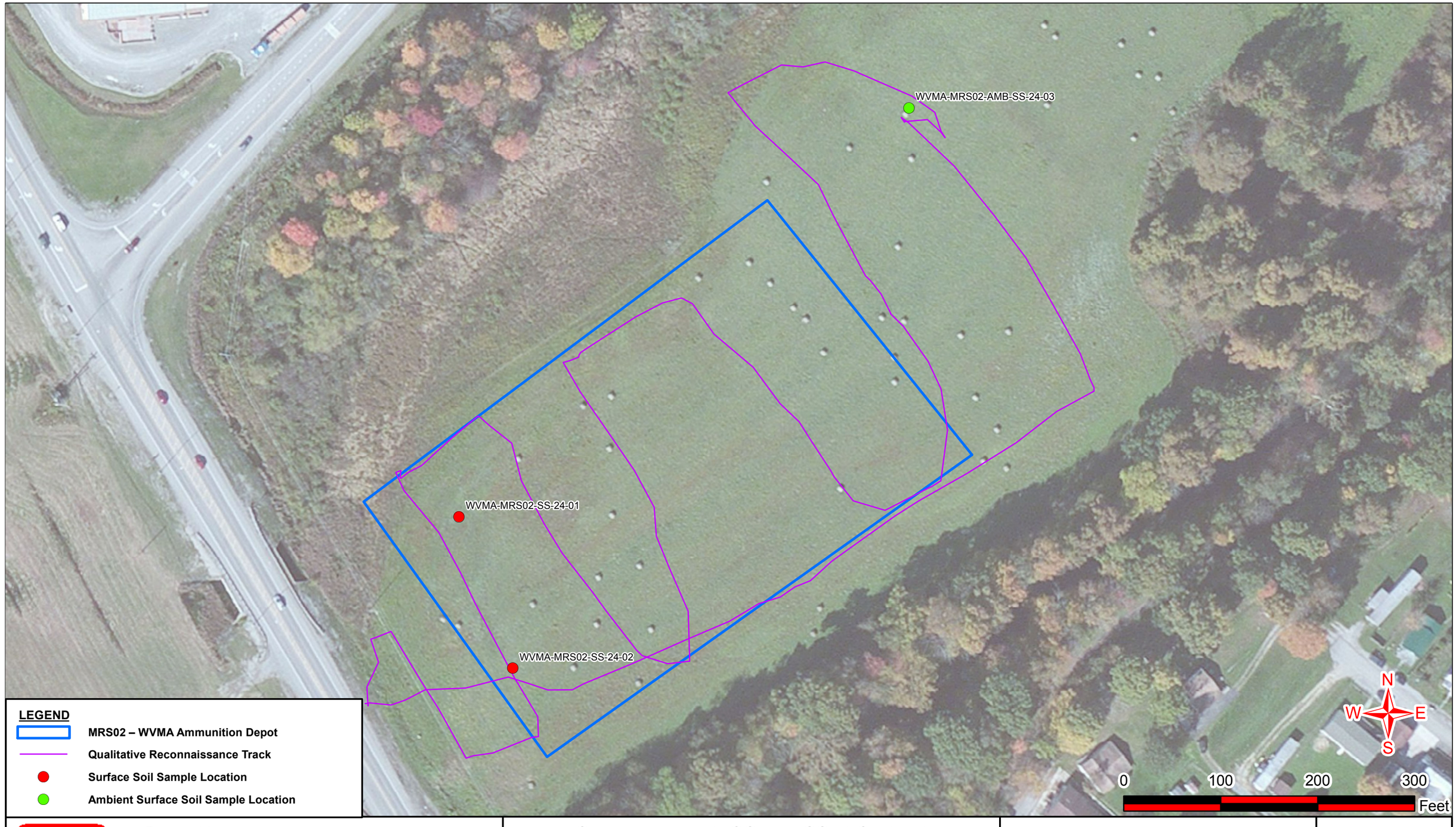
WATER WELLS WITHIN 4-MILE BUFFER

MRS02 – WVMA Ammunition Depot
MMRP West Virginia

PROJECT NO. Eco-11-452

DATED August 2013

FIGURE
5.1



Prepared by:
Eco & Associates, Inc.
and
PARSONS

QUALITATIVE RECONNAISSANCE AND SAMPLE LOCATIONS
MRS02 – WVMA Ammunition Depot
MMRP West Virginia

PROJECT NO. Eco-11-452

DATED August 2013

FIGURE
5.2

CHAPTER 6
SCREENING-LEVEL RISK ASSESSMENT

6.1 MUNITIONS AND EXPLOSIVES OF CONCERN SCREENING-LEVEL RISK ASSESSMENT

6.1.1 INTRODUCTION

A qualitative risk assessment evaluates the potential explosive safety risk to the public at the WVMA Ammunition Depot MRS. This risk assessment qualitatively communicates whether a potential risk exists at the MRS and the primary causes of that potential risk. The risk assessment is based on historical information presented in prior studies (e.g., the INPR and the PA) and on observations made during the SI QR.

An explosive safety risk exists if a person can come near or into contact with MEC and interact with the MEC in a manner that results in a detonation. The potential for an explosive safety risk depends on the presence of three critical elements:

- A source (i.e., presence of MEC), and
- A human receptor (i.e., a person), and
- The potential for interaction between the source and receptor (i.e., the possibility that the person might pick up or disturb the MEC).

All three of these elements must be present for an explosive safety risk to exist. There is no risk if any one element is missing. Each of these three elements provides a basis for implementing effective risk management response actions.

6.1.2 CONCEPTUAL SITE MODEL

The CSM for the WVMA Ammunition Depot MRS, included in Appendix J, summarizes conditions at the FUDS that could result in human exposure to MEC. They describe the types of MEC potentially present in the MRS, past MEC and MD findings, and current and projected future land use and receptors.

6.1.3 QUALITATIVE RISK EVALUATION

For the WVMA Ammunition Depot MRS, the potential risk posed by MEC was characterized qualitatively by evaluating the following three primary risk factors, which are related to the three critical elements listed above:

1. MEC presence: whether there is potential for MEC at each MRS
2. MEC type: the types of MEC that might be at each MRS and the related potential explosive hazards
3. Site accessibility: how potential receptors at each MRS might interact with the MEC

The known or suspected presence of an explosive hazard at a given MRS and any potential human receptors at that MRS will typically be considered sufficient justification for RI/FS implementation at that MRS. The following paragraphs describe each of the primary risk factors.

MEC presence describes whether MEC have been confirmed or are suspected at the MRS, either at the surface or in the subsurface, based on historical information in prior studies (e.g., the INPR and the PA) and observations made during the QR. If there is historical evidence of potential MEC presence at a site, lack of confirmation of MEC presence during the QR will not be considered as evidence of MEC absence for this qualitative risk evaluation. Table 6.1 describes the three possible categories of MEC presence for this evaluation.

TABLE 6.1

CATEGORIES OF MEC PRESENCE

WVMA AMMUNITION DEPOT MRS, RANDOLPH COUNTY, WV

MEC Presence	Description
Confirmed or suspected	There is physical or confirmed historical evidence of MEC presence at the MRS, or there is physical or historical evidence indicating that MEC may be present at the MRS.
Small arms only (1)	The presence of small arms ammunition is confirmed or suspected, and there is evidence that no other types of munitions were used or are present at the MRS.
Evidence of no munitions	Following investigation of the MRS, there is no physical or historical evidence that there are UXO or discarded military munitions present.

(1) Small arms ammunition is "ammunition, without projectiles that contain explosives (other than tracers), that is .50-caliber or smaller or for shotguns" (Department of the Army 2005a).

MEC type describes whether the MEC potentially present at the MRS might be detonated, resulting in a minor injury or worse to one or more human receptors. If multiple MEC types are potentially present at the MRS, the type that poses the greatest risk to public health is selected for this qualitative risk evaluation. This determination is based on historical information in prior studies (e.g., the INPR and the PA) and observations made during the QR. Table 6.2 describes the three possible categories of MEC type for this evaluation.

TABLE 6.2

CATEGORIES OF MEC TYPE

WVMA AMMUNITION DEPOT MRS, RANDOLPH COUNTY, WV

MEC Type	Description
Potentially hazardous	Fuzed or unfuzed MEC that may result in physical injury to an individual if detonated by an individual's activities.
Small arms only(1)	Small arms ammunition is confirmed or suspected, and there is evidence that no other types of munitions were used or are present at the MRS.
Inert	MD or other items that will cause no injury (e.g., training ordnance containing no explosives, fuzes, spotting charges, etc.).

(1) Small arms ammunition is defined as "ammunition, without projectiles that contain explosives (other than tracers), that is .50-caliber or smaller or for shotguns" (Department of the Army, 2005a).

Site accessibility describes whether human receptors have access to the MRS and, therefore, may interact with any MEC at the surface or in the subsurface. For this qualitative risk evaluation, if MEC are confirmed or suspected at the MRS, it is assumed that human receptors might come into contact with the MEC unless there is complete restriction to access. This assessment will also describe the potential receptors. Table 6.3 describes the two possible categories of site accessibility for this evaluation.

TABLE 6.3

CATEGORIES OF SITE ACCESSIBILITY

WVMA AMMUNITION DEPOT MRS, RANDOLPH COUNTY, WV

Site Accessibility	Description
Accessible	Access control is not complete: residents, site workers, or visitors can gain access to all or part of the MRS.
Complete restriction to access	Human receptors are completely prevented from gaining access to the MRS.

For this qualitative risk assessment, further evaluation (i.e., RI/FS) for the MRS will typically be justified if the following conditions are all met:

- MEC are confirmed or suspected to be present.
- The MEC confirmed or suspected to be present are potentially hazardous.
- The MRS is accessible.

The primary risk factors identified above were evaluated for the WVMA Ammunition Depot MRS at the former WVMA/Dolly Sods using the data collected during the 2012 site visit and the historical data available from other studies. The following subchapters discuss the

qualitative risk evaluation by each primary risk factor to determine whether further evaluation is justified at this MRS.

6.1.4 MUNITIONS AND EXPLOSIVES OF CONCERN RISK ASSESSMENT: WVMA AMMUNITION DEPOT MUNITIONS RESPONSE SITE

The 2009 PA indicates that the WVMA Ammunition Depot served as the main ammunition storage area during the operational period of the WVMA. There is no historical documentation or other evidence indicating disposal of munitions (burial or demolition) occurred at the WVMA Ammunition Depot MRS and, consequently, no release mechanisms exist for MEC. According to the PA, there are no documented historical findings of MEC or MD at the MRS. No MD or MEC items were found during the 2007 PA field visit to the MRS, and no MD or MEC items were observed during the 2012 site visit. Based on these findings and the known historic use of the site for munitions storage, the MEC presence at the WVMA Ammunition Depot MRS is considered "Evidence of no munitions."

All munitions potentially used within the WVMA may have been stored at the WVMA Ammunition Depot. The potential munitions list includes 155mm HE projectiles; 105mm HE and SR cartridges; 81mm HE and SR cartridges; 75mm HE and SR shells; 60mm HE and SR shells; 4.2-inch HE and SR shells; 3.25-inch target rockets; fragmentation, smoke, and practice hand grenades; demolition charge blocks, demolition firing devices, blasting caps, time fuses, and general small arms ammunition (.22, .30, .38, .45, and .50 Caliber). While some of these munitions contain explosives and fuzes and would present explosive hazards if they remained at the site intact, there is no reason to believe that MEC remain at this MRS (see above). For this reason, the MEC type at the WVMA Ammunition Depot MRS is not applicable.

The WVMA Ammunition Depot MRS consists of 4 acres of vacant agricultural land approximately 1.5 miles north of City Hall in Elkins, WV. The MRS is bordered by Old Route 219 and a concrete company to the north, Leading Creek, the Western Maryland RR line, and residences to the south, vacant land to the east, and County Route 11/U.S. Route 219 with vacant land beyond to the west. The SVT encountered no barriers to control access to the WVMA Ammunition Depot MRS. Site visitors can easily access the property from the highways to the north and west or from the vacant land to the east. Therefore, the site accessibility at the WVMA Ammunition Depot MRS is considered "Accessible."

6.1.5 RISK SUMMARY

Table 6.4 summarizes the qualitative MEC risk evaluation for the WVMA Ammunition Depot MRS. Based on this qualitative evaluation, no known explosive hazards remain at the WVMA Ammunition Depot MRS. Therefore, there is no explosive safety risk at this MRS.

TABLE 6.4

MEC RISK EVALUATION

WVMA AMMUNITION DEPOT MRS, RANDOLPH COUNTY, WV

MRS	MEC Presence	MEC Type		Site Accessibility	Further Evaluation ?
WVMA Ammunition Depot	Evidence of no munitions	None	Not applicable	Accessible	No

6.2 MUNITIONS CONSTITUENTS HUMAN HEALTH SCREENING-LEVEL RISK ASSESSMENT

6.2.1 CONCEPTUAL SITE MODEL

Based on the current and future land use of the WVMA Ammunition Depot MRS, potential human receptors at the MRS are commercial/industrial workers (farmers) and site visitors (private landowners and trespassers). Based on the evaluation of exposure pathways in Chapter 5, these receptors may be exposed to metals through direct contact with soil. Human receptors may be exposed to surface soil through incidental ingestion, dermal contact, and inhalation of re-suspended soil particulates. The CSEM identifies source media, transport mechanisms, exposure routes, and potential receptors (Appendix J) for this MRS.

6.2.2 AFFECTED MEDIA

Direct release of metals from munitions activities within the MRS would have been to soil. Metals in the surface soil can become airborne as re-suspended particulate matter, can migrate to shallow groundwater through leaching, and can migrate to surface water and sediment through runoff and erosion. Based on decisions made at the TPP Meeting, two biased surface soil samples and one field duplicate sample were collected from this MRS. No other media (surface water, sediment, groundwater, or air) were sampled at this MRS.

6.2.3 HUMAN HEALTH SCREENING VALUES

The human health screening values selected by the TPP Team for this SI are the WVDEP RBCs, and Table 60-3B in the Voluntary Remediation and Redevelopment Rule (60CSR3), supplemented with USEPA RSLs.

6.2.4 RISK CHARACTERIZATION FOR SOIL

As discussed in Subchapter 5.2.8, the metals source evaluation is used to determine which analytes are retained for consideration in a SLRA. Only those analytes retained for consideration in the SLRA following the source evaluation are evaluated in this chapter.

To complete the human health risk characterization for the WVMA Ammunition Depot MRS, the maximum detected concentrations of each selected metals that exceeded the selected background criteria for surface soil were retained for consideration in the SLRA. These maximum detected concentrations were compared to the screening levels agreed to by the TPP Team and described in Subchapter 6.2.3. For an analyte to be considered a potential

human health risk related to a release from munitions activities at the WVMA Ammunition Depot MRS, it is necessary for the metals concentrations to exceed their screening values. Subchapter 6.2.5 evaluates the WVMA Ammunition Depot MRS at the WVMA/ Dolly Sods FUDS and any potential effects on human health.

6.2.5 DISCUSSION

Two biased surface soil samples and one field duplicate sample were collected from the WVMA Ammunition Depot MRS in May 2012. As shown in Table 5.5, none of the metals were detected at concentrations above their respective background criteria. Therefore, based on the analytical results presented in this report, no unacceptable human health risk is expected from exposure to metals in surface soil due to former munitions-related activities at the WVMA Ammunition Depot MRS.

6.3 MUNITIONS CONSTITUENTS SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT

As discussed in Subchapter 5.2.4, the WVMA Ammunition Depot MRS is not within a national wildlife refuge, national park, national forest, or wilderness area. Wetlands are not present within the MRS. There are no federally designated critical habitats for any T&E species in the FUDS or the MRS. T&E species have not been documented as occurring within the MRS, and the SVT observed no T&E species during the site visit. Based on this information, the WVMA Ammunition Depot MRS is not an important ecological place, and ecological receptors are not expected to be present at the site and are not considered to be at risk at the WVMA Ammunition Depot MRS. Therefore, a SLERA was not conducted for the WVMA Ammunition Depot MRS. Appendix J presents the CSEM developed for this MRS.

CHAPTER 7
SUMMARY AND CONCLUSIONS

7.1 SUMMARY

The SI performed at the WVMA Ammunition Depot MRS in Randolph County, West Virginia, evaluated site-specific conditions that could affect the potential for complete exposure pathways to human and ecological receptors at the MRS. The project was planned and performed to satisfy the DQOs set for the project: 1) evaluate potential presence of MEC; 2) evaluate potential presence of elevated metals concentrations that are consistent with the identified MC contaminants of concern; 3) collect data needed to complete MRSPP scoring sheets; and 4) collect information for HRS scoring. Successful completion of the DQOs allowed determination of whether further response action under CERCLA is appropriate.

The SI included 0.75 miles of QR and the collection of soil samples at three locations (with associated QC samples) at the WVMA Ammunition Depot MRS. The SVT observed no MEC or MD indicative of MEC during the QR. Soil samples were collected in the area generally suspected to be used for ammunition storage, the area with the highest likelihood for the presence of MEC or metals contamination within the WVMA Ammunition Depot MRS.

APPL, Inc. in Clovis, California, analyzed the soil samples for explosives and selected metals. No explosives were detected in the soil samples at the MRS and no metals exceeded their respective background criteria. Therefore, a SLRA was not conducted. Because the MRS is not considered an important ecological place, a SLERA was not conducted for this MRS.

7.2 CONCLUSIONS REGARDING POTENTIAL MUNITIONS AND EXPLOSIVES OF CONCERN EXPOSURE PATHWAYS

The evaluation of potential MEC exposure (Subchapter 6.1) concluded that the MEC exposure pathway is incomplete for the WVMA Ammunition Depot MRS, based on the fact that the MRS was used for munitions storage only, and no known explosive hazards remain at the MRS.

7.3 CONCLUSIONS REGARDING POTENTIAL MUNITIONS CONSTITUENTS EXPOSURE PATHWAYS

7.3.1 ELEMENTS CONSTITUTING COMPLETE EXPOSURE PATHWAY

An exposure pathway for a chemical release is not considered complete unless all four of the following elements are present (USEPA 1989):

1. A source and mechanism for chemical release
2. An environmental transport and/or exposure medium
3. A receptor exposure point

4. A receptor and a likely route of exposure at the exposure point

7.3.2 CONCLUSIONS REGARDING EXPOSURE PATHWAYS

No explosives were detected in the samples collected and no metals were detected above their respective background concentrations; therefore, the surface soil exposure pathways for human receptors are considered incomplete. Because the MRS is not considered an important ecological place, a SLERA was not performed for this SI.

CHAPTER 8
RECOMMENDATIONS

Based on the analytical results and exposure pathways evaluated during this SI, no further action is necessary at the WVMA Ammunition Depot MRS; therefore, no removal action is warranted. As summarized in Table 8.1, the recommendation is based on the following:

- The known historic use of the WVMA Ammunition Depot MRS includes munitions storage only and there is no evidence of any release mechanisms that might result in explosive hazards remaining at the MRS.
- There are no documented historical findings or other evidence of MEC remaining at the MRS. No MD and no MEC items were found during a previous field visit to the MRS, and no MD and no MEC items were observed during the 2012 site visit.
- No explosives were detected and no metals were detected above the selected background values.

TABLE 8.1

RECOMMENDATIONS

WVMA AMMUNITION DEPOT MRS, RANDOLPH COUNTY, WV

MRS	ACREAGE	MEC ASSESSMENT (1)	METALS ASSESSMENT (2)	RECOMMENDATION
WVMA Ammunition Depot	4	**No** No MEC has been found at the MRS. No MD indicative of MEC has been observed within the MRS. Based on historical use, MEC is not suspected to remain at the MRS.	**No** No unacceptable risk to human health due to exposure to elevated metals in surface soil has been identified.	No Further Action

Notes:

(1) "No" in this column indicates no confirmed MEC or MD indicative of potential MEC presence

(2) "No" in this column indicates the absence of metals at levels indicating a potential risk to human health or ecological receptors, resulting in a recommendation for no further metals sampling for the MRS.

CHAPTER 9
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APPENDIX A

PERFORMANCE WORK STATEMENT

STATEMENT OF WORK

1. PROJECT AND LOCATION. The project sites will be throughout the Range Support Center boundaries and can be found as part of the Former West Virginia Maneuver Area, Grant, Preston, Pendleton, Tucker, and Randolph Counties, West Virginia. Each site identified will require the completion of the Military Munitions Response Program (MMRP) Project Site Inspection phase of work.

2. PURPOSE. The purpose of the project is to complete all planning, field work and reporting for the Site Inspection (SI) phase at each of the projects listed below. The Contractor shall use the existing programmatic documents as developed by Parsons Infrastructure and Technology Group for the 2004 SI initiative. The final SI shall reflect that attempts were made to seek concurrence from state regulators and other potential stake holders related to the decisions made based on the findings of the SI.

3. AUTHORIZATION. This projected is in support of the U.S. Army Corps of Engineers (USACE), Los Angeles District (SPL) Formerly Used Defense Site Program (FUDS). This project will comply with Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Occupational Safety & Health Administration (OSHA), and all other applicable local, city, county, state, and federal requirements.

4. DESCRIPTION OF WORK AND SERVICES REQUIRED. The Contractor shall perform the work and services as follows.

Task 1. **Coordinate Technical Project Planning (TPP) Meetings**: The Contractor shall coordinate, attend, and take meeting minutes for the TPP meeting with the USACE Project Manager, members of the Project Delivery Team (PDT), State Regulators and other stakeholders involved with the execution of the SI phase of work. In preparation for this meeting the Contractor shall research the current property owners associated with the FUDS Project locations and provide this information to USACE to assist in inviting relevant stakeholders to the TPP meetings. The Contractor shall capture decisions made in the TPP meeting in a TPP Memorandum submittal.

Task 2. **Prepare Site Specific Work Plan:** The Contractor shall prepare a Draft Site Specific Work Plan that incorporates all decisions and inputs from the TPP. All work shall be performed in accordance with the programmatic planning documents referenced above.

Task 3. **Field Work and Sampling:** Field work will be scheduled based on the approval of a final Site Specific Work Plan (SSWP) and the execution of an Rights of Entry (ROE) by the Government for all properties to be visited during field activities. Field Work will be conducted in compliance with the SSWP and existing programmatic planning documents.

Task 4. **Reporting:** Reports shall be developed using the established format for the MMRP SI Program. A draft, draft-final and final version shall be prepared. All appendices shall be included with the final deliverable in the electronic version.

Task 5. **Digital Data:** Analytical and Digital Data will be maintained and delivered to the Government at the finalization of each report. Analytical data shall be validated according to the accepted protocols established by the MMRP SI Program. Geographic

Information Systems (GIS) deliverable shall contain a Spatial Data Standard for Facilities, Infrastructure and Environment (SDSFIE) data structure and Federal Geographic Data Committee (FGDC) metadata.

Sites

Project #	Project Name	FUDS #
05	DAILEY INFILTRATION CAMP	G03WV0013
06	WVMA AMMUNITION DEPOT	G03WV0013
07	MANEUVER AREA	G03WV0013
08	FORE KNOBS-BEAR ROCKS FIRING RANGES	G03WV0013
09	BEARDEN KNOB FIRING RANGE	G03WV0013
10	BROWN/CABIN MOUNTAIN FIRING RANGES	G03WV0013
11	BUENA SMALL ARMS FIRING RANGE	G03WV0013

5. DELIVERABLE REQUIREMENTS. The front cover of all deliverables will state the report version, project name and number, title and date. The deliverables will include a section for responses to USACE and Regulatory comments.

A Compact Disc-Recordable (CD-R) will be included in a three-ring binder (in a plastic insert) along with each three-ring paper version of final reports issued. The CD-R will include the original documents in AutoCAD, MS Office 2007, JPG, PDF formats. The Contractor shall arrange all documents into separate file folders for each chapter. One file titled "Entries" adobe (PDF) file format will be included on the CD-R or FTP site download that contains the entire document, identical to the three-ring paper version.

Distribution List for Submittals:

Submittal	Quantity
Draft TPP Memo	6
Final TPP Memo	6
Draft Site Specific Work Plan	6
Final Site Specific Work Plan	6
Draft Site Inspection Report	6
Draft-Final Site Inspection Report	6
Final Site Inspection Report	6

6. GENERAL REQUIREMENTS.

a. Regulatory Requirements. All activities shall be conducted in compliance with all Federal, State, and Local regulations for the protection of human health and the environment. The Contractor shall comply with all Federal State, and Local environmental laws, statutes, and regulations.

b. Privacy Act and Confidential Information. The Contractor shall comply with the Privacy Act and keep all information private. The Contractor shall keep all data and information obtained confidential prior to the release of data by the USACE.

7. CRITERIA AND STANDARDS. The Contractor shall prepare the final materials in accordance with criteria and applicable publications and manuals listed herein. Materials shall also be prepared in accordance with guidance previously furnished to the Contractor or with supplemental detailed instructions which may be issued by the Contracting Officer or Contracting Officer Representative (COR) before and during the progress of the work. The Contractor is not to undertake action for relocation, enlargement or deletion of any features of this proposed project. The Contractor shall be responsible for notifying the Contracting Officer of any missing criteria needed for their work.

8. PERIOD OF PERFORMANCE. The period of performance shall commence on the date of receipt of the Notice to Proceed (NTP), and shall end 24 months after the NTP. The Contractor shall schedule performance of this statement of work with the COR for this contract to ensure efficiency and cost effectiveness, and shall also schedule the completion and review of interim deliverables as appropriate.

9. QUALITY CONTROL PLAN. The Contractor is responsible for ensuring that product development and independent technical review for this Statement of Work are carried out in accordance with the approved MMRP SI Programmatic Plans.

10. ITEMS AND DATA TO BE FURNISHED BY THE GOVERNMENT. The Government shall make available to the Contractor relevant information from related studies, reports, manuals, and other pertinent available data in its files, which may contribute to this work.

The Contractor shall ensure that all material has been received. This material is, by this reference, hereby incorporated into and made part of this contract, as fully and completely as thought the same were set forth in full.

11. PROJECT MANAGEMENT. The Contractor shall name and assign a responsible Project Manager who shall maintain a project file to contain correspondence and criteria pertinent to this project. The Project Manager shall be knowledgeable about all pertinent work ongoing and shall be available as the Contractor's point of contact to the Government.

During the progress of the work, the Contractor shall confer with the Project's COR, as required, to assure approval of the completed work.

The COR may visit the Contractor's office at any time during the progress of the work for the specific purpose of examining the progress of work and to resolve any questions the Contractor may have concerning the development of the work. The COR shall be supported by a technical specialist as necessary to provide guidance to assure an adequate submittal.

12. VISITS TO SITES, PRIVATE SOURCES, AND GOVERNMENTAL AGENCIES. The Contractor shall advise the COR of each proposed visit to the site, private sources and Governmental agencies prior to each visit. Contacts with Governmental representatives shall be limited to research and coordination of data pertinent to the project.

13. DEVIATION OF THIS STATEMENT OF WORK. The Contractor is advised not perform any extra services under this contract requested by any other person within or external to SPL, orally or in writing, which the Contractor considers to be a change in work or services required which necessitates an

adjustment in the contract fee, until the Contractor has been requested by the Contracting Officer to: (1) review a supplemental Statement of Work; (2) make a written proposal covering such extra services; and/or (3) has negotiated a mutually satisfactory fee and received a notice to proceed in writing from the Contracting Officer.

14. OTHER REQUIREMENTS:

a. Subcontractors: The Contractor shall not enter into any subcontracts without prior written approval of the Contracting Officer.

b. Responsibility for Field Work: The Contractor shall be responsible for all damages to persons and property that all occur as a result of the Contractor fault or negligence in connection with field work, and shall save and hold the Government free from all claims and suits arising from such damages.

15. PAYMENT FOR WORK AND SERVICES. The Government anticipates award of a Firm Fixed Price contract. The agreed upon awarded price shall constitute full compensation by the Government to the Contractor for the work and services performed under this contract. Payments shall be made in accordance with the payment clause included in this contract and period of performance of this contract. The Contractor shall invoice only after the completion of finalized milestones. The milestone structure for this requirement shall be as follows:

Final TPP Memo: 25%
Final SSWP: 25%
Field Work Complete: 25%
Final SI Report: 25%

APPENDIX B

TPP SESSION DOCUMENTATION/ MEETING MINUTES

(ELECTRONIC ONLY)

APPENDIX C

INTERVIEW DOCUMENTATION

NO INTERVIEWS WERE CONDUCTED AT THIS SITE; THEREFORE, NO INTERVIEW DOCUMENTATION IS INCLUDED WITH THIS REPORT

APPENDIX D

FIELD NOTES AND FIELD FORMS

DAILY FIELD REPORT
MMRP SITE INSPECTION

CONTRACT NO.	**W912PP-11-C-0007**	**DELIVERY ORDER NO.**	**0001**
JOB NO:	**748073-30001**	**DATE/DAY:**	11-May-12
SITE NAME:	WVMA (Ammunition Depot MRS)	**REPORT NO:**	1
USACE DISTRICT:	**CELRH**	**SHEET:**	1
WEATHER:	High of 62°F, low of 40°F, sunny		

WORK IN PROGRESS OR COMPLETED:

1. Mobilization/Demobilization

		CUMULATIVE
37	***Miles Driven***	**37**
0/0	***Number of Flights/Miles Flown***	**0/0**
3	***Number of Personnel***	**3**

2. Reconnaissance Details

3,958	***Linear Feet:(0.75 miles)***	**3,958**

3. MC Sampling Details

3	***Soil Samples***	**3**
0	***Sediment Samples***	**0**
0	***Water Samples***	**0**
	Sampling Notes: See Attached DQCR	

4. QC Activities

3	***Soil Samples***	**3**
0	***Sediment Samples***	**0**
1	***Water Samples***	**1**
	Sampling Notes: See Attached DQCR	

5. QA Activities

0	***Soil Samples***	**0**
0	***Sediment Samples***	**0**
0	***Water Samples***	**0**
	Sampling Notes: No QA split samples for this program	

6. Safety Activities

A tailgate safety briefing was conducted on site prior to the start of field activities. Topics included communication, hospital directions, uneven terrain, roadside safety, hydration, types of dangerous vegetation, insects, types of munitions, and slips, trips, and falls.

SITE VISIT TEAM (SVT)				On-site Yes/No	Tailgate Brief Yes/No
Parsons Field Team Leader	Lauren Ranker	Cell Phone:	(720) 988-4413	Yes	Yes
Parsons UXO Technician/SSHO	Rick White	Cell Phone:	(425) 577-8152	Yes	Yes
Eco Sampling Technician	Steven Saunders	Cell Phone:	(818) 397-2248	Yes	Yes
VISITORS					
None					

EQUIPMENT LIST:

Standard Field Kit Items:	Schonstedt GA-52Cx, Trimble GeoXT, Garmin Rhino 530HCx handheld GPS/radio, Iridium 9555 Satellite Phone, field computer, digital camera, first aid kit
Water Sampling Equipment	None

QC CHECKS (Place ' **X** ' in appropriate box)

QUALITY CONTROL CHECKS	**Analog Instrument**	**YES**	X	**NO**	
	Handheld GPS	**YES**	X	**NO**	
	GIS Data Logger	**YES**	X	**NO**	

ADDITIONAL INFORMATION:

All other site details recorded in PDA/logbook.

ACTIVITIES SCHEDULED FOR NEXT WORK DAY:

The SVT will conduct qualitative reconnaissance (QR) and soil sampling at the Jenningston Training Area MRS (MRS03) at the West Virginia Maneuver Area / Dolly Sods FUDS.

REQUEST FOR PROJECT ACTION:

None

ACCIDENTS REPORTED TODAY: 0
ACCIDENTS TO DATE: 0 **PREPARED BY FTL:** Lauren Ranker

DAILY CONTRACTOR QUALITY CONTROL REPORT

Contract Number: **W912PP-11-C-0007**
Delivery Order Number: **0001**
Project Name: **MMRP FUDS SI**
Project Number: **748073-30001**
Site Location: **WVMA (WV Maneuver Area MRS)**
Date: **11-May-12**

DAILY FIELD SI ACTIVITIES CONDUCTED

The SVT conducted approximately 0.75 miles of QR and completed surface soil sampling at the Ammunition Depot MRS (MRS02) at the Former West Virginia Maneuver Area / Dolly Sods FUDS.

Due to lack of right of entry (ROE), QR could not be conducted along the northern side of the property. The site visit team found no munitions debris, munitions and explosives of concern (MEC), or evidence of military use on the remaining portions of the property during the QR. The property consists of a flood plain on the northern side of Leading Creek, an unlikely location for the historical ammunition depot. Wetland areas were encountered on the north, south, and west boundaries of the property. The SVT collected three surface soil samples: WVMA-MRS02-SS-24-01, WVMA-MRS02-SS-24-02, and WVMA-MRS02-AMB-SS-24-03, and field duplicate (FD) sample WVMA-MRS02-SS-24-04 (duplicate of SS-01). A matrix spike (MS) and matrix spike duplicate (MSD) were collected for SS-02. The soil samples were collected at the proposed depth of 2 ft below ground surface (bgs) using a hand auger. Groundwater was encountered at 2 ft bgs in SS-01. The auger was decontaminated prior to sampling and between samples. An equipment blank (WVMA-MRS02-EB1) was also collected at the end of the day to verify that the auger was decontaminated successfully. The samples were shipped to the laboratory for Saturday delivery.

TOMORROW'S OPERATION PLAN

The SVT will conduct QR and soil sampling at the Jenningston Training Area MRS (MRS03) at the West Virginia Maneuver Area / Dolly Sods FUDS.

Water Sample Equipment Calibrations (list or provide attachment)

	pH (s.u.)	Conductivity (µS/cm)	Turbidity (NTU)	Temp. (ºC)	Time
Equip. Reading:	N/A	N/A	N/A	N/A	N/A

Field Instrument Measurements (list or provide attachment):

Water Sample ID:	Temp. (ºC)	Cond. (µS/cm)	Turbidity (NTU)	pH (s.u.)
N/A	N/A	N/A	N/A	N/A

Comments: N/A

List all field and quality control samples collected (list or provide attachment):

Sample ID	Media	Time	Analysis	Shipment Date	Lab	Comments
WVMA-MRS02-SS-24-01	SS	1152	Metals*, Explosives	5/11/2012	APPL, Inc.	
WVMA-MRS02-SS-24-02	SS	1227	Metals*, Explosives	5/11/2012	APPL, Inc.	MS/MSD
WVMA-MRS02-AMB-SS-24-03	SS	1212	Metals*, Explosives	5/11/2012	APPL, Inc.	
WVMA-MRS02-SS-24-04	SS	1208	Metals*, Explosives	5/11/2012	APPL, Inc.	FD of SS-24-01
WVMA-MRS02-EB1	Water	1240	Metals*, Explosives	5/11/2012	APPL, Inc.	

*Metals: Sb, Cu, Pb, Mn, Hg, and Zn

Departures from approved SAP:

Soil sample WVMA-MRS02-SS-24-01 and its FD (SS-24-04) were moved south of the proposed location to be within the portion of the property where ROE was granted.

Instructions given by government personnel:

None

Check all attachments:

_____ Field sampling forms (in separate submittal)
_____ Field-generated analytical results
X Chain-of-custody forms (in separate submittal)

Signed by: Lauren N. Ranker

Name	Lauren Ranker, Field Team Leader	
Date:	11-May-12	
Phone	Cell: (720) 988-4413	Office: (303) 764-8830
Copies sent to:		
	Richard Meadows (CELRH PM)	Brian Jordan (CESPA)
	Laura Kelley (Parsons PM)	Mohammad Estiri (Eco - PM)
	Brenda Galloway (Parsons)	Opjit Ghuman (Eco)
	Sandra de las Fuentes (Parsons)	Carlos Hernandez (Eco)

4.0°C

CHAIN OF CUSTODY RECORD

APPL, Inc.
908 N Temperance Ave
Clovis, CA 93611
Phone: (559) 275-2175
Fax: (559) 275-4422

C.O.C. 37930

Report to: PLEASE PRINT		Invoice to: PLEASE PRINT	
Company Name: Eco & Associates	Phone: (714) 289-0995	Company Name: Eco & Associates	Phone: (714) 289-0995
Address: 1855 W. Katella Ave. #340 Orange, CA 92867	Fax: (714) 289-0965	Address: 1855 W. Katella Ave. #340 Orange, CA 92867	Fax: (714) 289-0965
Attn:		Attn: Carlos Hernandez	

Project Name/Number	Sampler (Print)
Eco-11-452	Steven Saunders
Purchase Order Number	Sampler (Signature)

Sample Identification	Location	Date Collected	Time Collected	Time Zone	No. of Containers	Matrix: Aq	Matrix: Sed.	Matrix: Soil	Analysis Requested/Method Number: Explosives	Analysis Requested/Method Number: METALS
WVMA-MRS02-SS-24-01	WVMA	5/11/12	1152		2			X	X	X
WVMA-MRS02-SS-24-02			1227		6			X		
~~WVMA-MRS02-SS-24-03~~								X		
WVMA-MRS02-AMB-SS-24-03			1212		2			X		
WVMA-MRS02-SS-24-04			1208		2			X		
WVMA-MRS02-EB1			1240		3	X				

Date Shipped: 5/11/12
Carrier:
Waybill No.: 872622662658
Comments: MS/MSD

Shuttle Temperature:

Turnaround Requested: Check one
☑ Standard 2-3wk ☐ One week ☐ 24/48 Hrs. ☐ Other

Sample Disposal:
☐ Return to client ☐ Disposal by Lab (30-day retention) Refer to Contract

Relinquished by:	Date	Time	Received by:	Relinquished by:	Date	Time	Received by:
~~Relinquished by sampler:~~	5/11/12	1530					
Relinquished by:	Date	Time	Received by:	Relinquished by:	Date 5/12/12	Time 10:55	Received at lab by:

White: Return to client with report Yellow: Laboratory Copy Pink: Sampler

See reverse side for Container Preservative and Sampling Information

APPENDIX E

PHOTOGRAPH DOCUMENTATION LOG

Field Team Leader's Site Observations
WV Ammunition Depot MRS, Randolph County, West Virginia

Friday, May 11, 2012

Property: West Virginia Maneuver Area ***Area:*** MRS02 ***Time*** 11:07:55 AM ***Point_ID:*** 1

Team Leader: Lauren Ranker
Sampler: None
Sample ID: None
Vegetation: Grasses
Drainage: Wetland
SoilType: Clayey Silt
SoilColor: Brown

MRSPP Menu: None
MRSPP Note: None
Barrier: None
Topography: Flat
Surface Feature: None
Surface Debris: None

Subsurface Met: No Detect
MEC: None
MEC/MOD: N/A
MD: None
MD/MOD: N/A

Easting 599139.866
Northing 4311626.473

Stopped QR at the wetlands. Did not have signed ROE for the parcel on the north side of the MRS, which was covered in dense trees and brush.

05112012_1106.JPG
Facing south toward US-219. FTL collecting observation point.

05112012_1107a.JPG
Facing northeast. Wetlands in foreground.

05112012_1107b.JPG
Facing southeast toward Leading Creek.

Field Team Leader's Site Observations
WV Ammunition Depot MRS, Randolph County, West Virginia

Friday, May 11, 2012

Property: West Virginia Maneuver Area ***Area:*** MRS02 ***Time*** 11:14:51 AM ***Point_ID:*** 2

Team Leader: Lauren Ranker
Sampler: Steve Saunders
Sample ID: None

MRSPP Menu: None
MRSPP Note: None

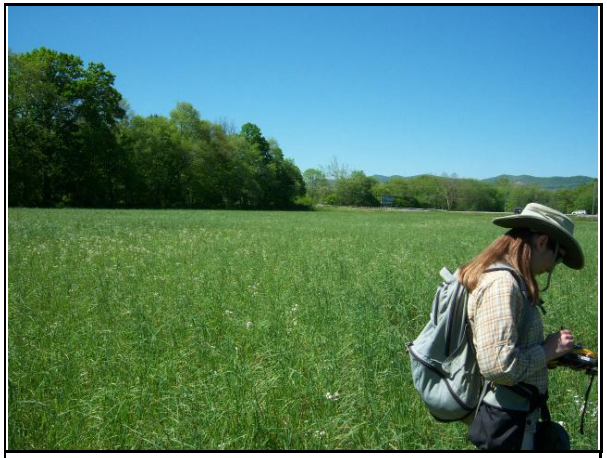
Subsurface Met: No Detect
MEC: None
MEC/MOD: N/A
MD: None
MD/MOD: N/A

Easting 599237.151
Northing 4311640.699

Nothing of interest.

Vegetation: Grasses
Drainage: None
SoilType: Clayey Silt
SoilColor: Brown

Barrier: None
Topography: Flat
Surface Feature: None
Surface Debris: None



05112012_1113.JPG
FTL collecting observation point.

05112012_1114a.JPG
Site terrain is flat and covered in tall grass.

05112012_1114b.JPG
Facing northwest toward intersection of US-219 and Old US-219.

Field Team Leader's Site Observations
WV Ammunition Depot MRS, Randolph County, West Virginia

Friday, May 11, 2012

Property: West Virginia Maneuver Area ***Area:*** MRS02 ***Time*** 11:21:49 AM ***Point_ID:*** 3

Team Leader: Lauren Ranker
Sampler: None
Sample ID: None

MRSPP Menu: None
MRSPP Note: None

Subsurface Met: No Detect
MEC: None
MEC/MOD: N/A
MD: None
MD/MOD: N/A

Easting 599300.307
Northing 4311615.453

Lots of trees and brush along Leading Creek to south.

Vegetation: Grasses
Drainage: None
SoilType: Clayey Silt
SoilColor: Brown

Barrier: None
Topography: Flat
Surface Feature: None
Surface Debris: None

05112012_1120a.JPG
Rolled hay bail lying at the base of the trees.

05112012_1120b.JPG
Trees along Leading Creek at the south end of the MRS.

05112012_1121.JPG
Facing west toward US-219.

Field Team Leader's Site Observations
WV Ammunition Depot MRS, Randolph County, West Virginia

Friday, May 11, 2012

Property: West Virginia Maneuver Area ***Area:*** MRS02 ***Time*** 11:25:11 AM ***Point_ID:*** 4

Team Leader: Lauren Ranker
Sampler: None
Sample ID: None

MRSPP Menu: None
MRSPP Note: None

Subsurface Met: No Detect
MEC: None
MEC/MOD: N/A
MD: None
MD/MOD: N/A

Easting 599201.742
Northing 4311551.176

Nothing of interest.

Vegetation: Grasses
Drainage: None
SoilType: Clayey Silt
SoilColor: Brown

Barrier: None
Topography: Flat
Surface Feature: None
Surface Debris: None

05112012_1124a.JPG
FTL collecting observation point.

05112012_1124b.JPG
Facing northeast toward US-219.

05112012_1124c.JPG
Facing southwest.

Field Team Leader's Site Observations
WV Ammunition Depot MRS, Randolph County, West Virginia

Friday, May 11, 2012

Property: West Virginia Maneuver Area ***Area:*** MRS02 ***Time*** 11:52:00 AM ***Point_ID:*** 5

Team Leader: Lauren Ranker
Sampler: Steve Saunders
Sample ID: WVMA-MRS02-SS-24-01

MRSPP Menu: None
MRSPP Note: None

Subsurface Met: No Detect
MEC: None
MEC/MOD: N/A
MD: None
MD/MOD: N/A

Easting 599101.861
Northing 4311573.351

Collected sample at a depth of 24 inches below ground surface using a hand auger.

Collected duplicate sample WVMA-MRS02-SS-24-04 as well.

Vegetation: Grasses
Drainage: None
SoilType: Clayey Silt
SoilColor: Brown

Barrier: None
Topography: Flat
Surface Feature: None
Surface Debris: None

05112012_1143.JPG
Sample Tech hand augering to 24 inches bgs.

05112012_1151a.JPG
Sample Tech collecting soil sample out of auger.

05112012_1159.JPG
Decontaminating the hand auger.

Field Team Leader's Site Observations
WV Ammunition Depot MRS, Randolph County, West Virginia

Friday, May 11, 2012

Property: West Virginia Maneuver Area ***Area:*** MRS02 ***Time*** 12:12:00 PM ***Point_ID:*** 6

Team Leader: Lauren Ranker
Sampler: Steve Saunders
Sample ID: WVMA-MRS02-AMB-SS-24-03

MRSPP Menu: None
MRSPP Note: None

Subsurface Met: No Detect
MEC: None
MEC/MOD: N/A
MD: None
MD/MOD: N/A

Easting 599243.244
Northing 4311701.821

Sample location has a rectangular area with shorter grass - appears to be print left by a hay bail. We saw many of these throughout the field.

Vegetation: Grasses
Drainage: None
Barrier: None
Topography: Flat

SoilType: Clayey Silt
SoilColor: Brown
Surface Feature: None
Surface Debris: None

05112012_1206.JPG
Sample Tech hand augering to 24 inches bgs.

05112012_1210.JPG
Sample Tech collecting soil sample out of auger.

05112012_1211.JPG
Sample location has a rectangular area with shorter grass.

Field Team Leader's Site Observations
WV Ammunition Depot MRS, Randolph County, West Virginia

Friday, May 11, 2012

Property: West Virginia Maneuver Area ***Area:*** MRS02 ***Time*** 12:27:00 PM ***Point_ID:*** 7

Team Leader: Lauren Ranker
Sampler: Steve Saunders
Sample ID: WVMA-MRS02-SS-24-02

MRSPP Menu: None
MRSPP Note: None

Subsurface Met: No Detect
MEC: None
MEC/MOD: N/A
MD: None
MD/MOD: N/A

Easting 599118.788
Northing 4311525.715

Collected MS and MSD samples as well.

Vegetation: Grasses
Drainage: None
SoilType: Clayey Silt
SoilColor: Brown

Barrier: None
Topography: Flat
Surface Feature: None
Surface Debris: None

05112012_1222.JPG
Sample Tech hand augering to 24 inches bgs.

05112012_1223b.JPG
View of hill to the northwest of the MRS - looks similar to historical photograph of ammunition depot.

05112012_1227b.JPG
Sample Tech collecting soil sample out of hand auger.

Field Team Leader's Site Observations
WV Ammunition Depot MRS, Randolph County, West Virginia

Friday, May 11, 2012

Property:	West Virginia Maneuver Area	***Area:***	Outside MRS	***Time***	12:54:27 PM	***Point_ID:***	8

Team Leader:	Lauren Ranker	***MRSPP Menu:***	None			***Easting***	599000.15
Sampler:	None	***MRSPP Note:***	None	***Subsurface Met:***	N/A	***Northing***	4311713.543
Sample ID:	None			***MEC:***	None		Adjacent property to the north of the MRS. Property is higher in elevation than the flood plain in the MRS.
Vegetation:	Barren	***Barrier:***	None	***MEC/MOD:***	N/A		
Drainage:	None	***Topography:***	Gentle Slope	***MD:***	None		
SoilType:	Gravel	***Surface Feature:***	None				
SoilColor:	Gray	***Surface Debris:***	None	***MD/MOD:***	N/A		

Facing northwest.

05112012_1253.JPG
Central Supply company occupies this property to the north of the MRS.

05112012_1252b.JPG
Facing east toward Old US-219.

APPENDIX F

ANALYTICAL DATA

THE ATTACHED CD-ROM INCLUDES THE ENTIRE ANALYTICAL DATA VALIDATION PACKAGE FOR CASE NO. 67746 IN PDF FORMAT

APPENDIX G

ANALYTICAL DATA QA/QC REPORT

DATA VALIDATION SUMMARY REPORT

for samples collected from the

AMMUNITION DEPOT (MRS02)

West Virginia

Data Validation by: Tammy Chang

Date: June 18, 2012

Parsons - Austin

INTRODUCTION

The following data validation summary report covers soil samples and field quality control (QC) samples collected from Ammunition Depot (MRS02), West Virginia on May 11, 2012. Samples were logged in under the following Sample Delivery Group (SDG):

67746

For MRS02, only four soil samples and one equipment blank (EB) were collected. All samples were analyzed for metals and explosives. Metals included antimony, copper, lead, manganese, zinc, and mercury. QC samples include one field duplicate (FD), one pair of matrix spike/matrix spike duplicate (MS/MSD) and one EB.

All samples were collected by Parsons and Eco & Associates, Inc. and were shipped to Agriculture and Priority Pollutants Laboratories, Inc. (APPL) in four coolers. Samples were packed with samples collected from MRS01. These coolers were received by the laboratory at a temperature of 4.0°C which were all within the 2-6°C range recommended by the PSAP

All samples were prepared and analyzed following the procedures outlined in the Project Sampling and Analysis Plan and Addendum (PSAP) for the Southeast Region and the site specific Sampling and Analysis Plan.

All APPL method detection limits (MDLs) and practical quantitation limits (PQLs) were below the lowest associated action level for all target analytes.

SAMPLE IDs AND REQUESTED PARAMETERS

Sample ID	Matrix	Explosives & Metals	Comments
WVMA-MRS02-SS-24-01	S	X	
WVMA-MRS02-SS-24-02	S	X	MS/MSD
WVMA-MRS02-AMB-SS-24-03	S	X	ambient sample
WVMA-MRS02-SS-24-04	S	X	FD of WVMA-MRS02-SS-24-01
WVMA-MRS02-EB1	W	X	equipment blank

S = Soil; W = water

EXTRACTION, ANALYTICAL, AND REPORTING DETAILS

PARAMETER	MATRIX	EXTRACTION METHOD	ANALYTICAL METHOD	UNITS	DRY WT. VS. WET WT
Explosives	S	8330B	8330B	mg/kg	Dry Wt.
Explosives	W	3535	8330B	µg/L	NA
Metals	S	3050B	6010B	mg/kg	Dry Wt.
Metals	W	3010A	6010B	µg/L	NA
Mercury	S	NA	7471A	mg/kg	Dry Wt.
Mercury	W	NA	7470A	µg/L	NA

See the end of this report for detailed description of the sample preparation procedures.

EVALUATION CRITERIA

The data submitted by the laboratory has been reviewed and verified following the guidelines outlined in the Project Work Plan, site specific Sampling and Analysis Plan, and PSAP. Information reviewed in the data packages included sample results; field and laboratory quality control results; calibrations; case narratives; raw data; cooler receipt forms, and chain-of-custody (COC) forms. The analyses and findings presented in this report are based on the reviewed information, and whether guidelines in the Work Plan were met.

Due to the flagging requirements of the electronic data deliverable (EDD) software, Automatic Data Review (ADR), the following rules were applied for flagging the data:

If an analyte was detected in the method blank, the associated sample concentrations were examined. If the analyte was detected in a sample at a concentration similar to that found in the blank (five times the blank concentration for most analytes, or ten times the blank concentration for common laboratory contaminants), the PQL for that analyte was raised to the detected level and the result was flagged "U" for that particular sample.

Approval was also received from a USACE chemist for laboratory to use the historically developed control limits to evaluate accuracy for explosives. The approved accuracy and precision criteria for explosives are as follows:

Analyte	Accuracy Criteria for Soil	Accuracy Criteria for Water	Maximum RPD (%)
HMX	75-125%	80-115%	30
RDX	70-135%	50-160%	30
1,3,5-Trinitrobenzene	75-125%	65-140%	30
1,3-Dinitrobenzene	80-125%	45-160%	30
Nitrobenzene	75-125%	50-140%	30
Tetryl	10-150%	20-175%	30
Nitroglycerin	68-131%	71-126%	30
2,4,6-Trinitrotoluene	55-140%	50-145%	30

4-Amino-2,6-dinitrotoluene	80-125%	55-155%	30
2-Amino-4,6-dinitrotoluene	80-125%	50-155%	30
2,4-Dinitrotoluene	80-125%	60-135%	30
2,6-Dinitrotoluene	80-120%	60-135%	30
3-Nitrotoluene	75-120%	50-130%	30
PETN	69-132%	65-115%	30
2-Nitrotoluene	80-125%	45-135%	30
4-Nitrotoluene	75-125%	50-130%	30
1,2-Dinitrobenzene (Surrogate)	70-130%	70-130%	NA

For metals, the accuracy criteria for the laboratory control sample (LCS), MS, and MSD are 80-120%.

The precision requirement for parent and FD is relative percent difference (%RPD) ≤70% for soil.

EXPLOSIVES

General

The explosives portion of this SDG consisted of four (4) soil samples and one (1) equipment blank. These samples were collected on May 11, 2012 and were analyzed for the full list of explosives as specified in the Work Plan.

The explosives analyses were performed according to the United States Environmental Protection Agency (USEPA) SW846 Method 8330B. These samples were analyzed following the procedures outlined in the laboratory Standard Operation Procedure (SOP) which was approved by USACE. All samples were prepared and analyzed within the holding time required by the method.

The explosives samples were extracted in two analytical batches (#120516W for EB and #120525S for soil). Samples were analyzed under two sets of single initial calibration (ICAL). Sample analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery (%R) obtained from the two LCSs, one set of MS/MSD, and the surrogate spikes. Sample WVMA-MRS02-SS-24-02 was designated as the parent sample for the MS/MSD analyses.

All LCSs, MS, MSD, and surrogate spike recoveries were within acceptance criteria.

Precision

Precision was evaluated based on the %RPD of MS/MSD results and parent/FD results.

All %RPDs of the MS/MSD were compliant.

None of the target explosives were detected in the parent and FD samples.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the Work Plan;
- Comparing actual analytical procedures to those described in the Work Plan;
- Evaluating holding times; and
- Examining laboratory blanks for cross contamination of samples during sample preparation and sample analysis.

All samples in this SDG were analyzed following the COC and the analytical procedures described in the Work Plan. All samples were prepared and analyzed within the holding time required by the method and the Work Plan.

- All initial calibration criteria were met.
- All secondary source verification criteria were met.
- All initial calibration verification (ICV) criteria were met.
- All continuing calibration verification (CCV) criteria were met.
- The limits of detection (LODs) were verified quarterly according to the DoD Quality System Manual (QSM) version 4.2 requirements.
- All sample-specific MDL and PQL values were below the lowest associated action level as listed in the PSAP for this site with one exception. The PQL for 1,3-dinitrobenzene exceeded the lowest action level of 0.073 mg/kg at 0.40 mg/kg. However, the MDL for this compound was well below the action level at 0.003 mg/kg.

There were two method blanks and one EB associated with the explosives analyses in this SDG. All target explosives were non-detect in both method blanks and the EB.

Completeness

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All explosives results for the samples in this SDG were considered usable. The completeness for the explosives portion of this SDG is 100%, which meets the minimum acceptance criteria of 95%.

METALS

General

The metals portion of this SDG consisted of four (4) soil samples and one (1) EB. All samples were collected on May 11, 2012. These samples were analyzed for antimony, copper, lead, manganese, and zinc.

The metals analyses were performed using USEPA SW846 Method 6010B. All samples were analyzed following the procedures outlined in the Work Plan. All samples were prepared and analyzed within the holding time required by the method and the Work Plan.

All samples were digested in two batches (#120529A for EB and #120601A1 for soil) and were analyzed under two sets of ICAL. Copper, lead, manganese and zinc of soil samples were analyzed with 5 fold dilutions; all other analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recovery obtained from the two LCSs and MS/MSD.

All LCS recoveries were within acceptance criteria.

For soil, results of MS/MSD analyses are listed below:

WVMA-MRS02-SS-24-02

Metals	MS, %R	MSD, %R	Criteria, %R
Antimony	45	42	
Copper	48	38	
Lead	69	61	80-120
Manganese	0	0	
Zinc	66	53	

It should be noted that the concentration of manganese was significantly greater than the spiked amount. "J" flags were applied to all parent sample results.

Precision

Precision was evaluated based on the RPD of MS/MSD results and parent/FD results.

For the soil pair of MS/MSD, all %RPDs were compliant.

WVMA-MRS02-SS-24-01

Metals	Parent, mg/Kg	FD, mg/Kg	%RPD	Criteria, %RPD
Copper	8.7	8.5	2.3	
Lead	9.4	9.4	0	≤70
Manganese	270	370	31	
Zinc	40	40	0	

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the Work Plan;

- Comparing actual analytical procedures to those described in the Work Plan;
- Evaluating preservation and holding times; and
- Examining laboratory blanks for cross contamination of samples during analysis.

All samples were analyzed following the COC and the analytical procedures described in the Work Plan. All samples were prepared and analyzed within the holding times required by the method.

- All instrument initial calibration criteria were met.
- All metals met criteria in the low-level check standards.
- All second source criteria were met. The ICV samples were prepared using a secondary source.
- All CCV criteria were met.
- All interference check (ICSA/ICSAB) criteria were met.
- The dilution test (DT) performed with sample WVMA-MRS01-SD-01.

WVMA-MRS01-SD-01

Metals	%D	Criteria, %D
Copper	**33**	≤10
Lead	0.92	
Manganese	0.16	

- The post digestion spike (PDS) was performed with the same sample:

WVMA-MRS01-SD-01

Metals	%D	Criteria, %D
Antimony	80	75-125
Copper	95	
Zinc	94	

- The LODs were verified quarterly according to the DoD QSM version 4.2 requirements.
- All sample-specific MDL and PQL values were below the lowest associated action level as listed in the PSAP for this site. Therefore, all MQOs were met

There were two method blanks, one EB, and several calibration blanks associated with the metals analyses in this SDG. All blanks were compliant. The EB had copper detected at 3.1 ppb level. However, the associated four soil samples had copper detected at 9 – 13 ppm range. The impact of possible cross contamination of copper via the sample tools is minimal. No flags were applied.

Completeness

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All metal results for all samples in this SDG were considered usable. Therefore, the completeness for the metal portion of this SDG is 100%, which meets the minimum acceptance criteria of 95%.

MERCURY

General

The mercury portion of this SDG consisted of four (4) soil samples and one (1) EB. These samples were collected on 11 of May, 2012 and were analyzed for mercury.

The mercury analyses were performed using USEPA SW846 Method 7471A for soil and sediment and Method 7470A for EB. The samples were analyzed following the procedures outlined in the Work Plan. All samples were prepared and analyzed within the holding time required by the method.

The samples for mercury were digested in two batches, #120523A1 for water and #120601A for soil. The samples were analyzed in two batches under two ICAL. All analyses were performed undiluted.

Accuracy

Accuracy was evaluated using the percent recoveries obtained from the two LCS and MS/MSD samples.

All LCS recoveries and MS/MSD were within acceptance criteria.

Precision

Precision was evaluated using the RPD obtained from the MS/MSD concentrations. Precision was further evaluated by comparing the of parent/FD analyte results.

The MS/MS RPD was within acceptance criteria.

Mercury was not detected in the parent or FD at or above the RL.

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represents actual site conditions. Representativeness has been evaluated by:

- Comparing the COC procedures to those described in the Work Plan;
- Comparing actual analytical procedures to those described in the Work Plan;
- Evaluating preservation and holding times; and
- Examining laboratory blanks for cross contamination of samples during analysis.

All samples in this SDG were analyzed following the COC and the analytical procedures described in the Work Plan. The samples were prepared and analyzed within the holding times required by the method.

- All instrument tune criteria were met.
- All initial calibration criteria were met.
- All low-level check standard criteria were met.
- All second source verification criteria were met. The ICV sample was prepared using a secondary source.
- All CCV criteria were met.
- The MDLs were verified annually.

There were two method blanks, one EB, and several calibration blanks associated with the mercury analyses. Mercury was not detected above one-half the RL in the method blanks.

Completeness

Completeness has been evaluated by comparing the total number of samples collected with the total number of samples with valid analytical data.

All mercury results for the samples in this SDG were considered usable. Therefore, the completeness for the mercury portion of this SDG is 100%, which meets the minimum acceptance criteria of 95%.

COMPARABILITY

All data was generated using contract-specific standard methods and reported with known data quality, type of analysis, units, etc.

DATA USABILITY

The purpose of this data validation report is to ensure the integrity and reliability of analytical laboratory data. The data quality is evaluated based on precision, accuracy, representativeness, comparability, and completeness (PARCC) characteristics of the data. The laboratory quality control samples and evaluated criteria included lab duplicate, method blanks, laboratory control spike samples, and surrogates. The validated data indicated that the laboratory correctly performed the analyses. Based on the data quality assessment, none of the data were qualified as rejected.

All calculations were spot checked and verified. All data in this SDG are considered usable for the purposes of this project. All sample MDLs and PQLs met the requirements listed in the approved site specific Sampling and Analysis Plan except as previously noted in this report.

APPL Inc Non- Incremental Sampling Procedures for Soil

Sample Drying to a Constant Weight:

Place approximately 20-30 grams of the sample into a labeled plastic weigh boat (or tray). Dry soil samples at room temperature (or less) to a “constant weight” as described below:

Record the date / time and the weight of the tray plus sample in a laboratory log book. Leave soil samples overnight to dry on shelves in a dark room.

The following morning weigh the tray containing the sample and record the weight, date and time, and place the trays back in the rack. After one hour record the weight, date and time again.

If the weight is consistent with the previous weighing (within +/- 3%), then this step is complete. If the weight is still not constant, continue drying and subsequent weighing until a constant weight is achieved before proceeding to the next step.

SAMPLE SIEVING AND GRINDING

Crush the dried soil in the weigh boat using a mortar and pestle. Pass the sample through a #30 mesh screen sieve and into a clean, labeled weigh boat in order to eliminate rocks and sticks. Wash the sieve in between each sample with soap and water and rinse with acetone.

SAMPLE WEIGHING

Weigh 10 grams of sample from the weigh boat into a labeled and tared 4oz. glass jar. Record the weight to the nearest 0.01 grams on the extraction sheet.

One method blank and one LCS are prepared with every analytical batch of 20 samples, using clean commercial sand. The LCS is spiked after sieving and grinding. The blank and LCS are taken through the exact same procedures as field samples.

Matrix Spike / Matrix Spike Duplicates are included for every analytical batch of 20 samples, based on the client's project requirements.

SAMPLE EXTRACTION

Add the appropriate amount of the 8330 Soil Surrogate (See SOP HPL002 Standard and Spike Prep) for the Blank, the LCS, MSD/MSD and field samples.

Add the appropriate amount of the 8330 Spike Mix (See SOP HPL002 Standard and Spike Prep) for the LCS and MSD/MSD.

Add 20mL Acetonitrile to each jar containing the spiked /surrogated soil. Place jars on a mechanical shaker for at least 18 hours.

Allow the extracts to settle for 30 minutes and remove approximately 8mL of the extract and place in a labeled 8mL amber screw-cap vial. Centrifuge the vials for approximately 10 minutes. Store extracted samples in a refrigerator between 2°C and 6°C.

Using a digital auto pipettor, remove 0.4mL of the final extract and combine with 0.4mL of DI water in an injection vial. Store under refrigeration until analysis.

APPENDIX H

GEOGRAPHIC INFORMATION SYSTEMS DATA

THE ATTACHED CD ROM INCLUDES THE ENTIRE GEOGRAPHICAL INFORMATION SYSTEMS LAYER

APPENDIX I

GEOPHYSICAL DATA

THERE WAS NO GEOPHYSICAL INVESTIGATION FOR THIS SI EVALUATION

APPENDIX J

CONCEPTUAL SITE MODEL

CONCEPTUAL SITE MODEL – MUNITIONS AND EXPLOSIVES OF CONCERN

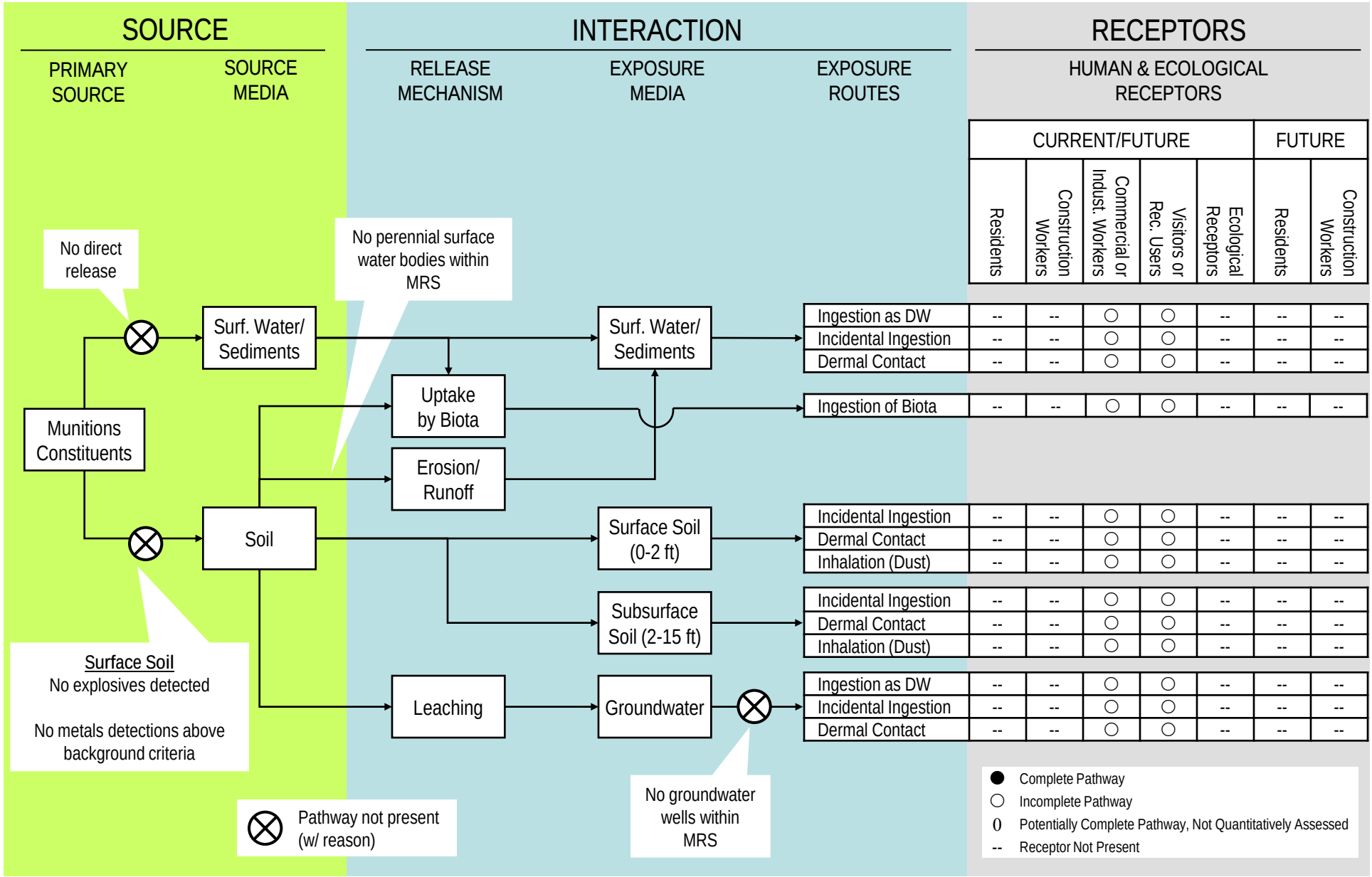
WV MANEUVER AREA AMMUNITION DEPOT MRS, RANDOLPH COUNTY, WEST VIRGINIA

Subsite / Range	Acreage	Suspect Past DoD Activities	Potential MEC / Munitions Debris Present	MEC / Munitions Debris Found Since Closure	Previous Investigation / Clearance Actions	Post-DoD Land Use and Current Land Use	Potential Receptors	Potential Source and Receptor Interaction	SI Field Sampling / Qualitative Reconnaissance
WV MANEUVER AREA AMMUNITION DEPOT	4	Ammunition storage area for the entire WV maneuver area	None	No MEC or munitions debris were found during the 2007 PA field visit. No MEC or munitions debris were found during the 2012 SI site visit.	2009 PA 2010 INPR 2012 SI No documentation of site clearance was found for this site.	Privately owned. Previously used for growning crops. Currently a vacant field.	Commercial/Industrial workers (farmers), site visitors (e.g., landowners and trespassers).	NO: There is physical or historical evidence that no MEC are present.	Approximately 0.75 miles of QR Discrete surface soil sampling: 3 surface soil samples: WVMA-MRS02-SS-24-01 WVMA-MRS02-SS-24-02 WVMA-MRS02-AMB-SS-24-03 Associated QC samples: WVMA-MRS02-SS-24-04 WVMA-MRS02-EB1
				Source: PA (2009) INPR (2010) SI (2012)	CRREL = Cold Regions Research and Engineering Laboratory DoD = Department of Defense MEC = munitions and explosives of concern MRS = Munitions Response Site PA = Preliminary Assessment QR = qualitative reconnaissance SD = sediment SI = Site Investigation SS = surface soil SW = surface water				

CONCEPTUAL SITE EXPOSURE MODEL

MRS Name: WEST VIRGINIA MANEUVER AREA: WVMA Ammunition Depot MRS

Created/Revised By: Emily Baxter, PARSONS ***Last Revision Date:*** July 9, 2013



APPENDIX K

MUNITIONS RESPONSE SITE PRIORITIZATION PROTOCOL EVALUATION

Table A
MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from DoD databases, such as RMIS. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the MRS summary, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental non-munitions related contaminants found at the MRS (e.g., benzene, trichloroethylene), and any potentially exposed human and ecological receptors. Include a map of the MRS, if one is available.

Munitions Response Site Name: WVMA Ammunition Depot

Component: U.S. Army Corps of Engineers (FUDS)

Installation/Property Name: WV Maneuver Area/Dolly Sods

Location (City, County, State): Elkins, Randolph County, West Virginia

Site Name (RMIS ID)/Project Name (Project No.): Proj. No. G03WV001305/FFID WV39799F346000

Date Information Entered/Updated: 12 June 2013

Point of Contact (Name/Phone): Mr. Richard Meadows (304) 543-2755

Project Phase (check only one):

❑ PA	☑ SI	❑ RI	❑ FS	❑ RD
❑ RA-C	❑ RIP	❑ RA-O	❑ RC	❑ LTM

Media Evaluated (check all that apply):

❑ Groundwater	❑ Sediment (human receptor)
☑ Surface soil	❑ Surface Water (ecological receptor)
❑ Sediment (ecological receptor)	❑ Surface Water (human receptor)

MRS Summary:

G03WV0013_MRS02 WVMA Ammunition Depot

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM (by type of munition, if known) or munitions constituents (by type, if known) known or suspected to be present):

The 4-acre WVMA Ammunition Depot (MRS02) (FUDS Project No. G03WV001306) is included within the 2,180,367 acres acquired by the Department of the Army for military training during WWII. (2013 SI, WVMA, Section 1.1) A Real Estate Property Lease Map obtained during PA research showed an ammunition depot a few miles north of the WVMA headquarters in Elkins, WV. This depot is confirmed to have existed based upon historical photos, USACE Common Operations reports, WVMA Administrative and Supply Plan, interviews and other historical information obtained during PA research. Munitions suspected to have been stored at the depot include 155mm high explosive (HE) projectiles; 105mm HE and smoke round (SR) cartridges; 81mm HE and SR cartridges; 75mm HE and SR shells; 60mm HE and SR shells; 4.2-inch HE and SR shells; 3.25-inch target rockets; fragmentation, smoke, and practice hand grenades; demolition charge blocks, demolition firing devices, blasting caps, time fuses, and general small arms ammunition (.22, .30, .38, .45, and .50 Caliber). However, there is no historical documentation or other evidence indicating disposal of munitions (burial or demolition) occurred at the WVMA Ammunition Depot MRS and, consequently, no release mechanisms exist for MEC at this MRS. The 2007 PA field team did not identify any MEC or MD. In addition, the 2012 site visit team did not identify any MEC or MD during QR conducted at the MRS. Based on these findings and the lack of historical evidence for munitions at this location, the EHE module has been rated "No Known or Suspected Explosive Hazard". The results of soil sampling did not identify any elevated metals risk to human receptors. Because the MRS is not considered an important ecological place, a SLERA was not conducted for this MRS. The 2009 PA found no evidence of storage, use, or disposal of chemical warfare materiel at the MRS; therefore a rating of "No Known or Suspected CWM Hazard" has been assigned to the CWM module. The MRSPP score was discussed during the TPP closeout meeting.

Documentation of TPP Team concurrence and a copy of the public notice are included in Appendix B of the Final SI Report (2013 SI, WVMA, Sec. 2.3; Table 2.2; Sec. 4.2.1; Table 4.1; Sec. 6.1.4).

Description of Pathways for Human and Ecological Receptors:

Exposure pathways for receptors consist of direct contact with soil, incidental ingestion of soil, and inhalation of re-suspended soil particles. Exposure pathways are considered incomplete (2013 SI, WVMA, Sec. 5.3.4.3).

The SI recommends No Further Action and finds no human health risk hazard due to detected concentrations below the selected background criteria, therefore, the MRS is assigned an Alternative Module Rating of "No Known or Suspected MC hazard" in the HHE Module Rating (see Table 28 herein).

Description of Receptors (Human and Ecological):

Human receptors consist of Commercial/Industrial workers (farmers) and Site Visitors (private landowners and trespassers). No ecological receptors are considered to be present at this MRS (2012 SI, WVMA, Sec. 5.3.4.3).

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the score(s) that correspond with **all** munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ All UXO that are considered likely to function upon any interaction with exposed persons [e.g., submunitions, 40mm high-explosive (HE) grenades, white phosphorus (WP) munitions, high-explosive antitank (HEAT) munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions]. ◆ All hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazard.	30
High explosive (used or damaged)	◆ All UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ All DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	25
Pyrotechnic (used or damaged)	◆ All UXO containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades). ◆ All DMM containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	20
High explosive (unused)	◆ All DMM containing a high explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	15
Propellant	◆ All UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	15
Bulk secondary high explosives, pyrotechnics, or propellant	◆ All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor), that are deteriorated. ◆ Bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ All DMM containing a pyrotechnic fillers (i.e., red phosphorous), other than white phosphorous filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ All UXO that are practice munitions that are not associated with a sensitive fuze. ◆ All DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ All UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ All used munitions or DMM that are categorized as small arms ammunition [Physical evidence or historical evidence that no other types of munitions (e.g., grenades, subcaliber training rockets, demolition charges) were used or are present on the MRS is required for selection of this category.].	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	0

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the score(s) that correspond with **all** munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

No MEC was observed during the SI or during previous field visits to the MRS. There is no historical documentation or other evidence indicating disposal of munitions (burial or demolition) occurred at the WVMA Ammunition Depot MRS and, consequently, no release mechanisms exist for MEC at this MRS (2013 SI, WVMA; Sec. 4.3.2; Sec. 4.2.1; Table 4.2). As a result, Tables 2-9 have been omitted.

Table 10
Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.
4. Circle the appropriate range for the **EHE Module Total** below.
5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Explosive Hazard Factor Data Elements			
Munitions Type	Table 1	0	0
Source of Hazard	Table 2		
Accessibility Factor Data Elements			
Location of Munitions	Table 3		0
Ease of Access	Table 4		
Status of Property	Table 5		
Receptor Factor Data Elements			
Population Density	Table 6		0
Population Near Hazard	Table 7		
Types of Activities/ Structures	Table 8		
Ecological and /or Cultural Resources	Table 9		
EHE MODULE TOTAL			0

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard

EHE MODULE RATING	*No Known or Suspected Explosive Hazard*

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the score(s) that correspond to **all** CWM configurations known or suspected to be present at the MRS.

Note: The terms *CWM/UXO, CWM/DMM, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, explosive configuration either UXO or damaged DMM	The CWM known or suspected of being present at the MRS is: ◆ Explosively configured CWM that are UXO (i.e., CWM/UXO). ◆ Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged.	30
CWM mixed with UXO	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged, or nonexplosively configured CWM/DMM, or CWM not configured as a munition, that are commingled with conventional munitions that are UXO.	25
CWM, explosive configuration that are undamaged DMM	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20
CWM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS is: ◆ Nonexplosively configured CWM/DMM. ◆ Bulk CWM/DMM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS is CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ Only CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10
Evidence of no CWM	◆ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	0
CWM CONFIGURATION	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	0

DIRECTIONS: Document any MRS-specific data used in selecting the ***CWM Configuration*** classifications in the space provided.

Research that was performed for the Preliminary Assessment showed that this MRS is not suspected to contain CWM; therefore, Tables 12-19 are omitted (2009 PA, USACE, pg 63).

Table 20
Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
4. Circle the appropriate range for the **CHE Module Total** below.
5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	0	0
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		0
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		0
Population Near Hazard	Table 17		
Types of Activities/ Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			0

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	*No Known or Suspected CWM Hazard*

Table 21
HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's groundwater and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration (µg/L)	Comparison Value (µg/L)	Ratios

CHF Scale	CHF Value	Sum The Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to geological structures or physical controls).	L

MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L

RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Groundwater MC Hazard ☐

Table 21 Comments: Because there are no groundwater wells within the MRS, groundwater exposure pathways are considered incomplete (2013 SI, WVMA, Sec. 5.3.2.6). No groundwater samples were collected during the SI.

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for human endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration (µg/L)	Comparison Value (µg/L)	Ratios
CHF Scale	**CHF Value**	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ☐

Table 22 Comments: Due to the absence of perennial surface water within the MRS, surface water samples were not collected and exposure pathways are considered incomplete (2013 SI, WVMA, Sec. 5.3.3.6).

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the site's sediment and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for human endpoints present in the sediment, select the box at the bottom of the table.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
CHF Scale	**CHF Value**	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Sediment (Human Endpoint) MC Hazard ☐

Table 23 Comments: Due to the absence of perennial surface water within the MRS, sediment samples were not collected and exposure pathways are considered incomplete (2013 SI, WVMA, Sec. 5.3.3.6).

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Contaminant	Maximum Concentration (µg/L)	Comparison Value (µg/L)	Ratios

CHF Scale	CHF Value	Sum the Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ☐

Table 24 Comments: Because the MRS is not considered an important ecological place, ecological receptors are not anticipated at the MRS (2013 SI, WVMA, Sec. 5.2.4).

Table 25

HHE Module: Sediment– Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's sediment and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the sediment, select the box at the bottom of the table.

.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
CHF Scale	**CHF Value**	**Sum the Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ☐

Table 25 Comments: Because the MRS is not considered an important ecological place, ecological receptors are not anticipated at the MRS (2013 SI, WVMA, Sec. 5.2.4).

Table 26

HHE Module: Surface Soil – Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface soil and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratio
CHF Scale	**CHF Value**	**Sum the Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	

No Known or Suspected Surface Soil MC Hazard ☑

Table 26 Comments: The soil exposure pathways are incomplete for human receptors. The maximum detected concentrations of all metals analyzed were detected below background levels (2013 SI, Subsection 5.3.5).

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: **Only use this table if there are more than five contaminants present at the MRS.** This is a supplemental table designed to hold information about contaminants that do not fit in the previous tables. Indicate the **media** in which these contaminants are present. Then record all **contaminants**, their **maximum concentrations** and their **comparison values** (from Appendix B) in the table below. Calculate and record the **ratio** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** for each medium on the appropriate media-specific tables.

Note: Remember not to add ratios from different media.

Media	Contaminant	Maximum Concentration	Comparison Value	Ratio

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard, Migration Pathway, and Receptor Factors** for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the reference provided below, determine each media's rating (A–G) and record the letter in the corresponding **Media Rating** box below.

Media (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value		Three-Letter Combination (Hs-Ms-Ls)		Media Rating (A-G)
Groundwater (Table 21)							
Surface Water/Human Endpoint (Table 22)							
Sediment/Human Endpoint (Table 23)							
Surface Water/Ecological Endpoint (Table 24)							
Sediment/Ecological Endpoint (Table 25)							
Surface Soil (Table 26)							

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the **HHE Module Rating** box below.

Note:

An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

HHE MODULE RATING	*No Known or Suspected MC Hazard*

HHE Ratings (for reference only)	
Combination	**Rating**
HHH	A
HHM	B
HHL	C
HMM	C
HML	D
MMM	D
HLL	E
MML	E
MLL	F
LLL	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected MC Hazard

Table 29
MRS Priority

DIRECTIONS: In the chart below, circle the letter **rating** for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical **priority** for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS priority is the single highest priority; record this number in the **MRS or Alternative Priority** box at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	B	2	A	2
B	3	C	3	B	3
C	4	D	4	C	4
D	5	E	5	D	5
E	6	F	6	E	6
F	7	G	7	F	7
G	8			G	8
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		*No Known or Suspected CWM Hazard*		*No Known or Suspected MC Hazard*	
MRS or ALTERNATIVE PRIORITY				*No Known or Suspected Hazard*	

APPENDIX L

REFERENCE COPIES

NOTE:

Selected pages from reference documents have been included in the hard copy of the Site Inspection Report. An electronic version containing full documents is on the CD-ROM included with this report.

FORMER WV MANEUVER AREA/DOLLY SODS
GRANT, PRESTON, PENDLETON, TUCKER AND RANDOLPH COUNTIES, WEST VIRGINIA
FUDS Property Number G03WV0013

PRELIMINARY ASSESSMENT

VOLUME I
REPORT AND APPENDICES A - K

Final Version

Prepared by
U.S. Army Corps of Engineers
Huntington, WV District
502 8th Street
Huntington, WV 25701-2070

February 2009

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, LOUISVILLE
CORPS OF ENGINEERS
P.O. BOX 59
LOUISVILLE, KY 40201-0059

http://www.lrl.usace.army.mil/

CELRL-ED-E

DEC 1 2010

MEMORANDUM FOR Commander, Great Lakes and Ohio River Division, ATTN: CELRD-PDM/Patty Bertsch, 550 Main Street, Rm. 10032, Cincinnati, Ohio 45202-3222

SUBJECT: Defense Environmental Restoration Program – Formerly Used Defense Sites (DERP-FUDS) Inventory Project Report (INPR) for Property No. G03WV0013, WV Maneuver Area/Dolly Sods, Davis, West Virginia

1. Reference ER 200-3-1, Environmental Quality, Formerly Used Defense Sites (FUDS) Program Policy, Department of the Army, U.S. Army Corps of Engineers, Washington, D.C., 20314, 10 May 2004.

2. This memorandum transmits the INPR for the subject DERP-FUDS property. This INPR requests after-the-fact approval for one existing Military Munitions Response Program (MMRP) project and proposes seven new MMRP projects.

3. Office of Counsel, Real Estate, and the Environmental and Munitions Center of Expertise (EM CX) have reviewed this INPR and concur that the property was formerly used by the Department of Defense (DoD) and that the projects described in paragraph 5 below are appropriate.

4. A Property Survey Summary Sheet including property maps and photographs is included at Enclosure 1. The revised FDE, dated 7 January 1992, is included at Enclosure 2. The property had an original FDE, dated 21 May 1990, but was subsequently revised to clarify the eligibility of Blackbird Knob. The revised FDE indicates a Property Number of G03WV0065 which is a duplicate of G03WV0013. The INPR checklist is included at Enclosure 3. The Executive Summary of the WV Maneuver Area/Dolly Sods Preliminary Assessment is included at Enclosure 4.

5. The following is a summary of the existing and proposed projects at the subject property:

a. **G03WV001304 (MMRP)** – *Dolly Sods Removal.* This existing MMRP project was approved on 25 May 1990 to address munitions-related contamination at an area of the property known as the Dolly Sods Region. While it was approved as MMRP project G03WV006500, all funding has been recorded under MMRP project G03WV001304. Consequently, this INPR seeks after-the-fact approval of this on-going MMRP project. The Dolly Sods Region consists of approximately 18,000 acres located in the northwest portion of the WV Maneuver Area/Dolly Sods property. Project 04 has transitioned to the Long-Term Management (LTM) phase. An Archives Search Report (ASR), Engineering Evaluation and Cost Analysis (EE/CA), Remedial Investigation/Feasibility Study (RI/FS), and a Munitions and Explosives of Concern (MEC)

Received
Sep 2, 2011
SC

WEST VIRGINIA
Division of Culture and History

The Culture Center
1900 Kanawha Blvd., E.
Charleston, WV 25305-0300
Randall Reid-Smith, Commissioner
Phone 304.558.0220 • www.wvculture.org
Fax 304.558.2779 • TDD 304.558.3562
EEO/AA Employer

August 29, 2011

Mr. Gabriel Cosyleon
Senior Scientist
Parsons
1700 Broadway
Suite 900
Denver, CO 80290

RE: Army National Guard Munitions Response Sites – Proposed Site Inspections
FR#: 11-990-Multi

Dear Mr. Cosyleon:

We have reviewed the information submitted for the above referenced project. As required by Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations, 36 CFR 800: "Protection of Historic Properties," we submit our comments.

According to the submitted information, Parsons is performing site inspections (SI) for the Department of Defense (DoD) under the US Army Corps of Engineers (COE) for the Formerly Used Defense Sites (FUDS) Military Munitions Response Program (MMRP). The sites are part of the former West Virginia Maneuver Area/Dolly Sods FUDS. The Munitions Response Sites (MRS) include: MRS01 – Dailey Infiltration Camp; MRS02 – WV Maneuver Area Ammunition Depot; MRS03 – Jennings ton Training Area; MRS04 - Fore Knobs/Bear Rocks Firing Range; MRS05 – Beardon Know Firing Range; MRS06 – Brown/Cabin Mountain Firing Ranges; and MRS07 – Buena Small Arms Firing Ranges.

A search of our records indicates that archaeological resources have been recorded across the landscape within the general vicinity of the proposed project areas. However, it is our understanding that the project consists of taking samples from the ground that are a half-inch in diameter and zero to two inches in depth. It is also our understanding that no construction, auguring or trenching is proposed for this project, which will result in minimal or no new disturbance. As a result, we are of the opinion that the proposed project will have no adverse effect to any archaeological resources that are eligible for or listed in the National Register of Historic Places. No further consultation is necessary.

We appreciate the opportunity to be of service. *If you have any questions regarding our comments or the Section 106 Process, please contact Lora A. Lamarre-DeMott, Senior Archaeologist, at 304-558-0220*

Sincerely,

Susan M. Pierce
Deputy State Historic Preservation Officer

SMP/LAL

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

February 8, 2012

Carlos Hernandez
Eco & Associates, Inc.
1855 West Katella Avenue, Suite 340
Orange, California 92867

SUBJECT: United States Army Corps of Engineers
West Virginia Maneuver Area
Town of Davis, Tucker County, West Virginia

Dear Mr. Hernandez:

The United States Environmental Protection Agency (EPA) Region III Drinking Water Branch is in receipt of your emails dated January 10 and 18, 2012, regarding the above referenced project. Eco & Associates, Inc., on behalf of the United States Army Corps of Engineers, is conducting an environmental study of the former West Virginia Maneuver Area to assess potential impacts to surface and ground waters in the vicinity of the defunct training area. You requested the location of wellhead protection areas, tribal drinking water sources, and public and private water supply wells within four miles of the MRS05 and MRS06 sites as outlined in the GIS shapefile you conveyed on January 19, 2012. You also requested the location of surface water intakes within fifteen miles of these sites.

This office neither maintains a database of delineated state or local source water protection areas nor a database of private water supply wells; you are encouraged to contact the West Virginia Department of Health and Human Resources for assistance in obtaining these areas, if available. Also, please be advised that at present there are no federally recognized tribal areas within EPA Region III.

Furthermore, the specific locations of public water supply wells and intakes are treated as sensitive information and, as such, we are disinclined to release the exact locations of these sources. However, based upon the GIS layer of the MRS05 and MRS06 sites you submitted, we have determined that the following public water systems and/or sources may fall within the aforementioned radii:

State	County	Public Water System	PWSID	Source Type	Buffer
WV	Grant	Town of Petersburg	WV3301204	Intake	15 miles of MRS05 and MRS06
WV	Tucker	Canaan Valley State Park	WV9947044	Intake	15 miles of MRS05 and MRS06
WV	Tucker	Hamrick PSD	WV3304704	Intake	15 miles of MRS05 and MRS06
WV	Tucker	City of Parsons	WV3304707	Intake	15 miles of MRS05 and MRS06
WV	Tucker	Davis Water Works	WV3304701	2 Intakes	15 miles of MRS05 and MRS06

State	County	Public Water System	PWSID	Source Type	Buffer
WV	Tucker	City of Thomas	WV3304709	Intake	15 miles of MRS05 and MRS06
WV	Grant	Mountain Top PSD	WV3301205	Intake	15 miles of MRS05 and MRS06
WV	Tucker	Timberline Four Season Resort Management	WV3304711	Well	4 miles of MRS05 and MRS06
WV	Tucker	Canaan Valley National Wildlife Reserve	WV9947006	Well	4 miles of MRS05 and MRS06
WV	Tucker	Canaan Village Inn	WV9947029	Well	4 miles of MRS05 and MRS06
WV	Tucker	Canaan Valley Stores	WV9947036	Well	4 miles of MRS05 and MRS06
WV	Tucker	Deerfield Village	WV9947039	3 Wells	4 miles of MRS05 and MRS06
WV	Tucker	WV Resorts	WV9947002	2 Wells	4 miles of MRS05 and MRS06
WV	Tucker	Beaver Ridge Resort	WV9947032	2 Wells	4 miles of MRS05 and MRS06
WV	Tucker	North Point Subdivision	WV9947042	Well	4 miles of MRS05 and MRS06
WV	Tucker	Black Bear Woods	WV9947031	4 Wells	4 miles of MRS05 and MRS06
WV	Tucker	Mettiki Coal LLC-Mtn View Mine	WV9947047	Well	4 miles of MRS05 and MRS06

If you would like to discuss this further, please contact me at (215) 814-5733.

Sincerely,

Alysa Suero

Alysa Suero, P.G.
Lead, Drinking Water Sensitive Data Security
Drinking Water Branch

MRS02 Ammo Depot
Elkins, WV 26241

Inquiry Number: 3360517.2w
July 10, 2012

EDR DataMap™ Well Search Report

Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
Toll Free: 800.352.0050
www.edrnet.com

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

GEOCHECK VERSION 2.1
SUMMARY

FEDERAL DATABASE WELL INFORMATION

MAP ID	WELL ID
1	USGS2249463
2	USGS2249456
3	USGS2249449
4	USGS2249448
5	USGS2246537
6	USGS2246535
7	USGS2246532
8	USGS2246530
9	USGS2246529
10	USGS2246527
11	USGS2246507
12	USGS2246505
13	USGS2246502
13	USGS2246504
13	USGS2246503
14	USGS2246500
15	USGS2246494
16	USGS2246493
17	USGS2246492
17	USGS2246491
18	USGS2246490
19	USGS2246489
20	USGS2246487
21	USGS2246478
22	USGS2246479
23	USGS2246476
24	USGS2246473
25	USGS2246471
26	USGS2246469
27	USGS2246466
28	USGS2246464
30	USGS2246451
32	USGS2246677
33	USGS2246665
34	USGS2246663
34	USGS2246664
35	USGS2246662
36	USGS2246660
37	USGS2246661
38	USGS2246659
39	USGS2246658
40	USGS2246657
41	USGS2246653
42	USGS2246654
43	USGS2246652

GEOCHECK VERSION 2.1
SUMMARY

FEDERAL DATABASE WELL INFORMATION

MAP ID	WELL ID
44	USGS2246651
45	USGS2246648
46	USGS2246645
47	USGS2246642
47	USGS2246641
48	USGS2246639
49	USGS2246638
50	USGS2246633
51	USGS2246630

STATE WATER WELL INFORMATION

MAP ID	WELL ID

NO WELLS FOUND

STATE OIL/GAS WELL INFORMATION

MAP ID	WELL ID
1	WVOG80000015856
2	WVOG80000091118
3	WVOG80000092942
4	WVOG80000034126
5	WVOG80000033978
6	WVOG80000062156
7	WVOG80000060077
8	WVOG80000105606

PUBLIC WATER SUPPLY SYSTEM INFORMATION

Map ID: 29
PWS ID: WV9942046
PWS Name: USFS - BEAR HEAVEN CAMPGROUND
P.O. BOX 1548
ELKINS, WV 26241
PWS currently has or had major violation(s) or enforcement:

Map ID: 31
PWS ID: WV3304203
PWS Name: COMMUNITY OF ELKINS
401 DAVIS AVE
ELKINS, WV 26241
PWS currently has or had major violation(s) or enforcement:

USGS TOPOGRAPHIC MAP(S)

38079-H7 ELKINS, WV
38079-H8 JUNIOR, WV
39079-A7 MONTROSE, WV
39079-A8 BELINGTON, WV

GEOCHECK VERSION 2.1
SUMMARY

AREA RADON INFORMATION

EPA Region 3 Statistical Summary Readings for Zip Code: 26250

Number of sites tested: 31.

Maximum Radon Level: 9.0 pCi/L.
Minimum Radon Level: 0.2 pCi/L.

pCi/L <4	pCi/L 4-10	pCi/L 10-20	pCi/L 20-50	pCi/L 50-100	pCi/L >100
26 (83.87%)	5 (16.13%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)

EPA Region 3 Statistical Summary Readings for Zip Code: 26283

Number of sites tested: 15.

Maximum Radon Level: 12.3 pCi/L.
Minimum Radon Level: -0.2 pCi/L.

pCi/L <4	pCi/L 4-10	pCi/L 10-20	pCi/L 20-50	pCi/L 50-100	pCi/L >100
12 (80.00%)	2 (13.33%)	1 (6.67%)	0 (0.00%)	0 (0.00%)	0 (0.00%)

EPA Region 3 Statistical Summary Readings for Zip Code: 26241

Number of sites tested: 187.

Maximum Radon Level: 15.7 pCi/L.
Minimum Radon Level: 0.3 pCi/L.

pCi/L <4	pCi/L 4-10	pCi/L 10-20	pCi/L 20-50	pCi/L 50-100	pCi/L >100
149 (79.68%)	30 (16.04%)	8 (4.28%)	0 (0.00%)	0 (0.00%)	0 (0.00%)

EPA Region 3 Statistical Summary Readings for Zip Code: 26257

Number of sites tested: 10.

Maximum Radon Level: 105.3 pCi/L.
Minimum Radon Level: 0.5 pCi/L.

pCi/L <4	pCi/L 4-10	pCi/L 10-20	pCi/L 20-50	pCi/L 50-100	pCi/L >100
8 (80.00%)	1 (10.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (10.00%)

GEOCHECK VERSION 2.1
SUMMARY

AREA RADON INFORMATION

EPA Region 3 Statistical Summary Readings for Zip Code: 26253

Number of sites tested: 28.

Maximum Radon Level: 10.0 pCi/L.
Minimum Radon Level: 0.4 pCi/L.

pCi/L <4	pCi/L 4-10	pCi/L 10-20	pCi/L 20-50	pCi/L 50-100	pCi/L >100
21 (75.00%)	5 (17.86%)	2 (7.14%)	0 (0.00%)	0 (0.00%)	0 (0.00%)

Federal Area Radon Information for BARBOUR COUNTY, WV

Number of sites tested: 13

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	3.125 pCi/L	88%	12%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	3.862 pCi/L	69%	31%	0%

Federal Area Radon Information for RANDOLPH COUNTY, WV

Number of sites tested: 16

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	2.013 pCi/L	94%	6%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	3.525 pCi/L	75%	25%	0%