**ARMY Draft**

**RCRA facility INVESTIGATION Work Plan**

**PARCEL 3**

**Solid Waste Management Units 14, 15, 33, AND 74**

**Areas of Concern 89, 90, 91, 92**

**Fort Wingate Depot Activity**

**McKinley County, New Mexico**

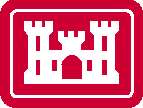
**October 23, 2015**

**Contract No. W912DY-10-D-0025**

**Task Order No. DS02**

**Modification No. 1**

***Prepared for:***



**United States Army Corps of Engineers**

**CESWF-PEC-TM**

**819 Taylor St.**

**Room 3A12**

**Ft. Worth, TX 76102**

***Prepared by:***



**12723 Capricorn Drive, Suite 500**

**Stafford, TX 77477**

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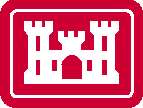
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Fort Wingate Depot Activity

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| Regional Support Center (USACE SPK)\*  Neal Navarro | 0 | 1 |
| Admin Record- OH | 0 | 1 |
| Bill O'Donnell (BRACD) | 0 | 1 |
| Total | **3** | **9** |

\*- Munitions and Explosives of Concern (MEC) Investigations only

BRACD = U.S. Army Base Realignment and Closure Division

FWDA BEC = Fort Wingate Depot Activity Base Realignment and Closure Environmental Coordinator

USACE SWF = U.S. Army Corps of Engineers, Fort Worth District

USACE SPA = U.S. Army Corps of Engineers, Albuquerque District

USACE SPK = U.S. Army Corps of Engineers, Sacramento District

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*(Appendix F will be submitted under separate cover)*

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**ACRONYMS**

AOC area of concern

APP Accident Prevention Plan

ASR Archive Search Report

bgs below ground surface

BIA Bureau of Indian Affairs

BRAC Base Realignment and Closure

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

CFP Closure Field Program

COC chain of custody

COPCs contaminants of potential concern

DoD Department of Defense

DOI United States Department of the Interior

DQO Data Quality Objective

DU Decision Unit

ELAP Environmental Laboratory Accreditation Program

EM electromagnetic induction

ft feet/foot

FTR Functional Test Range

FWDA Fort Wingate Depot Activity

GPR ground-penetrating radar

GPS Global Positioning System

HI Hazard Index

HWCP Hazardous Waste Contingency Plan

HWMU Hazardous Waste Management Unit

IAW in accordance with

IDW Investigation Derived Waste

ISM Incremental Sampling Methodology

JV PIKA-Pirnie Joint Venture LLC

KOA Kickout Area

MAG magnetic

MC munitions constituents

MD munitions debris

MEC Munitions and Explosives of Concern

mg/kg milligram per kilogram

MPPEH Material Potentially Presenting an Explosive Hazard

MS/MSD matrix spike/matrix spike duplicate

NMED New Mexico Environmental Department

NN Navajo Nation

NRCS Natural Resources Conservation Service

OB Open Burning

OD Open Detonation

Permit FWDA RCRA Permit Number NM6213820974

POZ Pueblo of Zuni

QA Quality Assurance

QC Quality Control

RCRA Resource Conservation and Recovery Act

RFI Resource Conservation and Recovery Act Facility Investigation

RSL Regional Screening Level

RSD Relative Standard Deviation

SOPs Standard Operating Procedures

SSHP Site Safety and Health Plan

SSLs Soil Screening Levels

SWMU Solid Waste Management Unit

SVOCs semi-volatile organic compounds

TAL Target Analyte List

TNT trinitrotoluene

TOC total organic carbon

UFP-QAPP Uniform Federal Policy for Quality Assurance Project Plan

U.S. United States

USACE United States Army Corps of Engineers

USDA United States Department of Agriculture

USEPA United States Environmental Protection Agency

UXO Unexploded Ordnance

VOC volatile organic compound

WMM Waste Military Munitions

WMP Waste Management Plan

WP Work Plan

# ES.1 EXECUTIVE SUMMARY

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan (WP) summarizes previous investigations and proposed additional investigation activities at Solid Waste Management Unit (SWMU) 14, SWMU 15, SWMU 33, SWMU 74, Area of Concern (AOC) 89, AOC 90, AOC 91, and AOC 92 within Parcel 3 at Fort Wingate Depot Activity (FWDA), New Mexico.

The Historical Information Summary Document for Parcel 3 was previously finalized in 2008 to compile and summarize historical documents available for the SWMUs and AOCs (TPMC, 2008). The Historical Information Summary Document for Parcel 3 is included as Appendix A for reference. The Historical Information Summary Document provides further detail regarding the operational history, site and facility drawings, geophysical surveys, and environmental information contained in previously completed reports.

This RFI WP has been prepared for submission to the New Mexico Environment Department (NMED) Hazardous Waste Bureau, as required by Section VII.H.1.a of the Resource Conservation and Recovery Act (RCRA) Permit NM 6213820974-1 for the FWDA (the Permit), effective on December 31, 2005 and modified in 2014. The Department of Defense (DoD) Base Realignment and Closure (BRAC)-Division and U.S. Army Corps of Engineers (USACE) mission is to complete the environmental remediation and restoration activities at FWDA to support final property transfer of most of the property for reuse by the Navajo Nation (NN) and Pueblo of Zuni (POZ) in accordance with the above-referenced permit.

Existing data have been evaluated to determine field activities required to characterize the nature and extent of potential environmental impacts at the above listed SWMUs and AOCs. Sections 5.0 through 11.0 of this RFI WP evaluate the existing data for the SWMUs and AOCs and propose additional data-gathering activities. Brief summaries of these areas are provided below and in Table ES‑1.

All soil investigation activities will be conducted in accordance with proposed actions and procedures specified in the NMED-approved WP. Other associated project-specific planning documents are discussed in this WP and provided as appendices.

***SWMU 14***

SWMU 14 was used for demilitarization activities which were part of the FWDA mission of demilitarizing unserviceable, obsolete, and/or waste explosives, propellants, munitions and munitions components. SWMU 14, known as the Old Burning Ground and Demolition Landfill Area, consists of approximately 15 acres and is located in the north-central portion of Parcel 3. This area was used between 1948 and 1955. Some of the demilitarization activities performed at this SWMU were accomplished using treatment by open burning (OB) or open detonation (OD). Related materials were also treated in these SWMUs, including objects potentially contaminated with explosives during storage and handling, such as shipping containers and dunnage. The proposed data gathering activities in SWMU 14 are summarized in Table ES‑1.

**SWMU 15**

SWMU 15 was used for demilitarization activities which were part of the FWDA mission of demilitarizing unserviceable, obsolete, and/or waste explosives, propellants, munitions and munitions components. SWMU 15, known as the Old Demolition Area, is approximately seven acres and is located to the southwest of SWMU 14 in Parcel 3. This area was used between 1948 and 1955. Some of the demilitarization activities performed at this SWMU were accomplished using treatment by open burning (OB) or open detonation (OD). Related materials were also treated in these SWMUs, including objects potentially contaminated with explosives during storage and handling, such as shipping containers and dunnage. The proposed data gathering activities in SWMU 15 are summarized in Table ES‑1.

**SWMU 33**

SWMU 33 was used for demilitarization activities which were part of the FWDA mission of demilitarizing unserviceable, obsolete, and/or waste explosives, propellants, munitions and munitions components. SWMU 33, also called Waste Pile KP1, is approximately 0.04 acres and is located south of SWMU 15. This area was used between 1948 and 1955. Some of the demilitarization activities performed at this SWMU were accomplished using treatment by open burning (OB) or open detonation (OD). Related materials were also treated in these SWMUs, including objects potentially contaminated with explosives during storage and handling, such as shipping containers and dunnage. The proposed data gathering activities in SWMU 33 are summarized in Table ES‑1.

***SWMU 74***

SWMU 74 is approximately 1.4 acres and is located along the eastern boarder of Parcel 3. This area was the Proposed Burning Ground identified in the Permit as Area 16 or Site 16; however, no records exist showing that the burning ground was ever established. The proposed data gathering activities in SWMU 74 are summarized in Table ES‑1.

***AOC 89***

AOC 89 is approximately six acres and is located in five separate areas along the north east boundary of Parcel 3. Three of these areas contain U-shaped revetments, one contains an L- shaped revetment, and one contains a rectangular cleared area with shallow trenches along two sides. The use of the L-shaped revetment was not documented in the historical records and its purpose is unknown. The remaining four areas were used as temporary storage areas for military munitions awaiting treatment by either OB or OD. The proposed data gathering activities in AOC 89 are summarized in Table ES‑1.

***AOC 90***

AOC 90 is approximately 1.7 acres and is located in two separate areas south of SWMU 15 along the western edge of Parcel 3. AOC 90 consists of two ponds which are dammed on the downstream end and are located topographically upgradient from all known areas of FWDA operations. One pond is outside of the of the FWDA western property boundary. The proposed data gathering activities in AOC 90 are summarized in Table ES‑1.

***AOC 91***

AOC 91 is approximately 28 acres and is located in the central portion of Parcel 3. This AOC consists of a disturbed area within the firebreak that is east and south of the known demolition area and a second disturbed area with many roads and paths. The proposed data gathering activities in AOC 91 are summarized in Table ES‑1.

***AOC 92***

AOC 92 is approximately 19.7 acres and is located inside the Inner Fence in the central portion of Parcel 3. This area has been identified as a “demil area.” AOC 92 is identified in the Permit as Feature 31 on the 1973 Aerial Photo API-5 and Feature 21 on the 1978 Aerial Photo API-7. Feature 31 is described as bare areas on a hillside with a loop road around the area, two trenches, three small pits, and three pit scars. Feature 21 is described as bare, rough ground on the side of a hill with loop road and two pits (USACE, 1995). The proposed data gathering activities in AOC 92 are summarized in Table ES‑1.

Table ES‑1: Summary of Data Gathering Activities for SWMUs and AOCs at Parcel 3

| **Area** | **Investigation** | **Sample Analysis** |
| --- | --- | --- |
| SWMU 14 | 33 Incremental Sampling Methodology (ISM) samples collected in the potentially affected areas.  33 composite samples (comprised of 6 subsamples) collected from each ISM sample decision unit | Explosives, Resource Conservation and Recovery Act (RCRA) 8 Metals, and Perchlorate  Semi-volatile organic compounds (SVOCs) |
| SWMU 15 | 14 Incremental Sampling Methodology (ISM) samples collected in the potentially affected areas.  14 composite samples (comprised of 6 subsamples) collected from each ISM sample decision unit | Explosives, Resource Conservation and Recovery Act (RCRA) 8 Metals, and Perchlorate  Semi-volatile organic compounds (SVOCs) |
| SWMU 33 | 1 Incremental Sampling Methodology (ISM) samples collected in the potentially affected areas.  1 composite samples (comprised of 6 subsamples) collected from each ISM sample decision unit | Explosives, Resource Conservation and Recovery Act (RCRA) 8 Metals, and Perchlorate  Semi-volatile organic compounds (SVOCs) |
| SWMU 74 | 4 Incremental Sampling Methodology (ISM) samples collected in the potentially affected areas.  4 composite samples (comprised of 6 subsamples) collected from each ISM sample decision unit | Explosives, Resource Conservation and Recovery Act (RCRA) 8 Metals, and Perchlorate  Semi-volatile organic compounds (SVOCs) |
| AOC 89 | 6 Incremental Sampling Methodology (ISM) samples collected in the potentially affected areas.  6 composite samples (comprised of 6 subsamples) collected from each ISM sample decision unit | Explosives, Resource Conservation and Recovery Act (RCRA) 8 Metals, and Perchlorate  Semi-volatile organic compounds (SVOCs) |
| AOC 90 | 4 Incremental Sampling Methodology (ISM) samples collected in the potentially affected areas.  4 composite samples (comprised of 6 subsamples) collected from each ISM sample decision unit | Explosives, Resource Conservation and Recovery Act (RCRA) 8 Metals, and Perchlorate  Semi-volatile organic compounds (SVOCs) |
| AOC 91 | 32 Incremental Sampling Methodology (ISM) samples collected in the potentially affected areas.  32 composite samples (comprised of 6 subsamples) collected from each ISM sample decision unit | Explosives, Resource Conservation and Recovery Act (RCRA) 8 Metals, and Perchlorate  Semi-volatile organic compounds (SVOCs) |
| AOC 92 | 80 ISM samples collected in the potentially affected areas.  80 composite samples (comprised of 6 subsamples) collected from each ISM sample decision unit | Explosives, RCRA 8 Metals, and Perchlorate  SVOCs |

# INTRODUCTION

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan (WP) summarizes previous investigations and describes additional investigation activities to be performed at Solid Waste Management Units (SWMUs) 14, 15, 33, and 74, and Areas of Concern (AOCs) 89, 90, 91, and 92, within Parcel 3 at Fort Wingate Depot Activity (FWDA), New Mexico (**Figure 1‑1**). Major land use areas and parcels within FWDA are shown on **Figure 1‑2**. The SWMUs and AOCs within Parcel 3 to be investigated are shown on **Figure 1‑3**.

The Historical Information Summary Document for Parcel 3 was previously finalized in 2008 to compile and summarize historical documents available for the SWMUs and AOCs (TPMC, 2008). The Historical Information Summary Document for Parcel 3 is included as Appendix A for reference. The Historical Information Summary Document provides further detail regarding the operational history, site and facility drawings, geophysical surveys, and environmental information contained in previously completed reports.

This RFI WP was developed in accordance with (IAW): the FWDA RCRA Permit NM 6213820974-1 (Permit) (dated December 2005 and modified in 2014); United States Army Corps of Engineers (USACE) Work Plans; and, the USACE Engineering Manual 385-1-97, Change 1.

As required by the Permit Section VIII.B.1, copies of this document were provided to designated representatives of the Navajo Nation (NN), Pueblo of Zuni (POZ), and the Bureau of Indian Affairs (BIA) for their review and comment.

## Purpose and Scope

The Parcel 3 SWMUs and AOCs are located entirely within the defined boundaries of the Kickout Area (KOA). Parcel 3 also contains a Hazardous Waste Management Unit (HWMU), also known as the current open burn/open detonation (OB/OD) unit which will be investigated under a separate contract. The surface and subsurface clearance of Munitions and Explosives of Concern (MEC) and munitions debris (MD) within the KOA is being performed separately IAW *Final Work Plan Munitions and Explosives of Concern Removal and Surface Clearance Kickout Area* (PIKA-Pirnie JV, 2015a), approved by the New Mexico Environmental Department (NMED). The PIKA-Pirnie Joint Venture, LLC (JV) also plans to perform interim measures to remove waste military munitions (WMM) and WMM scrap in AOCs and SWMUs within the KOA IAW the *Interim Measures Work Plan Areas of Concern and Solid Waste Management Units in the Kickout Area* (PIKA-Pirnie JV, 2015b), currently under review by the USACE. Groundwater assessment at Parcel 3 is performed under a separate project and as such, groundwater assessment is not included under this RFI scope of work.

The purpose of this RFI WP, in compliance with the Permit, is to detail the activities to determine the nature and lateral extent of site-specific contaminants of potential concern (COPCs) which may include semi-volatile organic compounds (SVOCs), RCRA 8 metals, explosives, and perchlorate, in the surface soil at the Parcel 3 SWMUs 14, 15, 33, and 74, and AOCs 89, 90, 91, and 92. For SWMUs 14, 15, and 33, the areas of RFI will include only those located outside the defined burial pits and waste piles. The burial pits and waste piles at these SWMUs will be addressed IAW the Interim Measures Work Plan (PIKA-Pirnie JV, 2015b). To make this determination, the following activities have been proposed:

* Perform discrete soil sampling for COPCs at the identified SWMUs and AOCs; and
* Perform incremental soil sampling for COPCs at the identified SWMUs and AOCs.

This RFI WP has been prepared by the USACE, Fort Worth District for submission to the NMED – Hazardous Waste Bureau, as required by Section VII.H.1.a of the RCRA Permit (NM 6213820974-1) for FWDA, which became effective December 31, 2005 and was modified in 2014. The Department of Defense (DoD) Base Realignment and Closure (BRAC)-Division’s mission is to complete the environmental remediation and restoration activities at FWDA to support final property transfer of most of the property for reuse to the NN and the POZ.

## Background Information

FWDA is located in McKinley County, New Mexico, approximately seven miles east of Gallup, New Mexico and currently occupies approximately 15,277 acres. The FWDA was originally established by the United States (U.S.) Army in 1862 at the southern edge of Navajo Territory. Parcel 3, located within FWDA, consists of approximately 1,806 acres (**Figure 1‑3**) at FWDA and contains four SWMUs (14, 15, 33, and 74) and four AOCs (89, 90, 91, and 92). Background information regarding FWDA and the SWMUs and AOCs located within Parcel 3 is provided in documents previously submitted to NMED including the following:

* *Interim Status Closure Plan* (ERM, 1993 and 1994a);
* *Unexploded Ordnance Survey Report*, Fort Wingate Depot Activity (ERM, 1994b);
* *Archive Search Report* (ASR) (USACE, 1995);
* *Removal Report, OE Sampling and Removal Action, Fort Wingate Depot Activity*. (CMS, 1998);
* *Final Open Burning/Open Detonation Area RCRA Interim Status Closure Plan Phase IA - Characterization and Assessment of Site Conditions for the Soils/Solid Matrix (Phase IA Report)* (PMC, 1999a);
* *Final Open Burning/Open Detonation Area RCRA Interim Status Closure Plan Phase IB - Characterization and Assessment of Site Conditions for the Groundwater Matrix (Phase IB Report)* (PMC, 1999b);
* *Final OE Location and Removal Report, Fort Wingate Depot Activity, New Mexico* (EHSI, 2000);
* *Final Risk Assessment Technical Memorandum, Open Burning/Open Detonation Areas* (PMC, 2000);
* *Hydrogeologic Summary Report* (TPMC, 2006a); and,
* *Soil Background Study and Data Evaluation Report* (Shaw Environmental, Inc. 2010).
* *Final Work Plan Kickout Area Munitions and Explosives of Concern Removal and Surface Clearance* (PIKA-Pirnie JV, 2015a)

## Work Plan Organization

The remaining sections of this work plan consist of the following:

* **Section 2**: Cultural Resources, presents the process for protection of traditional cultural properties and other cultural resources within the project investigation area.
* **Section 3**: Background, presents background information for the FWDA including operational histories and site conditions.
* **Section 4**: Investigation Methods, describes the proposed investigation methods.
* **Section 5**: SWMU 14, presents information for SWMU 14 including the site background, previous investigations, release assessment, and field activities.
* **Section 6:** SWMU 15, presents information for SWMU 15 including the site background, previous investigations, release assessment, and field activities.
* **Section 7:** SWMU 33, presents information for SWMU 33 including the site background, previous investigations, release assessment, and field activities.
* **Section 8**: SWMU 74, presents information for SWMU 74 including the site background, previous investigations, release assessment, and field activities.
* **Section 9**: AOC 89, presents information for AOC 89 including the site background, previous investigations, release assessment, and field activities.
* **Section 10**: AOC 90, presents information for AOC 90 including the site background, previous investigations, release assessment, and field activities.
* **Section 11**: AOC 91, presents information for AOC 91 including the site background, previous investigations, release assessment, and field activities.
* **Section 12**: AOC 92, presents information for AOC 92 including the site background, previous investigations, release assessment, and field activities.
* **Section 13**: Project Management, provides project management information including project scheduling and reporting requirements, and other plans followed during completion of the proposed field activities.
* **Section 14**: References, presents works cited within this report.

The WP also contains the following appendices:

**Appendix A** Historical Information Summary Document

**Appendix B** Cultural Resources Management Plan

*(Appendix B will be submitted under separate cover)*

**Appendix C** New Mexico Environment Department (NMED) December 18, 2003 letter *Evaluation of Background Levels for Arsenic in Soil*

Parcel 3 Historical Soil and Sediment Data Summary Table

**Appendix D** Uniform Federal Policy for Quality Assurance Project Plan (UFP-QAPP)

includes Standard Operating Procedures (SOPs) for Environmental Field Activities and Laboratory Activities

**Appendix E** Accident Prevention Plan (APP)/ Site Safety and Health Plan (SSHP)

*(Appendix E will be submitted under separate cover)*

**Appendix F** Environmental Protection Plan

Waste Management Plan (WMP)

Hazardous Waste Contingency Plan (HWCP)

*(Appendix F will be submitted under separate cover)*

**Appendix G** Project Schedule

**Appendix H** Responses to Comments

**Figure 1‑1: Regional Area Map**

**Figure 1‑2: Parcel Location Map**

**Figure 1‑3: Location of SWMUs and AOCs within Parcel 3**

# Cultural Resources

Traditional cultural properties and other cultural resources have been documented within the FWDA boundaries. The USACE, Fort Worth District has developed a Programmatic Agreement with the NN and POZ to specify procedures to be employed during environmental characterization and remediation activities. As part of the KOA MEC Removal field work, Navajo and Zuni tribal archaeologist located and field marked cultural resources within the KOA boundary based on information provided by USACE. During field marking additional cultural sites were discovered and field marked by a tribal archaeologist. Geographical Information System data from the field marking effort is utilized by field personnel during investigation and clearance activities. When final, this WP will be a public document, so to protect the integrity of cultural resources, maps showing the location of cultural resources relative to proposed investigation locations have not been included.

Cultural sites identified to date in and near the Parcel 3 SWMUs and AOCs have been located and field marked. Planned investigation and intrusive sampling will be adjusted to avoid cultural sites to the maximum extent practical.

A Cultural Resources Management Plan for this project has been finalized. The Cultural Resources Management Plan includes procedures for the management and protection of cultural resources during this RFI and is included as Appendix B.

# Background

## Site Description and Operational History

FWDA contained facilities used to operate a reserve storage activity providing for the care, preservation, and minor maintenance of assigned commodities, primarily conventional military munitions. FWDA is almost entirely surrounded by federally owned or administered lands, including both National Forest and Tribal lands. The installation can be divided into several sub-areas based on location and historical land use. The major land use areas include the following:

* The Administration Area – encompassing approximately 800 acres in the northern portion of the installation, containing former office facilities, housing, equipment maintenance facilities, warehouse buildings, and utility support facilities.
* The Workshop Area – encompassing approximately 700 acres to the south of the Administration Area consisting of an industrial area containing ammunition maintenance and renovation facilities, the trinitrotoluene (TNT) washout facility and leach beds. The buildings and other structures were demolished in 2010.
* Ten Munitions Storage Areas (Igloo Blocks A through H, J, and K) – encompassing approximately 7,400 acres in the central portion of the installation. This area has 732 earth-covered igloos and 241 earthen revetments previously used for the storage of munitions.
* The OB/OD Area – encompassing approximately 1,800 acres in the west-central portion of the installation, which is separated into two sub-areas based on the period of operation: the Closed OB/OD Area and the Current OB/OD Area [also known as the HWMU (Section 3.3)].
* Protection and Buffer Areas – encompassing approximately 4,050 acres located adjacent to the eastern, western, and northern installation boundaries, consisting of buffer zones surrounding the former magazine and demolition areas.
* The Functional Test Range (FTR) Areas – Fort Wingate has two FTR Areas: FTR 1 is approximately 345 acres in the east-central portion of FWDA and is located in Parcel 20; and, FTR 2/3 located in Parcel 16. FTR 2/3 encompasses approximately 600 acres in the northeast corner of Fort Wingate and includes two range areas adjacent to one another.

## FWDA History

The FWDA is located in McKinley County, New Mexico, approximately seven miles east of Gallup, New Mexico and currently occupies approximately 15,277 acres. The FWDA was originally established by the U.S. Army in 1862 at the southern edge of Navajo Territory. In 1918, the mission of the FWDA changed from tribal issues to World War I related activities. Beginning in 1940, the FWDA’s mission was primarily to receive, store, maintain, and ship explosives and military munitions, as well as disassemble and dispose of unserviceable or obsolete explosives and other military munitions. In 1975, the installation came under the administrative command of Tooele Army Depot, located near Salt Lake City, Utah. In January 1993, the active mission of the FWDA was ceased and the installation closed as a result of the Defense BRAC Act of 1990. Beginning in 2002, the U.S. Army reassigned many FWDA functions to the BRAC Division, including caretaker duties, property transfer, and performance of environmental compliance and restoration activities. Command and control responsibilities were retained by Tooele Army Depot until January 31, 2008, when these responsibilities were transferred to White Sands Missile Range.

In 2005, environmental investigation and restoration activities began under Permit USEPA ID No. NM 6213820974-1 (Permit) which was finalized in December 2005 and modified in 2014. FWDA is currently undergoing final environmental characterization and restoration activities prior to final property transfer and reuse.

## Parcel 3 Area History

The FWDA installation is currently undergoing final environmental characterization and restoration activities prior to final property transfer and reuse. The installation has been divided into reuse parcels as part of the planned property transfer to the U.S. Department of the Interior (DOI). Parcel 3 is located entirely within the KOA. KOA is defined as the combined area of land adjacent to the OB/OD unit, SWMU 14 (Demolition Landfill and Old Burning Ground), SWMU 15 (Old Demolition Area), and SWMU 33 (Waste Pile KP1) where WMM were released during the operation of the OB/OD unit and solid waste were released during the operation of SWMU 14, SWMU 15, and SWMU 33.

The JV is currently performing surface and subsurface clearance of MEC and MD within the KOA IAW *Final Kickout Area MEC Removal and Surface Clearance Work Plan* (PIKA-Pirnie JV, 2015a), approved by NMED. The JV also plans to perform interim measures to remove WMM and WMM scrap in AOCs and SWMUs within the KOA IAW the *Interim Measures Work Plan* (PIKA-Pirnie JV, 2015b), currently under review by the USACE. The purpose of the RFI is to determine the presence of COPCs in surface soil at the SWMUs and AOCs associated with past use of these areas and, if present, determine the lateral extent of contamination in surface soil. The following information is presented for an understanding of the historical use of Parcel 3.

An area known as the Closed OB/OD Area within Parcel 3 was used from 1948 to 1955. Residue and debris from OB/OD operations were placed at various locations within the Closed OB/OD Area. Because the period of operations in the Closed OB/OD Area predated RCRA by approximately 25 years, the Closed OB/OD Area was not permitted under RCRA. Therefore, when the Permit was issued, the area previously known as the Closed OB/OD Area was identified as three separate SWMUs:

* SWMU 14, which is also described as the Old Burning Ground and Demolition Landfill Area;
* SWMU 15, which is also described as the Old Demolition Area; and,
* SWMU 33, also described as Waste Pile KP1.

From approximately 1955 until installation closure in January 1993, burning and detonation operations were performed within an area known as the Current OB/OD Area also located within Parcel 3. The OB/OD Unit is an active unit located in the southwest part of the facility. After 1980, the OB/OD Unit was classified as a RCRA HWMU. The HWMU (Current OB/OD area) is not included within the scope of this RFI.

Parcel 3 also contains one additional SWMU and four AOCs:

* SWMU 74, which is also described as Area 16 or Site 16 (Proposed Burning Ground);
* AOC 89, which is also described as Features 30 and 34 on the 1973 Aerial Photo API-5;
* AOC 90, which is also described as Feature 36 on the 1973 Aerial Photo API-5;
* AOC 91, which is also described as Feature 41 on the 1973 Aerial Photo API-5 and Feature 27 on the 1978 Aerial Photo API-7; and
* AOC 92, which is also described as Feature 31 on the 1973 Aerial Photo API-5 and Feature 21 on the 1978 Aerial Photo API-7.

Potential receptors, characteristics of waste, known/possible sources, history of releases, known extent of contamination, and summaries of past investigations are included in Sections 5 through 10.

## Site Conditions

### Project Location

FWDA is located in northwestern New Mexico in McKinley County, approximately seven miles east of Gallup, New Mexico. FWDA currently occupies approximately 24 square miles (15,277 acres) of land with facilities formerly used to operate a reserve storage facility providing for the care, preservation, and minor maintenance of assigned commodities–primarily conventional military munitions. The terrain is best described as gently hilly to steep inaccessible terrain, with mixed pine and hardwood forests. McKinley County, bisected by the Continental Divide, encompasses the scenic Chuska and Zuni Mountains with peaks ranging up to 8,969 feet (ft) at the summit of Cerros de Alejandro. FWDA is located within the Zuni Mountains. The elevation at FWDA ranges from 6,500 ft above mean sea level to 8,250 ft above mean sea level with terrain ranging from rolling hills to impassable sheer cliffs and deep arroyos. The topography of Parcel 3 is shown on **Figure 3‑3**.

### FWDA Site Conditions

The following information regarding the site conditions at the FWDA is from U.S. Geological Survey Report 2013-5098 (Robertson et al., 2013):

*Climate and Vegetation*

The climate of the region is arid to semiarid; precipitation has averaged 11.9 inches at FWDA (1940 to 1966), 11.3 inches at Gallup, New Mexico (1921 to 2005), and 18.7 inches at McGaffey, New Mexico (1923 to 2005), in the Zuni Mountains (Western Regional Climate Center, 2010). The majority of the precipitation at FWDA occurs during the monsoon season (midsummer and early fall); however, the slow release of spring snowmelt provides for a higher percentage of infiltration as compared to the precipitation from the intense monsoon thunderstorms. The regional climate supports Ponderosa Pine and mixed fir forests above 7,500 ft and predominantly piñon and juniper forests from 6,800 to 7,500 ft; shrubs and grasses dominate below 6,800 ft (Anderson and others, 2003).

*Regional Geology*

FWDA is located in the Navajo Section of the Colorado Plateau physiographic region (Fenneman and Johnson, 1946) within the Gallup sag and at the northwestern edge of the Zuni Mountains (Zuni uplift) (Cather, 2003, 2004). The Zuni uplift is a northwest-striking, asymmetric uplift (Lorenz and Cooper, 2001). The uplift gently tilted the bedrock underlying the majority of FWDA to the northwest at an angle of approximately five degrees from horizontal (Lorenz and Cooper, 2001); subsequent erosion has exhumed the various Triassic sedimentary layers visible across the surface of the FWDA.

The dominant topographic and structural feature at FWDA is the Nutria monocline, known locally as “The Hogback” (Figure 3-2). The Nutria monocline is a north-northwest to south-southeast trending monocline dipping steeply to the south-southwest and defines the west and southwest margin of the Zuni uplift. The northern boundary of FWDA terminates in the strike valley (a valley eroded parallel to the strike of the underlying rock formations) of the South Fork of the Puerco River. This valley represents the transition between the Zuni uplift to the south and the Chaco slope to the north.

Granites and smaller amounts of schist and gneiss of Precambrian age compose the underlying basement formation of the region and are exposed in the Zuni Mountains to the southeast (Gordon, 1961). The preservation of sedimentary deposits now visible at the surface on FWDA began in the Late Pennsylvanian epoch; the depositional environment changed from marine to continental and restricted marine by the Early Permian period (Baars, 1962). The Petrified Forest Formation is composed of the Blue Mesa, Sonsela, and Painted Desert members. The Chinle Group was elevated from formation to group status by Lucas (1993) but this change has not been fully accepted (Dubiel, 1994; Woody, 2006). The Chinle Group designation is used for purposes of this report.

*Surface Hydrology*

FWDA is located approximately 15 miles west of the Continental Divide. While no perennial streams are located within FWDA’s boundaries, the surface water collecting in drainages, flows northward to the South Fork of the Puerco River. The South Fork of the Puerco River joins the Puerco River just east of Gallup and is part of the larger Puerco River and Little Colorado River watersheds. FWDA contains multiple unnamed drainages that are high-gradient (100 ft/mile or greater) ephemeral streams and are typically fed by spring snowmelt or monsoon season thunderstorms (Anderson and others, 2003).

*Groundwater*

There are several water-bearing units underlying FWDA (Shomaker, 1971). These include the San Andres-Glorieta Formations, the Shinarump Formation, and the Sonsela Member and several thin sandstone beds within the Painted Desert Member of the Petrified Forest Formation, as well as the Quaternary alluvium. In the Administration Area, the Quaternary alluvium contains interbedded layers of sediments with variable moisture content in the vertical profile. Groundwater in the region has been produced from the Shinarump Formation and the Sonsela Member of the Petrified Forest Formation (Errol L. Montgomery & Associates, Inc., 2003). Yields reported from these aquifers range from five to 50 gallons per minute.

The San Andres-Glorieta aquifer is the principal aquifer in the region. At FWDA, the top of the San Andres-Glorieta aquifer is about 1,100 ft below ground surface (bgs) and has a thickness of about 200 ft (Shomaker, 1971). The San Andres-Glorieta aquifer is composed of the San Andres Limestone and the Glorieta Sandstone. The two units are considered a single aquifer because no impermeable bed separates them (Callahan and Cushman, 1954) and extensive interfingering makes determination of the contact difficult (Baldwin and Anderholm, 1992).

### Parcel 3 Surface Conditions

The Rock outcrop -Vessilla complex is a major soil type along the eastern edge of the parcel. Vessilla complex parent material is eolian material and slope alluvium derived from sandstone. This complex has 35 to 50 percent (%) slopes and is considered excessively drained. It is considered a fine sandy loam.

Through the central portion of the parcel, the Evpark-Arabrab complex is the major soil type. This complex has 2 to 6 % slopes and has a parent material of eolian material and slope alluvium derived from sandstone and shale. It is considered a loamy soil (USDA NRCS, 2001) (**Figure 3‑3**).

### Parcel 3 Subsurface Conditions

Parcel 3 is underlain by a complex hydrogeologic regime including several water-bearing rock formations and minor amounts of saturated unconsolidated sediments. In general, the Nutria Monocline Fault Zone (“fault zone”) bisects Parcel 3 at the Current OB/OD Area and the eastern portion of the Closed OB/OD Area. This fault zone consists of a complex series of steeply dipping, roughly north-south trending faults.

The central portion of the site is dominated by Triassic Petrified Forest Formation and Painted Desert Member. The western side of the parcel contains Jurassic Zuni Sandstone and Morrison Formation outcrops. The southwestern portion of the site is dominated by Cretaceous Mancos Shale and Dakota Sandstone (Figure 3‑4). The Mancos Shale is a slightly clayey, light-gray limestone overlying the Dakota Sandstone. The Dakota Sandstone is a light-gray, fine grained, not well cemented, sandstone (DOI, 1973).

**Figure 3‑1: Topography and Watershed of Parcel 3**

**Figure 3‑2: Facility-wide Geologic Map**

**Figure 3‑3: Natural Resources Conservation Service Soil Map for Parcel 3**

Figure 3‑4: Regional Geology for Parcel 3

# Investigation Methods

## Previous Investigations

The environmental restoration process has been underway for more than 30 years at the FWDA. In 1980, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) began to guide the environmental restoration activities, other than those in the OB/OD Area, with the U.S. Environmental Protection Agency (USEPA) Region 6 as the lead regulatory agency. In 1996 the NMED was granted regulatory authority under RCRA and became the lead regulatory agency at the site. Activities are currently performed under the RCRA Permit issued in 2005 and modified in 2014.

SWMUs 14, 15, 33, and 74, and AOCs 89, 90, 91, and 92 constitute the relevant SWMUs and AOCs listed for Parcel 3 in Attachment 8, Table 1 of the RCRA Permit. Available historical information from prior investigations at these sites has been compiled and summarized in the Historical Information Summary Document (Appendix A). Findings from previous investigations for each SWMU and AOC being investigated as part of this RFI are presented in Sections 5.2, 6.2, 7.2, 8.2, 9.2, 10.2, 11.2, and 12.2 of this document.

The HWMU located within Parcel 3 and KOA encompassing Parcel 3 represent MEC hazards and are being investigated/restored under other work activities.

## Evaluation of Existing Data

Existing data have been evaluated to determine whether additional field activities are required to determine the nature and lateral extent of potential environmental impacts in surface soil at the SWMUs and AOCs being investigated within Parcel 3. The following sections present a brief discussion of the general types of existing data available for the investigation areas.

### Non-sampling Data

Non-sampling data available for Parcel 3 include facility drawings, maps, photographs, aerial imagery, and historical documents. Specific non-sampling data available is discussed further in Sections 5.2.1, 6.2.1, 7.2.1, 8.2.1, 9.2.1, 10.2.1, 11.2.1, and 12.2.1 of this document.

### Sampling Data

Sampling data available for Parcel 3 include surface soil samples collected and analyzed during prior investigations. Specific sampling data available for the SWMUs and AOCs being investigated as part of this RFI are evaluated in Sections 5.2.2, 6.2.2, 7.2.2, 8.2.2, 9.2.2, 10.2.2, 11.2.2, and 12.2.2 of this document.

## Data Quality Objectives

Parcel 3 and its associated SWMUs and AOCs are located entirely within the defined boundaries of the KOA. There are three primary environmental issues at the KOA from past operations:

* MEC and MD contamination (all AOCs and SWMUs non-burial pit areas): The surface and subsurface soil of these areas are potentially contaminated with MEC and Material Potentially Presenting and Explosive Hazard (MPPEH) resulting from past operations. The MEC and MPPEH items are currently being addressed via surface and subsurface clearance of MEC and MD within the KOA IAW the NMED-approved *Final Work Plan Munitions and Explosives of Concern Removal and Surface Clearance Kickout Area* (PIKA-Pirnie JV, 2015a).
* Burial pits (SWMUs 14, 15 and the SWMU 33 waste pile) contain waste debris, and are potentially contaminated with MEC, MPPEH and metallic scrap related to munitions disposal. This waste will be removed IAW the *Interim Measures Work Plan AOCs and SWMUs in the KOA* (PIKA-Pirnie JV, 2015b), currently under review by the USACE.
* Potential soil contamination exists in the burial pits resulting from long-term burial of waste and debris. The presence or absence munitions constituents (MC) related to past operations at SWMUs and AOCs is currently unknown.

For the RFI work, data quality objectives (DQOs) have been developed for characterization of COPCs within surface soils at the SWMUs and AOCs at Parcel 3 and for reporting to NMED. For AOC 92, the characterization data will also be used to determine soil removal requirements (to be performed IAW the *Interim Measures Work Plan Areas of Concern and Solid Waste Management Units in the KOA, October 2015*.)

1. **Statement of Problem**

There is one primary problem associated with COPCs within the AOCs and SWMUs which will involve soil sampling activities:

The presence or absence of COPCs in surface soil related to past site operations is unknown. If COPCs are present in surface soil, the current data is not sufficient to characterize the extent of that contamination.

1. **Identification of a Decision that Addresses the Problem**

The decision addressing the primary problem is:

Potential Soil Contamination: To comply with Section VII of the RCRA Permit, the lateral extent of COPCs in the surface soil at the SWMUs and AOCs in Parcel 3 will be determined by collecting and analyzing surface soil samples and evaluating the presence and/or absence of COPCs at concentrations greater than approved screening levels. Soil characterization samples collected using Incremental Sampling Methodology (ISM) and composite sampling techniques will be analyzed for COPCs. The COPCs associated with MC include explosives, RCRA 8 metals, perchlorate, and SVOCs.

The COPCs identified above were determined based on planning documents approved by NMED for similar sites.

1. **Identification of Inputs Affecting the Decision**

Inputs affecting the decision of whether or not COPCs in soil samples from the SWMUs and AOCs exceed approved screening levels include the validated analytical results for collected soil samples, site specific background concentrations for metals, the NMED Residential Soil Screening Levels (SSLs) or USEPA Region 6 Regional Screening Levels (RSLs), and the two step approach for assessing arsenic in soils at the FWDA recommended by the NMED in their December 18, 2003 letter (Appendix C; see also Section 5.2.3.4). The evaluation of metals background and the risk/hazard-based screening level for each analyte will be determined as follows:

**Metals Background**

The FWDA soil background for metals (with the exception of arsenic and antimony), are based on the Soil Background Study and Data Evaluation Report Version 2 (Shaw, 2010). In accordance with NMED’s Evaluation of Background Levels for Arsenic in Soil, dated December 18, 2013, 5.6 milligrams per kilogram (mg/kg) will be used for arsenic.. If the arsenic value of 5.6 mg/kg is exceeded, then the detected site range compared to the background range of 0.2-11.2 mg/kg will be considered. The background value (0.23 mg/kg) for antimony is the 95% Upper Tolerance Limit for soil unit 350ss based on the 2012 background study. Metals determined to be at or below background will be eliminated from further consideration and will not be considered for estimation of potential risk/hazard.

**Risk/Hazard-Based Screening Level Hierarchy**

The risk/hazard-based screening levels have been determined IAW the FWDA soil cleanup levels as defined by the Permit Attachment 7 (December 2005, Revised April 2014). The following hierarchy will be used to determine the risk/hazard-based screening level for each analyte:

* The current NMED Residential Soil Screening Level (SSL) per the NMED Risk Assessment Guidance for Site Investigations and Remediation (December 2014) will be used (with the exception of arsenic) (<http://www.nmenv.state.nm.us/HWB/documents/RA_Guidance_for_SI_and_Remediation_12-24-2014.pdf> ).
* A site-specific background level of 5.6 mg/kg will be used for arsenic in lieu of the NMED Residential SSL in accordance with NMED’s Evaluation of Background Levels for Arsenic in Soil, dated December 18, 2013. If the arsenic value of 5.6 mg/kg is exceeded, the site range compared to the background range of 0.2-11.2 mg/kg will be considered. If it is determined arsenic is above background, the NMED Residential SSL of 4.25 mg/kg (cancer endpoint) will be used for assessment of potential risk.
* If a NMED Residential SSL has not been established, the most recent (currently January 2015) USEPA Residential RSL (<http://www.epa.gov/region9/superfund/prg/>) will be used. USEPA RSLs based on a cancer endpoint are adjusted to a cancer risk of 1x10-5 consistent with NMED guidance.
* If an analyte does not have an NMED SSL or USEPA RSL, appropriate surrogates may be used with NMED approval.

**Potential Cumulative Risk/Hazard**

Potential cumulative risk/hazard will be assessed as follows:

* For metals the initial comparison will be made to background levels. Metals determined to be at or below background will be eliminated from further consideration. If it is determined that background is exceeded then comparison will be made to the appropriate risk/hazard-based screening level (NMED Residential SSL or USEPA Residential RSL, as appropriate) to estimate potential cumulative risk/hazard.
* Potential cumulative risk will be assessed by summing potential risks for each individual analyte. The risk threshold is 1x10-5.
* For potential cumulative hazard estimates, individual hazard quotients are summed to provide a cumulative hazard index (HI). The target hazard is 1. The HI is compared to 1. If the HI is less than 1 then unacceptable hazard is not expected. If the HI is greater than 1 then unacceptable hazard is possible. When the HI for a data set exceeds 1, but an individual hazard quotient does not exceed 1, then it may be appropriate to perform further assessment by assessing the toxic endpoint (target organ) of the analytes contributing to the HI exceeding 1. The critical toxicity and secondary toxicity should be assessed.
* Lead is assessed separately.

1. **Specification of the Domain of the Decision**

The domain of the decision of whether or not soil at the SWMUs/AOCs have been negatively impacted is restricted to the evaluation of only those parameters for which samples are analyzed and for which a screening level has been defined (NMED SSL or USEPA RSL).

1. **Development of a Logic Statement**

Characterization Sampling (ISM and Composite samples): If the validated analytical data for samples collected during the RFI exceed the risk/hazard-based screening levels, the area from which the sample was collected will be considered affected. Additional horizontal and/or vertical delineation may then be required until data indicates non-contaminated soil is encountered.

1. **Establishment of Constraints on Uncertainty**

Uncertainty in the data used to evaluate the logic statement will be constrained by following the quality assurance and quality control (QA/QC) guidelines specified in the UFP-QAPP (Appendix D); selecting the appropriate analytical support level for the soil sample data; and by adhering to both the field and laboratory data quality indicator objectives (precision, accuracy, representativeness, comparability, and completeness). All reasonable attempts will be made to ensure laboratory reporting limits and/or method detection limits are below the screening levels.

1. **Optimization of Design for Obtaining Data**

To optimize the quality of data collected for evaluation, this RFI WP will be used as guidance during field activities. QA/QC procedures associated with the field activities described in this document are presented in the UPF-QAPP (Appendix D).

## Planned Investigations

This RFI WP describes field activities to be conducted in Parcel 3 to determine the presence or absence of COPCs in surface soil at SWMUs 14, 15, 33, and 74, and AOCs 89, 90, 91, and 92.

Cultural resources coordination, specific sampling methods and procedures, management of investigation-derived waste (IDW), and health and safety procedures are presented in the sections below and in specified appendices to this document.

### Cultural Resources Coordination

The Army, in consultation with the NN and the POZ has documented cultural resources within the FWDA boundaries. The location of cultural resources relative to the proposed investigation and remediation locations are not included in this WP, which when final, will be a public document.

Cultural sites within the KOA boundary have been located and field marked by NN and POZ tribal archaeologists. The field marking effort included cultural sites in and near the Parcel 3 SWMUs and AOCs. In the event potential cultural resources are discovered, during investigation and clearance operations, the site will be managed IAW procedures outlined in the approved Cultural Resources Management Plan. A copy of the Cultural Resources Management Plan is included as Appendix B.

### Health and Safety

The project-specific APP and SSHP was amended for this work and reviewed and accepted by the Army.

### ISM Soil Sampling

ISM samples will be collected in areas suspected to be impacted by historical uses. The ISM sampling program will follow the guidance provided in *Incremental Sampling Methodology [ISM] for Metallic Residues*, Project ER-0918 (USACE, 2013) and *Technical and Regulatory Guidance Incremental Sampling Methodology* (ITRC, 2012) provided as part of the UFP-QAPP in Appendix D. Collecting and combining a large number of increments from a Decision Unit (DU) to produce one incremental sample is the physical analog of collecting and separately analyzing an equal number of discrete samples from the DU and arithmetically averaging the results. The ISM methodology provides an unbiased and representative estimate of the mean concentration of explosives, RCRA 8 metals, and perchlorate in the DU. Details describing the dimensions of the DUs and how the ISM samples are collected are provided in Sections 5.4.1, 6.4.1, 7.4.1, 8.4.1, 9.4.1, and 10.4.1 and in the SOPs provided with the UFP-QAPP in Appendix D. General ISM sampling procedures include:

* The ISM samples will be placed into new, large, double-bagged, non-preserved Ziploc bags. Each inner sample bag will be labeled and include site name, sample number, date, time of sample, name of sampler, and analysis IAW FWDA format;
* The sample information will be recorded on the field sample collection form;
* The sample information will be recorded on the Chain of Custody (COC);
* The sample bag will be placed on ice until prepared for shipping to the laboratory; and,
* The samples will be packaged under COC for shipment to the laboratory for analysis.

Sample collection volumes and holding times are described in the project UFP-QAPP (Appendix D).

### Composite Soil Sampling

Composite soil sampling will be conducted during ISM sampling activities to determine the presence or absence of SVOCs at SWMUs 14, 15, 33, and 74, and AOCs 89, 90, 91, and 92. The composite sample will be comprised of six subsamples (nine subsamples at AOC 92), collected from within the DU. Specific sampling activities are described in Sections 5.4.2, 6.4.2, 7.4.2, 8.4.2, 9.4.2, and 10.4.2. The samples will be collected using either a new or decontaminated sampling tool as required by the analytical method. General composite sampling procedures include:

* The samples will be placed into new, laboratory provided sample containers. Each sample container will be labeled and include site name, sample number, date, time of sample, name of sampler(s), and analysis IAW FWDA format;
* The sample information will be recorded on the field sample collection form;
* The sample information will be recorded on the COC;
* The sample container will be placed in a zip lock bag, sealed and placed on ice until prepared for shipping to the laboratory; and,
* The samples will then be packaged under COC for shipment to the laboratory for analysis.

Sample collection SOPs, sample collection volumes, bottle requirements, preservation, and holding times are described in the project UFP-QAPP (Appendix D).

### Groundwater Assessment

Groundwater at the SWMUs and AOCs is not within the current RFI scope and is being assessed under a separate project.

### Survey of Points

The corners of each ISM DU established for site characterization sampling will be recorded with a hand held Global Positioning System (GPS) unit (e.g., Trimble GeoXT, or equivalent) with sub-meter accuracy or better. Horizontal coordinates for GPS data points will be referenced to the New Mexico State Planar grid or Universal Transverse Mercator coordinates.

Because the sampling work being undertaken at AOC 92 is intended to support potential corrective action, the corners of the ISM DUs established for AOC 92 will be surveyed to the nearest foot. A New Mexico-licensed professional surveyor, will perform location surveying and mapping IAW Data Item Description Worldwide Environmental Remediation Services -007.01. The surveyor will conduct a survey to establish control monuments or survey markers with a minimum of horizontal control Class I. Third order accuracy will be established for all new primary control monuments established by the New Mexico-licensed professional surveyor. Horizontal control is referenced to New Mexico State Plane North American Datum of 1983, with units of U.S. survey ft. Staking of control points and points of interest will be accomplished by driving wooden stakes for temporary markers. The surveyed geographic position and State Plane coordinates will be referenced to the primary control monuments established for the project. Vertical control or topography will not be surveyed. Survey control points will be used as Real-Time Kinematic Digital GPS base stations within radio line-of-sight to each survey area.

An Unexploded Ordnance (UXO) Technician II, or higher, will escort survey personnel and provide anomaly avoidance support, as needed, for survey work. During all field and intrusive operations, the survey crew will be accompanied by UXO qualified personnel. The UXO technician will perform a visual MEC survey for surface ordnance before the survey crew enters the area and a magnetometer survey of each intrusive activity site to ensure the survey/staking point is anomaly-free before the survey crew begins setting monuments, driving stakes, or establishing other points. Pertinent information related to items recovered during the survey related anomaly avoidance process will be entered into the Geographic Information System database and included in the Final RFI Report.

### Sampling Identification, Chain-of-Custody, Packaging, and Shipping Procedures

#### Sample Identification

The sample identification will consist of a combination of the Parcel number, SWMU or AOC number, additional site identifier, source of sample, DU, type of sample, and depth of sample collection IAW the latest version of the FWDA Environmental Information Management Plan (USACE, 2007). An additional description of the proposed sample nomenclature system (using SWMU 14) is shown in the example below:

Parcel: 3

SWMU or AOC: 14

Source of Sample: SS (surface soil)

DU Number: XX or XXX, DU number as appropriate

Depth Range (ft): 0.0-0.5 (most cases)

Type of Sample: IS (Incremental Sample), C (composite)

Matrix: SO (Soil)

QA/QC samples (as described in the UFP-QAPP [Appendix D]) will carry the same sample nomenclature as the parent sample with a unique suffix and numeral (if required) to distinguish individual samples. An example of a sample identification label is provided in Worksheet #18 of the UFP-QAPP (Appendix D).

#### Chain-of-Custody

COC forms will be completed and accompany each sample at all times. Data on the forms will include the sample number, name of sampler(s), date sampled, time sampled, project name, project number, and signatures of those in possession of the sample. Forms will accompany those samples shipped to the designated laboratory so sample possession information can be maintained. The field team will retain a separate copy of the COC reports at the field office. Additionally, the sample numbers; name of sampler(s), date and time collected; collection location; tracking number; and analysis will be documented in the field log book. An example of a COC form is provided in Appendix D.

#### Packing and Shipping Procedures

All samples will be shipped by overnight air freight to the laboratory. Unless otherwise indicated, samples will be treated as environmental samples, shipped in sealed plastics bags, inside heavy-duty coolers, packed in material to prevent breakage, and preserved with ice. Corresponding COC forms will be placed in waterproof bags and taped to the inside of the cooler’s lid which will be sealed using tape and custody seals with the project name and date.

### Field Documentation

Appropriate field documentation for all activities will be maintained as part of the formal project documentation. This documentation includes field notes, sample collection forms, photographs, COCs, geophysical data, and Geographic Information System data. Field sampling documentation and data reporting will adhere to those procedures specified in the SOPs provided with the UFP-QAPP (Appendix D). An example of the field sampling form is provided in Appendix D.

### Investigation-Derived Waste Disposal

IDW will be managed IAW the WMP (Appendix F). Three types of IDW may be generated during the soil investigation sampling of environmental media: residual soil volume, disposable sampling equipment and personal protective equipment. This IDW will be managed as follows:

* Surface soil that remains after required sample volumes have been collected will be returned to the hole.
* Used, non-decontaminated disposable sampling equipment or personal protective equipment will be placed in polyethylene trash bags and treated as general refuse which will be placed in suitable facility trash receptacles on a daily basis.
* After the completion of a field investigation in a specific area, all IDW will be immediately removed from the area and disposed of according to procedures in the WMP (Appendix F).

Table 4‑1: Document Summary Table - Parcel 3

(SWMUs 14, 15, 33, and 74, and AOCs 89, 90, 91, and 92)

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# SWMU 14

## Background

### Location, Description, and Operational History

SWMU 14 was used for demilitarization activities which were part of the FWDA mission of demilitarizing unserviceable, obsolete, and/or waste explosives, propellants, munitions and munitions components. This area was used between 1948 and 1955. Some of these demilitarization activities were accomplished using treatment by OB or OD. Related materials were also treated in this area, including objects potentially contaminated with explosives during storage and handling, such as shipping containers and dunnage.

SWMU 14, known as the Old Burning Ground and Demolition Landfill Area, is approximately 15 acres and located in the north-central portion of Parcel 3. This area was used to dispose of explosives contaminated waste from the TNT Washout Plant and old equipment from the TNT drying and flaking operations. The area was permitted by the Army to open burn up to 30,000 pounds of explosives at a time. The Demolition Landfill Area reportedly contained 75 millimeter projectiles, fuzes/fuze components, shell casings, pipes (ranging in various sizes and lengths), metal strapping and other metal materials.

### MEC, MPPEH, and Burial Pits at SWMU 14

The MEC and MPPEH items are currently being addressed via surface and subsurface clearance of MEC and MD within the KOA IAW the NMED-approved *Final Work Plan Munitions and Explosives of Concern Removal and Surface Clearance Kickout Area* (PIKA-Pirnie JV, 2015a). The results of the MEC removal activities will be presented to the NMED in the Final KOA MEC Removal Report.

This waste in the burial pits and debris will be removed IAW the *Interim Measures Work Plan AOCs and SWMUs in the KOA* (PIKA-Pirnie JV, 2015b), currently under review by the USACE. The results of removal activities for burial pits and debris piles will be presented to the NMED in the Final Interim Measures SWMUs and AOCs Report.

This RFI WP will focus on areas in SWMU 14 located outside of the burial pits. The RFI activities will be performed after the surface and subsurface clearance of MEC, and after completion of the Interim Measures activities.

### Waste Characterizations and Contaminants of Potential Concern

The operational history of FDWA indicates SWMU 14 was used for demilitarization activities. Based on the operational history, the COPCs for the soil investigation activities at SWMU 14 in areas other than the burial pit removal areas are explosives, RCRA 8 metals, perchlorate, and SVOCs.

## Previous Investigations

Previous investigations are summarized in Table 4‑1. Previous investigation areas for SWMU 14 are illustrated on Figure 5-1. Results of previous investigations for this SWMU are discussed in the following sections. Previous investigation areas for the HWMU are illustrated on Figure 5-2 through Figure 5-4.

### Non-sampling Data

Previous non-sampling data include historical aerial photographs available for SWMU 14 as presented in the Historical Investigation Summary Document (Appendix A), Table 4‑1 and geophysical surveys.

#### Aerial Photographs

Aerial photographs for SWMUs 14 showed evidence of potential debris (particularly along the arroyo) and within mounds. The burial pits within SWMU 14 will be addressed separately and not included under this RFI WP.

#### Geophysical Surveys

The objectives of the surveys were to delineate the lateral extent of potentially disturbed ground within specific sub-areas of the Closed OB/OD Area (now known as SWMU 14, 15, and 33) and to detect buried metal objects. To achieve these objectives, electromagnetic induction (EM), magnetic (MAG), and ground-penetrating radar (GPR) geophysical techniques were used. EM and MAG surveys were conducted over established survey grids. GPR data were collected at specific anomalies identified by the EM and MAG surveys.

The results of the geophysical surveys for the Parcel 3 SWMUs are presented in the document entitled the *Final Open Burning/Open Detonation Area RCRA Interim Status Closure Plan Phase IA – Characterization and Assessment of Site Conditions for the Soils/Solid Matrix* (PMC, 1999a). Since accurate mapping was not completed at the time of the geophysical surveys, local grids (50 ft by 50 ft) were established at the two areas surveyed, and the boundaries of geophysical anomalies identified for further investigation were staked and later surveyed for inclusion on project maps. A review of the grid maps shows more than nine acres in the area of SWMU 14 were surveyed using geophysical methods. Three geophysical anomalies (KGA3 through KGA5) were identified within SWMU 14 and delineated for further characterization.

### Sampling Data

The following is a summary of previous environmental investigations conducted at SWMU 14. Surface water and groundwater investigations were also conducted, but are not summarized here as surface water and groundwater media are not covered under this RFI scope. Additional information, including document excerpts, from the previous investigative activities performed at this SWMU is described in the Historical Investigation Summary Document (Appendix A) and a table summarizing historical soil data collected from this SWMU is presented in Appendix C. Potential cumulative risk/hazard was not assessed for previous data; however, the historical data will be included in the evaluation of the risks and hazards in the RFI Report.

### Environmental Investigations Conducted Under Pre-Permit Closure Plan

This section summarizes environmental characterization efforts completed under the approved pre-Permit Closure Plan. The NMED-approved Final Interim Status Closure Plan (ERM, 1993) incorporated Closure Field Program (CFP) WPs presenting the approaches in performing environmental sampling, site characterization, and engineering evaluations of the closed OB/OD Area. These activities were necessary to support finalization of the Closure Plan and select a closure/remedial option for implementation. As specified by NMED, the CFP contained three phases:

* Phase I – Characterization and Assessment of Site Conditions;
* Phase II – Description, Evaluation, and Recommendation of Closure-Remedial Options; and,
* Phase III – Design, Construction and Operation of Selected Closure Option.

Field efforts to satisfy Phase I of the CFP were conducted from 1996 through 1998. Soil and waste characterization efforts in the OB/OD Unit and all Parcel 3 SWMUs were performed during 1996. Eleven monitoring wells were installed and sampled in October 1996 and February 1997. Water level data collected indicated the distribution of hydraulic heads was complex and required additional definition.

Further subsurface characterization consisting of subsurface seismic profiling, geophysical borehole logging, geologic mapping, and fracture trace analysis was proposed in the Final OB/OD Area Work Plan (PMC, 1998). These characterization efforts were completed in 1997 and the results were used to select locations for additional monitoring wells.

Further characterization of the OB/OD Area was proposed in the Final OB/OD Area Work Plan (PMC, 1998). The characterization activities consisted of focused geologic mapping within the OB/OD Area arroyos, identification of wells near FWDA, completion of eight additional boreholes/monitoring wells, and collection and analysis of surface water, sediment, and ground water samples. These efforts were completed in 1998.

The results of Phase I of the CFP were provided to NMED in two documents:

* The first document, entitled *Final Open Burning/Open Detonation Area RCRA Interim Status Closure Plan Phase IA – Characterization and Assessment of Site Conditions for the Soils/Solid Matrix (Phase IA Report)* (PMC, 1999a), was submitted to NMED on 25 November 1999.
* The second document, entitled *Final Open Burning/Open Detonation Area RCRA Interim Status Closure Plan Phase IB – Characterization and Assessment of Site Conditions for the Ground Water Matrix (Phase IB Report)* (PMC, 1999b), was submitted to NMED on 29 December 1999.

Interim groundwater sampling was performed during 2000, 2001, 2002, 2003, and 2005 for continued monitoring of groundwater at both the OB/OD Unit HWMU and the Parcel 3 SWMUs. These sampling events are detailed in the *Hydrogeologic Summary Report* dated 27 February 2006 (TPMC, 2006a).

#### Waste and Underlying Soil Characterization

Investigations were performed in 1996 to characterize conditions in six areas where either waste materials were visible on the ground surface or a geophysical anomaly was detected within the Old Burning Ground (SWMU 14).

The primary objectives of the investigations were:

* To characterize the types of waste/debris present;
* To confirm the lateral extent of the waste/debris identified by the geophysical and/or visual surveys;
* To delineate the vertical extent of the waste/debris; and,
* To estimate the volumes of waste/debris and potentially impacted soil.

The areas were mapped and investigation trenches were completed using a shielded trackhoe (PMC, 1999a) in order to allow observation and sampling of waste and underlying soil. Field teams consisted of a UXO-qualified equipment operator, a UXO-qualified safety observer, and an environmental professional. Samples of waste and/or soil were screened in a field laboratory using immunoassay test kits for explosives and an X-ray Fluorescence instrument for metals. Field screening results were used to guide further trenching and/or to select samples for off-site laboratory confirmation analyses (PMC 1999a). Waste characterization samples were collected: representative (grab) waste samples were analyzed for total organic carbon (TOC), particle size distribution, Toxicity Characteristic Leaching Procedure for explosives and metals, and Synthetic Precipitation Leaching Procedure for explosives and metals. Composite waste samples were submitted for laboratory analysis of total explosives and total Target Analyte List (TAL) metals. Samples from the Parcel 3 SWMUs were also analyzed for total phosphorous because of reported disposal/treatment of munitions containing white phosphorus filler in the Closed OB/OD Area. The current USEPA method for determining white phosphorus concentrations (SW846 7580) was approved in December 1996, after the field investigations had been completed, and thus was not part of the CFP effort.

“Background” soil data were acquired via collection and analysis of near-surface soil samples. Soil samples were collected from 20 locations in two areas believed to be un-impacted/undisturbed by FWDA operations. Samples were collected from each location at depths of 0.5 ft to 1.0 ft bgs. Background samples were analyzed for total explosives, TAL metals, salinity, acidity, and total phosphorus (select samples only). Although data from these “background” locations was submitted to NMED for review as part of the Phase IA Report in November 1999, no comments on, nor approval of, the Phase IA Report was received from NMED and thus these data do not represent approved background values. The “background” data have not been used in evaluation of existing data in the companion Closure Plan Phase I Work Plan (PMC, 1999a).

Confirmatory grab soil samples were submitted for laboratory analysis of explosives and TAL metals once the extent of a trench was beyond the visible limits of waste or contaminated soil (based on field screening results). The purpose of these samples was to document the results of field screening and to evaluate constituent concentrations in the native soils situated just beyond the horizontal and/or vertical extents of waste materials and/or impacted soil. “Representative” soil samples were grab samples collected from generally the same locations (just beyond the horizontal and/or vertical extents of waste materials and/or impacted soil) to characterize soil properties that may affect fate and transport of detected constituents through site soils. Representative soil samples were analyzed for moisture content, cation exchange capacity, TOC, particle size distribution, and pH.

Samples to characterize deeper subsurface soils outside the waste areas were collected during completion of soil borings (which were later completed as groundwater monitoring wells). These samples were analyzed for explosives and TAL metals (PMC, 1999b).

#### Waste Characterization

Approximately 37 investigation trenches were completed through six areas (KP2 through KP4 and KGA 3 through KGA5) investigated within SWMU 14.

Residual materials from OB operations were found on and beneath the ground surface at five of the nine areas in SWMU 14; the KP3 area had only limited amounts of debris (e.g., metal pallet/container banding) on the ground surface, and the three Closed Stained Areas locations had only surface soil stained with explosives(PMC, 1999a).

#### Soil Characterization

Soil samples, both surface and subsurface, have been collected to characterize soils within and around SWMU 14 (Appendix A). Samples to characterize deeper subsurface soils outside the waste areas were collected during completion of soil borings which were later completed as groundwater monitoring wells. Analytical data summary tables including a comparison to Permit cleanup levels are provided in the companion Closure Plan Phase I Work Plan Phase IA (PMC, 1999a).

#### Soil Background Study and Data Evaluation Report, 2010

A background study was conducted and used to make a statistical determination on the nature and occurrence of inorganic constituents in soil at the FWDA based on site-to-background comparisons. In response to this study, the NMED recommended the following two-step approach to assessing arsenic at the FWDA in lieu of traditional site attribution analysis (NMED, 2013; Appendix C):

Step 1. Compare the site (SWMU/AOC) maximum arsenic concentration to the new background reference for arsenic (5.6 mg/kg). If the maximum detected concentration of arsenic from site soil is below 5.6 mg/kg, then no additional action is required and the arsenic may be considered background. If the site maximum, is greater than 5.6 mg/kg, proceed to Step 2.

Step 2. Compare the range of site (SWMU/AOC) data to the range of background data (0.2 to 11.2 mg/kg). If the site range falls within the background range of arsenic, then no additional action is required and the arsenic may be considered background. If the site range is inconsistent with the background range, then additional investigation and/or corrective action may be required.

### Conceptual Model

#### Site Profile and Land Use

SWMU 14, known as the Old Burning Ground and Demolition Landfill Area, consists of approximately 15 acres and is located in the north-central portion of Parcel 3. This area was used between 1948 and 1955. Some of the demilitarization activities performed at these SWMUs were accomplished using treatment by OB or OD. Related materials were also treated in these SWMUs, including objects potentially contaminated with explosives during storage and handling, such as shipping containers and dunnage. The FWDA is currently in BRAC caretaker status undergoing environmental investigation and remediation. Following environmental remediation, the land will be turned over to the BIA and held in trust for the NN and/or the POZ for unrestricted land use.

#### Nature and Extent of Contamination

The surface soil of SWMU should be characterized by collecting surface soil samples using ISM methodology and composite (6-point discrete) samples. Visual inspection during previous site reconnaissance found numerous MEC items and there have been a limited number of soil investigations conducted at the SWMU, which have not fully characterized the site. In addition, historical investigations also introduced the possibility of remaining MEC items in which further intrusive investigations should be conducted. Prior to the soil investigation, surface and subsurface clearance of the MEC items will be completed, and the burial pits within the SWMU will be removed. The surface soil in the investigation areas located outside of the burial pits limits will be sampled to determine the nature and lateral extent of contamination.

#### Fate and Transport

If soils at SWMU 14 are affected due to past operations, there is a potential for threat to human health and the environment through exposure to surface soils.

If MEC is found to be present during surface and subsurface clearance of MEC and MPPEH, and during removal of burial pits and debris, a threat to human health and the environment exists. The clearance of MEC/MPPEH and removal of burial pits and debris is performed separately (and prior to the RFI work) and is discussed in other work plans.

#### Data Gaps

Surface soils and geophysical anomalies where probable MEC items are present will be removed IAW other work plans.Additional surface soil samples need to be collected to characterize the nature and lateral extent of impacts in SMWU 14.Further subsurface investigation that may be required to characterize groundwater transport pathways will be done under a separate project.

## Investigation Methods

The following section provides the data gathering activities that will be conducted to characterize the surface soils within SWMU 14 outside of the burial pits that may have been impacted during the mission of the FWDA. Interim removals followed by confirmation sampling will be performed within the burial pits at SWMU 14 IAW the Army Draft *Interim Measures Work Plan Areas of Concern and Solid Waste Management Units, October 2015.* Confirmation sampling results will be presented in the Interim Measures Report.

### Contaminants of Potential Concern

As a result of potential demilitarization activities, the COPCs outside of the burial pits at SWMU 14 are:

* Explosives
* RCRA 8 metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver
* Perchlorate
* SVOCs

### Soil Characterization

The presence of affected surface soil outside of the burial areas at SWMU 14 will be evaluated by the collection of ISM samples and composite (6-point) samples.

### Analytical Methods

The following analytical methods will be used to analyze samples collected outside of the burial pits at SWMU 14 (discussed further in the UFP-QAPP included as Appendix D):

* Explosives by USEPA method SW846/8330B
* RCRA 8 metals by method 6010C/6020A/7471B
* Perchlorate by USEPA method SW846/6850
* SVOCs by USEPA method SW846/8270D

### Quality Assurance/Quality Control

The QA/QC practices specified in the project for environmental sampling are included in the UFP-QAPP (Appendix D).

## Scope of Activities

The following field activities will be conducted at SWMU 14:

* Locate and establish DUs
* Collection of surface soil ISM samples to identify if explosives, RCRA metals, or perchlorate exceed screening levels in the SWMUs as a result of OB/OD activities.
* Collection of composite surface soil samples to identify if SVOCs exceed screening levels in the SWMUs as a result of OB/OD activities.

### ISM Soil Sampling at SWMU 14

Thirty-three ISM samples will be collected from DUs located within SWMU 14 in areas outside of the burial areas, which are being excavated and removed

Figure 5-4 shows the proposed locations of thirty-three DUs for SWMU 14. The locations of DUs may be adjusted in the field based on field conditions. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications.

Each DU will be established as a grid with an area of 10,000 square ft, and 50 increments will be collected from each DU, from a depth of 0-6 inches. Most DUs will be a 100 ft by 100 ft square, with the exception of five DUs in SWMU 14, which are located near the boundaries of SWMU 14. These DUs will be 200 ft by 50 ft to allow them to remain within the limits of the SWMU.

The DU grids will be laid out as follows:

* The southwest corner of each grid to be sampled will be located using GPS coordinates and staked (Section 4.4.8).
* The remaining three corners will then be staked and GPS coordinates taken.
* After the four corners are staked, the length of each side of the DU will then be measured with a tape measure, to verify the dimension. Corner locations will be adjusted as necessary.

The increment locations will be selected by walking in a random meandering path traversing the DU. The increments will be collected using a dedicated hand trowel instead of the traditional ISM sampling tool because the sandy surface soil at the site cannot be retained in the traditional ISM sampling tool.

Samples will be shipped to a DoD Environmental Laboratory Accreditation Program (ELAP) certified laboratory for analysis. Samples will be analyzed for explosives, perchlorate, and RCRA 8 metals (Table 5‑1). QC samples will be collected at a frequency of 10% of the DUs in the form of triplicate samples. Triplicate samples will be in the form of the primary ISM sample plus two replicate ISM samples (R1/R2). Replicate samples will be collected from the DU at the same time as the primary ISM sample is being collected. The locations of the increments for the two replicate samples will be selected in the same manner as the primary sample (i.e., by walking in separate random meandering paths traversing the DU). Matrix spike/matrix spike duplicate (MS/MSD) samples will be taken at the lab from existing ISM soil sample volumes.

Samples will be labeled as described in Section 4.4.7. The primary sample and the two replicate samples will be sent to the primary lab for analysis. The samples will be placed into laboratory supplied containers, documented on the sample and COC, and packed in a plastic cooler with ice. One temperature blank per cooler is required. A trip blank will not be required, because analysis for volatile organic compounds (VOCs) is not being performed.

QA/QC samples will be subjected to the same laboratory handling and analytical procedures as those used on the primary samples, as applicable to the analysis. The relative standard deviation (RSD) for triplicate samples and acceptable percent recovery for the MS/MSD samples will be established during the DQO process. The data collected will be documented in the Final RFI Report.

Table 5‑1: ISM Soil Samples and Composite Samples for SWMU 14

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample Type** | Explosives  SW846/8330B | RCRA Metals  SW846 6010C/6020A/7471B | Perchlorate SW846/6850 | SVOCs SW846/ 8270D | **Where Collected** |
| **SWMU 14** |  |  |  |  |  |
| **ISM Samples**  Primary | 33 | 33 | 33 |  | Field |
| Replicate at 10% of DUs R1/R2 (10% each) | 3 each (6 total) | 3 each (6 total) | 3 each (6 total) |  | Field |
| MS/MSD (5% each) | 2 each (4 total) | 2 each (4 total) | 2 each (4 total) |  | Lab |
|  |  |  |  |  |  |
| **6 point composite** |  |  |  | 33 | Field |
| 10% Field Duplicate (QC) |  |  |  | 3 | Field |
| 10% QA (Secondary Lab) |  |  |  | 3 | Field |
| MS/MSD (5% each) |  |  |  | 2 each (4 total) | Lab |
| **Sample Total** | 43 | 43 | 43 | 43 |  |

### Composite Sampling at DUs at SWMU 14

Composite samples will be collected from each of the DUs in SWMU 14 using a dedicated hand tool. These samples will not be collected or processed in the same manner as the ISM samples. The composite sample will be comprised of six subsamples, randomly collected from within the DU and will be analyzed for SVOCs (Table 5‑1). QA/QC samples will be collected from 10% of the DUs, and will be comprised of two splits with the primary sample. One split sample will be sent to the primary lab as a blind field duplicate and the second split sample will be sent to the QA (secondary) laboratory. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications.

Figure 5‑1: Historical Sampling Locations (SWMU 14)

Figure 5‑2: Historical Sampling Locations (Open Detonation & Disposal Area)

Figure 5‑3: Historical Sampling Locations (AOC 91 & HWMU)

Figure 5‑4: Locations of ISM Samples for SWMU 14

# SWMU 15

## Background

### Location, Description, and Operational History

SWMU 15 was used for demilitarization activities as part of the FWDA mission of demilitarizing unserviceable, obsolete, and/or waste explosives, propellants, munitions and munitions components. This area was used between 1948 and 1955. Some of these demilitarization activities were accomplished using treatment by OB or OD. Related materials were also treated in this area, including objects potentially contaminated with explosives during storage and handling, such as shipping containers and dunnage (**Figure 1‑3**).

SWMU 15, known as the Old Demolition Area, is approximately seven acres and located to the south west of SWMU 14 in Parcel 3. Material was periodically bulldozed from this area towards the arroyo bisecting SWMU 15. As a result, MEC is on the surface and in the subsurface in this area. Surface and subsurface clearance of MEC at SWMU 15 is addressed separately and not included in the RFI work.

### MEC, MPPEH, and Waste Pits at SWMU 15

The MEC and MPPEH items are currently being addressed via surface and subsurface clearance of MEC and MD within the KOA IAW the NMED-approved *Final Work Plan MEC Removal and Surface Clearance KOA* (PIKA-Pirnie JV, 2015a). The results of the MEC removal activities will be presented to the NMED in the Final KOA MEC Removal Report.

This waste in the burial pits and debris will be removed IAW the *Interim Measures Work Plan AOCs and SWMUs in the KOA* (PIKA-Pirnie JV, 2015b), currently under review by the USACE. The results of removal activities for burial pits and debris piles will be presented to the NMED in the Final Interim Measures SWMUs and AOCs Report. The RFI activities will be performed after the surface and subsurface clearance of MEC, and after completion of the Interim Measures activities.

### Waste Characterizations and Contaminants of Potential Concern

The operational history of FDWA indicates that SWMU 15 was used for demilitarization activities. Based on the operational history, the COPCs for the soil investigation activities at SWMU 15 in areas other than the burial pit removal areas are explosives, RCRA 8 metals, perchlorate, and SVOCs.

## Previous Investigations

Previous investigations are summarized in Table 4‑1. Previous investigation areas for SWMU 15 are illustrated on Figure 6-1. Results of previous investigations for this SWMU are discussed in the following sections.

### Non-sampling Data

Previous non-sampling data include historical aerial photographs available for SWMU 15 as presented in the Historical Investigation Summary Document (Appendix A), Table 4‑1 and geophysical surveys.

#### Aerial Photographs

Aerial photographs for SWMU 15 showed evidence of potential debris (particularly along the arroyo) and within mounds.

#### Geophysical Surveys

The objectives of the surveys were to delineate the lateral extent of potentially disturbed ground within specific sub-areas of the Closed OB/OD Area and to detect buried metal objects. To achieve these objectives, EM, MAG, and GPR geophysical techniques were used. EM and MAG surveys were conducted over established survey grids. GPR data were collected at specific anomalies identified by the EM and MAG surveys.

The results of the geophysical surveys for the Parcel 3 SWMUs are presented in the document entitled the *Final Open Burning/Open Detonation Area RCRA Interim Status Closure Plan Phase IA – Characterization and Assessment of Site Conditions for the Soils/Solid Matrix* (PMC, 1999a). Since accurate mapping had not been completed at the time of the geophysical surveys, local grids (50 ft by 50 ft) were established at the two areas surveyed, and the boundaries of geophysical anomalies identified for further investigation were staked and later surveyed for inclusion on project maps. A review of the grid maps shows more than 11 acres in the area of SWMU 15 were surveyed using geophysical methods. Two geophysical anomalies (KGA1 and KGA2) were identified within SWMU 15 and delineated for further characterization.

### Sampling Data

The following is a summary of previous environmental investigations conducted at SWMU 15. Surface water and groundwater investigations were also conducted, but are not summarized here as surface water and groundwater media are not covered under this RFI scope. Additional information, including document excerpts, from the previous investigative activities performed at this SWMU is described in the Historical Investigation Summary Document (Appendix A) and a table summarizing historical soil data collected from this SWMU is presented in Appendix C. Potential cumulative risk/hazard was not assessed for previous data; however, the historical data will be included in the evaluation of the risks and hazards in the RFI report.

### Environmental Investigations Conducted Under Pre-Permit Closure Plan

This section summarizes environmental characterization efforts completed under the approved pre-Permit Closure Plan. The NMED-approved Final Interim Status Closure Plan (ERM, 1996a) incorporated CFP WPs that presented the approaches in performing environmental sampling, site characterization, and engineering evaluations of the OB/OD Area. These activities were necessary to support finalization of the Closure Plan and select a closure/remedial option for implementation. As specified by NMED, the CFP contained three phases:

* Phase I – Characterization and Assessment of Site Conditions;
* Phase II – Description, Evaluation, and Recommendation of Closure-Remedial Options; and,
* Phase III – Design, Construction and Operation of Selected Closure Option.

Field efforts to satisfy Phase I of the CFP were conducted from 1996 through 1998. Soil and waste characterization efforts in the OB/OD Unit and Parcel 3 SWMUs were performed during 1996. Eleven monitoring wells were installed and sampled in October 1996 and February 1997. Water level data collected indicated the distribution of hydraulic heads was complex and required additional definition.

Further subsurface characterization consisting of subsurface seismic profiling, geophysical borehole logging, geologic mapping, and fracture trace analysis was proposed in the Final OB/OD Area Work Plan (PMC, 1998). These characterization efforts were completed in 1997 and the results were used to select locations for additional monitoring wells.

Further characterization of the OB/OD Area was proposed in the Final OB/OD Area Work Plan (PMC, 1998). The characterization activities consisted of focused geologic mapping within the OB/OD Area arroyos, identification of wells near FWDA, completion of eight additional boreholes/monitoring wells, and collection and analysis of surface water, sediment, and ground water samples. These efforts were completed in 1998.

The results of Phase I of the CFP were provided to NMED in two documents:

* The first document, entitled *Final Open Burning/Open Detonation Area RCRA Interim Status Closure Plan Phase IA – Characterization and Assessment of Site Conditions for the Soils/Solid Matrix (Phase IA Report)* (PMC, 1999a), was submitted to NMED on 25 November 1999.
* The second document, entitled *Final Open Burning/Open Detonation Area RCRA Interim Status Closure Plan Phase IB – Characterization and Assessment of Site Conditions for the Ground Water Matrix (Phase IB Report)* (PMC, 1999b), was submitted to NMED on 29 December 1999.

Interim groundwater sampling was performed during 2000, 2001, 2002, 2003, and 2005 for continued monitoring of groundwater at both the OB/OD Unit HWMU and the Parcel 3 SWMUs. These sampling events are detailed in the *Hydrogeologic Summary Report* dated 27 February 2006 (TPMC, 2006a).

#### Waste Characterization

Approximately 13 investigation trenches were completed through the two areas (KGA1 and KGA2) investigated within SWMU 15. Residual materials from OB/OD operations were found on and beneath the ground surface in SWMU 15 (PMC, 1999a).

#### Soil Characterization

Soil samples, both surface and subsurface, have been collected to characterize soils within and around SWMU 15 (Appendix A). Samples to characterize deeper subsurface soils outside the waste areas were collected during completion of soil borings which were later completed as groundwater monitoring wells. Analytical data summary tables including a comparison to Permit cleanup levels are provided in the companion Closure Plan Phase I Work Plan Phase IA (PMC, 1999a).

#### Soil Background Study and Data Evaluation Report, 2010

A background study was conducted and used to make a statistical determination on the nature and occurrence of inorganic constituents in soil at the FWDA based on site-to-background comparisons. In response to this study, the NMED recommended the following two-step approach to assessing arsenic at the FWDA in lieu of traditional site attribution analysis (NMED, 2013; Appendix C):

Step 1. Compare the site (SWMU/AOC) maximum arsenic concentration to the new background reference for arsenic (5.6 mg/kg). If the maximum detected concentration of arsenic from site soil is below 5.6 mg/kg, then no additional action is required and the arsenic may be considered background. If the site maximum, is greater than 5.6 mg/kg, proceed to Step 2.

Step 2. Compare the range of site (SWMU/AOC) data to the range of background data (0.2 to 11.2 mg/kg). If the site range falls within the background range of arsenic, then no additional action is required and the arsenic may be considered background. If the site range is inconsistent with the background range, then additional investigation and/or corrective action may be required.

### Conceptual Model

#### Site Profile and Land Use

SWMU 15, known as the Old Demolition Area, is approximately seven acres and is located to the southwest of SWMU 14 in Parcel 3. This area were used between 1948 and 1955. Some of the demilitarization activities performed at this SWMU were accomplished using treatment by OB or OD. Related materials were also treated in this SWMU, including objects potentially contaminated with explosives during storage and handling, such as shipping containers and dunnage. The FWDA is currently in BRAC caretaker status undergoing environmental investigation and remediation. Following environmental remediation, the land will be turned over to the BIA and held in trust for the NN and/or the POZ for unrestricted land use.

#### Nature and Extent of Contamination

The surface soil of SWMUs should be characterized by collecting surface soil samples using ISM methodology and composite (6-point discrete) samples. Visual inspection during the site reconnaissance found numerous MEC items and there have been a limited number of soil investigations conducted at the SWMU, which have not fully characterized the site. In addition, historical investigations also introduced the possibility of remaining MEC items in the SWMU. Prior to the soil investigation, surface and subsurface clearance of the MEC items will be completed, and the burial pits within the SWMU will be removed. The surface soil in the investigation areas outside of the limits of burial pits will be sampled to determine the nature and lateral extent of contamination within the SWMU.

#### Fate and Transport

If soils at SWMU 15 are affected due to past operations, there is a potential for threat to human health and the environment through exposure to surface soils.

If MEC is found to be present during surface and subsurface clearance of MEC and MPPEH, and during removal of burial pits and debris, a threat to human health and the environment exists. The clearance of MEC/MPPEH and removal of burial pits and debris is performed separately (and prior to the RFI work) and is discussed in other work plans.

#### Data Gaps

Surface soils where geophysical anomalies and MEC items were identified require investigation.Surface soil samples will be collected to determine the nature and lateral extent of contamination within SMWU 15.Further subsurface investigation that may be required to characterize groundwater transport pathways will be performed under a separate project.

## Investigation Methods

The following section provides the data gathering activities that will be conducted to characterize the surface soils within SWMU 15 outside of the burial pits that may have been impacted during the mission of the FWDA. Interim removals followed by confirmation sampling will be performed within the burial pits at SWMU 15 IAW the Army Draft *Interim Measures Work Plan Areas of Concern and Solid Waste Management Units, October 2015.* Confirmation sampling results will be presented in the Interim Measures Report.

### Contaminants of Potential Concern

As a result of potential demilitarization activities, the COPCs outside of the burial pits at SWMU 15 are:

* Explosives
* RCRA 8 metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver
* Perchlorate
* SVOCs

### Soil Characterization

The presence of affected surface soil outside of the burial areas at SWMU 15 will be evaluated by the collection of ISM samples and composite (6-point) samples.

### Analytical Methods

The following analytical methods will be used to analyze samples collected outside of the burial pits at SWMU 15 (discussed further in the UFP-QAPP included as Appendix D):

* Explosives by USEPA method SW846/8330B
* RCRA 8 metals by method 6010C/6020A/7471B
* Perchlorate by USEPA method SW846/6850
* SVOCs by USEPA method SW846/8270D

### Quality Assurance/Quality Control

The QA/QC practices specified in the project for environmental sampling are included in the UFP-QAPP (Appendix D).

## Scope of Activities

The following field activities will be conducted at SWMU 15:

* Locate and establish DUs
* Collection of surface soil ISM samples to identify if explosives, RCRA metals, or perchlorate exceed screening levels in the SWMUs as a result of OB/OD activities.
* Collection of composite surface soil samples to identify if SVOCs exceed screening levels in the SWMUs as a result of OB/OD activities.

### ISM Soil Sampling at SWMU 15

Fourteen ISM samples will be collected from DUs located within SWMU 15 in areas outside of the burial areas, which are being excavated and removed.

Figure 6-4 shows the proposed locations of 14 DUs for SWMU 15. The locations of DUs may be adjusted in the field based on field conditions. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications.

Each DU will be established as a grid with an area of 10,000 square ft (100 ft by 100 ft square), and 50 increments will be collected from each DU, from a depth of 0-6 inches.

The DU grids will be laid out as follows:

* The southwest corner of each grid to be sampled will be located using GPS coordinates and staked (Section 4.4.8).
* The remaining three corners will then be staked and GPS coordinates taken.
* After the four corners are staked, the length of each side of the DU will then be measured with a tape measure, to verify the dimension. Corner locations will be adjusted as necessary.

The increment locations will be selected by walking in a random meandering path traversing the DU. The increments will be collected using a dedicated hand trowel instead of the traditional ISM sampling tool because the sandy surface soil at the site cannot be retained in the traditional ISM sampling tool.

Samples will be shipped to a DoD ELAP certified laboratory for analysis. Samples will be analyzed for explosives, perchlorate, and RCRA 8 metals (Table 5‑1). Quality control samples will be collected at a frequency of 10% of the DUs in the form of triplicate samples. Triplicate samples will be in the form of the primary ISM sample plus two replicate ISM samples (R1/R2). Replicate samples will be collected from the DU at the same time as the primary ISM sample is being collected. The locations of the increments for the two replicate samples will be selected in the same manner as the primary sample (i.e., by walking in separate random meandering paths traversing the DU). MS/MSD samples will be taken at the lab from existing ISM soil sample volumes.

Samples will be labeled as described in Section 4.4.7. The primary sample and the two replicate samples will be sent to the primary lab for analysis. The samples will be placed into laboratory supplied containers, documented on the sample and on the COC, and packed in a plastic cooler with ice. One temperature blank per cooler is required. A trip blank will not be required, because analysis for VOCs is not being performed.

QA/QC samples will be subjected to the same laboratory handling and analytical procedures as those used on the primary samples, as applicable to the analysis. The RSD for triplicate samples and acceptable percent recovery for the MS/MSD samples will be established during the DQO process. The data collected will be documented in the Final RFI Report.

Table 6‑1: ISM Soil Samples and Composite Samples for SWMU 15

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample Type** | Explosives  SW846/8330B | RCRA Metals  SW846 6010C/6020A/7471B | Perchlorate SW846/6850 | SVOCs SW846/ 8270D | **Where Collected** |
| **SWMU 15** |  |  |  |  |  |
| **ISM Samples** Primary | 14 | 14 | 14 |  | Field |
| Replicate 10% of DUs R1/R2 (10% each) | 2 each (4 total) | 2 each (4 total) | 2 each (4 total) |  | Field |
| MS/MSD (5% each) | 1 each (2 total) | 1 each (2 total) | 1 each (2 total) |  | Lab |
|  |  |  |  |  |  |
| **6 point composite** |  |  |  | 14 | Field |
| 10% Field Duplicate (QC) |  |  |  | 2 | Field |
| 10% QA (Secondary Lab) |  |  |  | 2 | Field |
| MS/MSD (5% each) |  |  |  | 1 each (2 total) | Lab |
| **Sample Total** | 20 | 20 | 20 | 20 |  |

### Composite Sampling at DUs at SWMU 15

Composite samples will be collected from each of the DUs in SWMU 15 using a dedicated hand tool

These samples will not be collected or processed in the same manner as the ISM samples. The composite sample will be comprised of six subsamples, randomly collected from within the DU and will be analyzed for SVOCs (Table 5‑1). QA/QC samples will be collected from 10% of the DUs, and will be comprised of two splits with the primary sample. One split sample will be sent to the primary lab as a blind field duplicate and the second split sample will be sent to the QA (secondary) laboratory. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications.

Figure 6‑1: Historical Sampling Locations (SWMU 15)

Figure 6‑2: Locations of ISM Samples for SWMU 15

# smwu 33

## Background

### Location, Description, and Operational History

SWMU 33 was used for demilitarization activities as part of the FWDA mission of demilitarizing unserviceable, obsolete, and/or waste explosives, propellants, munitions and munitions components. This area was used between 1948 and 1955. Some of these demilitarization activities were accomplished using treatment by OB or OD. Related materials were also treated in this area, including objects potentially contaminated with explosives during storage and handling, such as shipping containers and dunnage (**Figure 1‑3**).

SWMU 33, also called Waste Pile KP1 consisting of a residue/debris pile, is approximately 0.04 acres and is located south of SWMU 15. The munitions debris pile consisted of large projectiles that were eroded out of the back of a small side arroyo.

### MEC, MPPEH, and Waste Pits at SWMU 33

The MEC and MPPEH items are currently being addressed via surface and subsurface clearance of MEC and MD within the KOA IAW the NMED-approved *Final Work Plan MEC Removal and Surface Clearance KOA* (PIKA-Pirnie JV, 2015a). The results of the MEC removal activities will be presented to the NMED in the Final KOA MEC Removal Report.

This waste in the burial pits and debris will be removed IAW the *Interim Measures Work Plan AOCs and SWMUs in the KOA* (PIKA-Pirnie JV, 2015b), currently under review by the USACE. The results of removal activities for burial pits and debris piles will be presented to the NMED in the Final Interim Measures SWMUs and AOCs Report. The RFI activities will be performed after the surface and subsurface clearance of MEC, and after completion of the Interim Measures activities.

### Waste Characterizations and Contaminants of Potential Concern

The operational history of FDWA indicates SWMU 33 was used for demilitarization activities. Based on the operational history, the COPCs for the soil investigation activities at SWMU 33 in areas other than the waste pile removal areas are explosives, RCRA 8 metals, perchlorate, and SVOCs.

## Previous Investigations

Previous investigations are summarized in Table 4‑1. Previous investigation areas for SWMU 33 are illustrated on Figure 7-1. Results of previous investigations for these SWMUs are discussed in the following sections.

### Non-sampling Data

Previous non-sampling data include historical aerial photographs available for SWMU 33 as presented in the Historical Investigation Summary Document (Appendix A), Table 4‑1 and geophysical surveys.

#### Aerial Photographs

Aerial photographs for SWMU 33 had no significant findings.

### Sampling Data

The following is a summary of previous environmental investigations conducted at SWMU 33. Surface water and groundwater investigations were also conducted, but are not summarized here as surface water and groundwater media are not covered under this RFI scope. Additional information, including document excerpts, from the previous investigative activities performed at these SWMUs is described in the Historical Investigation Summary Document (Appendix A) and a table summarizing historical soil data collected from these SWMUs is presented in Appendix C. Potential cumulative risk/hazard was not assessed for previous data; however, the historical data will be included in the evaluation of the risks and hazards in the RFI report.

### Environmental Investigations Conducted Under Pre-Permit Closure Plan

This section summarizes environmental characterization efforts completed under the approved pre-Permit Closure Plan. The NMED-approved Final Interim Status Closure Plan (ERM, 1996a) incorporated CFP WPs that presented the approaches in performing environmental sampling, site characterization, and engineering evaluations of the OB/OD Area. These activities were necessary to support finalization of the Closure Plan and select a closure/remedial option for implementation. As specified by NMED, the CFP contained three phases:

* Phase I – Characterization and Assessment of Site Conditions;
* Phase II – Description, Evaluation, and Recommendation of Closure-Remedial Options; and,
* Phase III – Design, Construction and Operation of Selected Closure Option.

Field efforts to satisfy Phase I of the CFP were conducted from 1996 through 1998. Soil and waste characterization efforts in the OB/OD Unit and Parcel 3 SWMUs were performed during 1996. Eleven monitoring wells were installed and sampled in October 1996 and February 1997. Water level data collected indicated the distribution of hydraulic heads was complex and required additional definition.

Further subsurface characterization consisting of subsurface seismic profiling, geophysical borehole logging, geologic mapping, and fracture trace analysis was proposed in the Final OB/OD Area Work Plan (PMC, 1998). These characterization efforts were completed in 1997 and the results were used to select locations for additional monitoring wells.

Further characterization of the OB/OD Area was proposed in the Final OB/OD Area Work Plan (PMC, 1998). The characterization activities consisted of focused geologic mapping within the OB/OD Area arroyos, identification of wells near FWDA, completion of eight additional boreholes/monitoring wells, and collection and analysis of surface water, sediment, and ground water samples. These efforts were completed in 1998.

The results of Phase I of the CFP were provided to NMED in two documents:

* The first document, entitled *Final Open Burning/Open Detonation Area RCRA Interim Status Closure Plan Phase IA – Characterization and Assessment of Site Conditions for the Soils/Solid Matrix (Phase IA Report)* (PMC, 1999a), was submitted to NMED on 25 November 1999.
* The second document, entitled *Final Open Burning/Open Detonation Area RCRA Interim Status Closure Plan Phase IB – Characterization and Assessment of Site Conditions for the Ground Water Matrix (Phase IB Report)* (PMC, 1999b), was submitted to NMED on 29 December 1999.

Interim groundwater sampling was performed during 2000, 2001, 2002, 2003, and 2005 for continued monitoring of groundwater at both the OB/OD Unit HWMU and the Parcel 3 SWMUs. These sampling events are detailed in the *Hydrogeologic Summary Report* dated 27 February 2006 (TPMC, 2006a).

#### Waste Characterization

Approximately three investigation trenches were completed through SWMU 33. Residual materials from OB/OD operations were found on and beneath the ground surface in SWMU 15 and SWMU 33 (PMC, 1999a).

#### Soil Characterization

Soil samples, both surface and subsurface, have been collected to characterize soils within and around SWMU 33 (Appendix A). Samples to characterize deeper subsurface soils outside the waste areas were collected during completion of soil borings which were later completed as groundwater monitoring wells. Analytical data summary tables including a comparison to Permit cleanup levels are provided in the companion Closure Plan Phase I Work Plan Phase IA (PMC, 1999a).

#### Soil Background Study and Data Evaluation Report, 2010

A background study was conducted and used to make a statistical determination on the nature and occurrence of inorganic constituents in soil at the FWDA based on site-to-background comparisons. In response to this study, the NMED recommended the following two-step approach to assessing arsenic at the FWDA in lieu of traditional site attribution analysis (NMED, 2013; Appendix C):

Step 1. Compare the site (SWMU/AOC) maximum arsenic concentration to the new background reference for arsenic (5.6 mg/kg). If the maximum detected concentration of arsenic from site soil is below 5.6 mg/kg, then no additional action is required and the arsenic may be considered background. If the site maximum, is greater than 5.6 mg/kg, proceed to Step 2.

Step 2. Compare the range of site (SWMU/AOC) data to the range of background data (0.2 to 11.2 mg/kg). If the site range falls within the background range of arsenic, then no additional action is required and the arsenic may be considered background. If the site range is inconsistent with the background range, then additional investigation and/or corrective action may be required.

### Conceptual Model

#### Site Profile and Land Use

SWMU 33, known as the Waste Pile KP1, consists of one residue/debris pile south of SWMU 15. This area were used between 1948 and 1955. Some of the demilitarization activities performed at these SWMUs were accomplished using treatment by OB or OD. Related materials were also treated in these SWMUs, including objects potentially contaminated with explosives during storage and handling, such as shipping containers and dunnage. The FWDA is currently in BRAC caretaker status undergoing environmental investigation and remediation. Following environmental remediation, the land will be turned over to the BIA and held in trust for the NN and/or the POZ for unrestricted land use.

#### Nature and Extent of Contamination

The surface soil of SWMU should be characterized by collecting surface soil samples using ISM methodology and composite (6-point discrete) samples. Visual inspection during the site reconnaissance found numerous MEC items and there have been a limited number of soil investigations conducted at the SWMU, which have not fully characterized the site. In addition, historical investigations also introduced the possibility of MEC items. Prior to the soil investigation, surface and subsurface clearance of the MEC items will be completed, and the waste piles within the SWMU will be removed. The surface soil in the investigation will be sampled to determine the nature and lateral extent of contamination at the SWMU.

#### Fate and Transport

If soils at SWMU 33 are affected due to past operations, there is a potential for threat to human health and the environment through exposure to surface soils.

If MEC is found to be present during surface and subsurface clearance of MEC and MPPEH, and during removal of waste pile, a threat to human health and the environment exists.

#### Data Gaps

Surface soils where geophysical anomalies and probable MEC items were previously identified requires investigation.Surface soil samples will be collected to determine nature and lateral extent of contamination at SMWU 33 .Further subsurface investigation that may be required to characterize groundwater transport pathways will be performed under a separate project.

## Investigation Methods

The following section provides the data gathering activities that will be conducted to characterize the surface soils within SWMU 33 outside of the burial pits that may have been impacted during the mission of the FWDA. Interim removals followed by confirmation sampling will be performed within SWMU 33 IAW the Army Draft *Interim Measures Work Plan Areas of Concern and Solid Waste Management Units, October 2015.* Confirmation sampling results will be presented in the Interim Measures Report.

### Contaminants of Potential Concern

As a result of potential demilitarization activities, the COPCs outside of the residue/debris pile at SWMU 33 are:

* Explosives
* RCRA 8 metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver
* Perchlorate
* SVOCs

### Soil Characterization

The presence of affected surface soil outside of the residue/debris pile at SWMU 33 will be evaluated by the collection of ISM samples and composite (6-point) samples.

### Analytical Methods

The following analytical methods will be used to analyze samples collected outside of the residue/debris pile at SWMU 33 (discussed further in the UFP-QAPP included as Appendix D):

* Explosives by USEPA method SW846/8330B
* RCRA 8 metals by method 6010C/6020A/7471B
* Perchlorate by USEPA method SW846/6850
* SVOCs by USEPA method SW846/8270D

### Quality Assurance/Quality Control

The QA/QC practices specified in the project for environmental sampling are included in the UFP-QAPP (Appendix D).

## Scope of Activities

The following field activities will be conducted at SWMU 33:

* Locate and establish DUs
* Collection of surface soil ISM samples to identify if explosives, RCRA metals, or perchlorate exceed screening levels in the SWMUs as a result of OB/OD activities.
* Collection of composite surface soil samples to identify if SVOCs exceed screening levels in the SWMUs as a result of OB/OD activities.

### ISM Soil Sampling at SWMU 33

One ISM sample will be collected from the DU located within SWMU 33. Figure 7‑1 shows the proposed locations of the one DU for SWMU 33. The locations of DU may be adjusted in the field based on field conditions. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications.

The DU will be established as a grid with an area of 2,500 square ft (50 ft by 50 ft square), and 50 increments will be collected from each DU, from a depth of 0-6 inches.

The DU grids will be laid out as follows:

* The southwest corner of each grid to be sampled will be located using GPS coordinates and staked (Section 4.4.8).
* The remaining three corners will then be staked and GPS coordinates taken.
* After the four corners are staked, the length of each side of the DU will then be measured with a tape measure, to verify the dimension. Corner locations will be adjusted as necessary.

The increment locations will be selected by walking in a random meandering path traversing the DU. The increments will be collected using a dedicated hand trowel instead of the traditional ISM sampling tool because the sandy surface soil at the site cannot be retained in the traditional ISM sampling tool.

Samples will be shipped to a DoD ELAP certified laboratory for analysis. Samples will be analyzed for explosives, perchlorate, and RCRA 8 metals (Table 5‑1). QC samples will not be collected from the single DU at SWMU 33 as a sufficient number of QA/QC samples will be collected from the other SWMUs and AOCs to meet the overall project requirement.

Samples will be labeled as described in Section 4.4.7. The primary sample will be sent to the primary lab for analysis. The samples will be placed into laboratory supplied containers, documented on the sample and on the COC, and packed in a plastic cooler with ice. One temperature blank per cooler is required. A trip blank will not be required, because analysis for VOCs is not being performed. The data collected will be documented in the Final RFI Report.

Table 7‑1: ISM Soil Samples and Composite Samples for SWMU 33

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample Type** | Explosives  SW846/8330B | RCRA Metals  SW846 6010C/6020A/7471B | Perchlorate SW846/6850 | SVOCs SW846/ 8270D | **Where Collected** |
| **SWMU 33** |  |  |  |  |  |
| **ISM Samples** Primary | 1 | 1 | 1 |  | Field |
| Replicate 10% of DUs R1/R2 (10% each) |  |  |  |  | Field |
| MS/MSD (5% each) |  |  |  |  | Lab |
|  |  |  |  |  |  |
| **6 point composite** |  |  |  | 1 | Field |
| 10% Field Duplicate (QC) |  |  |  |  | Field |
| 10% QA (Secondary Lab) |  |  |  |  | Field |
| MS/MSD (5% each) |  |  |  | 1 each (2 total) | Lab |
| **Sample Total** | 1 | 1 | 1 | 1 |  |

### Composite Sampling at DUs at SWMU 33

Composite samples will be collected from the DU in SWMU 33 using a dedicated hand tool. These samples will not be collected or processed in the same manner as the ISM samples. The composite sample will be comprised of six subsamples, randomly collected from within the DU and will be analyzed for SVOCs (Table 5‑1). QA/QC samples will not be collected from the DU as a sufficient quantity of QA/QC samples will be collected from the other SWMUs and AOCs to meet the overall project requirement. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications

Figure 7‑1: Location of ISM Samples for SWMU 33

# SWMU 74

## Background

### Location, Description, and Operational History

SWMU 74 is approximately 1.4 acres located along the eastern border of Parcel 3. This area was the Proposed Burning Ground identified in the Permit as Area 16 or Site 16. Area 16/Site 16 was a proposed burning ground on a 1958 map, per the 1995 Archive Search Report (ASR). However, no records exist showing the burning ground was ever established (**Figure 1‑3**).

### Waste Characterizations and Contaminants of Potential Concern

Based on review of the operational history of FWDA, there is no evidence a burning ground was ever established or operated at SWMU 74. Because of its proposed use for demilitarization activities, the COPCs for SWMU 74 are explosives, RCRA 8 metals, perchlorate, and SVOCs.

## Previous Investigations

Previous investigations are summarized in Table 4‑1. Results of previous investigations for this SWMU are discussed in the following sections.

### Non-sampling Data

Previous non-sampling data include an ASR, MEC removal efforts (discussed in Appendix A), and historical aerials available for SWMU 74 as presented in the Historical Investigation Summary Document (Appendix A) and Table 4‑1.

#### Aerial Photographs

No features were identified within SWMU 74, but a single feature (cleared area) was noted nearby to the northwest in the 1952 photo.

#### Archive Search Report, 1995

Under the requirements of the CERCLA for Army remediation of munitions response sites, an ASR was prepared for FWDA by USACE, St. Louis District in July, 1995 (USACE, 1995). The ASR compiled information obtained through historical research at various archives and records-holding facilities, interviews with persons associated with the site or its operations, review of environmental reports, aerial photographs, maps, and personal visits to the site. The investigation centered on identifying the exact location of potential environmental contamination from the past demilitarization activities occurring on FWDA. A total of 19 numbered sites and two additional locations were identified as specific AOCs and were further investigated during the site visits. Additional investigation/work was recommended for more than half of the sites. The ASR was the source of information leading to the identification of SWMU 74 and the four AOCs in Parcel 3 in the Permit.

The ASR identified “Site 16” (AOC 74) as a “proposed burning ground from 1958 map” and a 1955 map showing the area labeled as “powder burning ground – proposed location.” There are no records showing a burning ground was established at “Site 16”, and the ASR concluded no burning ground was ever placed in this location, and no further action was recommended (USACE, 1995).

#### Site Visits

SWMU 74 was also investigated as part of previous DoD Munitions Response activities. Approximately 1.4 acres were evaluated using handheld magnetometers with a 5-ft lane spacing (EHSI, 2000). No MEC/UXO was observed. A total of 15 contacts were located and excavated, and approximately 29 pounds of munitions debris (fragments) were recovered. The MD was inspected by UXO-qualified personnel and determined to be scrap, and was turned in with other scrap for off-site recycling.

Additionally, a site visit was conducted by the USACE 18 October 2006. The site was located using GPS. While the site had been cleared of vegetation, it did not appear as though the area had ever been utilized as a burning ground.

### Sampling Data

Environmental investigations, with the exception of the soil background study, have not been previously conducted at SWMU 74.

#### Soil Background Study and Data Evaluation Report, 2010

A background study was conducted and used to make a statistical determination on the nature and occurrence of inorganic constituents in soil at the FWDA based on site-to-background comparisons.

In response to this study, the NMED recommended the following two-step approach to assessing arsenic at the FWDA in lieu of traditional site attribution analysis (NMED, 2013; provided in Appendix C):

Step 1. Compare the site (SWMU/AOC) maximum arsenic concentration to the new background reference for arsenic (5.6 mg/kg). If the maximum detected concentration of arsenic from site soil is below 5.6 mg/kg, then no additional action is required and the arsenic may be considered background. If the site maximum, is greater than 5.6 mg/kg, proceed to Step 2.

Step 2. Compare the range of site (SWMU/AOC) data to the range of background data (0.2 to 11.2 mg/kg). If the site range falls within the background range of arsenic, then no additional action is required and the arsenic may be considered background. If the site range is inconsistent with the background range, then additional investigation and/or corrective action may be required.

### Conceptual Model

#### Site Profile and Land Use

SWMU 74 is approximately 1.4 acres and is located along the eastern boarder of Parcel 3. This area was the Proposed Burning Ground identified in the Permit as Area 16 or Site 16; however, no records exist showing that the burning ground was ever established. The FWDA is currently in BRAC caretaker status undergoing environmental investigation and remediation. Following environmental remediation, the land will be turned over to the BIA and held in trust for the NN and/or the POZ for unrestricted land use.

#### Nature and Extent of Contamination

The surface soil of SWMU 74 will be characterized by collecting surface soil samples using ISM and composite (6-point discrete) samples. Visual inspection during the site reconnaissance found munition debris (MEC/UXO items were not observed) and previous soil investigations have not been conducted at the SWMU. The surface soil investigation in SWMU 74 will determine the nature and lateral extent of contamination at the proposed burning ground area.

#### Fate and Transport

If soils are affected at SWMU 74, there is a potential for threat to human health and the environment through exposure to surface soils.

#### Data Gaps

Data are needed to identify whether demilitarization activities caused a release of contaminants to surface soils in the area.Surface soil samples will be collected to determine nature and lateral extent of contamination at SMWU 74.Further subsurface investigations may be required to characterize groundwater transport pathways and will be performed under a separate project.

## Investigation Methods

The following section provides the data gathering activities conducted to characterize the surface soils within SWMU 74 possibly impacted during the mission of the FWDA.

### Contaminants of Potential Concern

As a result of proposed demilitarization activities at SWMU 74 the COPCs are:

* Explosives by USEPA method 8330B;
* RCRA 8 metals by method 6010/7000 analysis that includes; arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver;
* Perchlorate by USEPA method 6850; and
* SVOCs by USEPA method 8270D

### Media Characterization

The presence of affected surface soil at SWMU 74 will be evaluated by the collection of ISM soil samples and composite samples.

### Analytical Methods

The following analytical methods will be used to analyze samples collected at SWMU 74 (discussed further in the UFP-QAPP included as Appendix D):

* Explosives by USEPA method SW846/8330B
* RCRA 8 metals by method 6010C/6020A/7471B
* Perchlorate by USEPA method SW846/6850
* SVOCs by USEPA method SW846/8270D

### Quality Assurance/Quality Control

The QA/QC practices specified in the project for environmental sampling are included in the UFP-QAPP (Appendix D).

## Scope of Activities

The following field activities will be conducted at SWMU 74:

* Collection of surface soil ISM samples to identify if explosives, RCRA metals, or perchlorate exceed screening levels in the SWMU as a result of potential OB activities.
* Collection of composite surface soil samples to identify if SVOCs exceed screening levels in the SWMU as a result of OB activities.

### ISM Soil Sampling at SWMU 74

Four ISM samples will be collected from DUs distributed across SWMU 74 (**Figure 8‑1**). The locations of DUs may vary based on field conditions. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications.

Each DU will be established as a grid with an area of 10,000 square ft, and 50 increments will be collected from each DU, from a depth of 0-6 inches. The DUs will be a 100 ft by 100 ft square and will be laid out as follows:

* The southwest corner of each grid to be sampled will be located using GPS coordinates and staked (Section 4.4.8).
* The remaining three corners will then be staked and GPS coordinates taken.
* After the four corners are staked, the length of each side of the DU will then be measured with a tape measure, to verify the dimension. Corner locations will be adjusted as necessary.

The increment locations will be selected by walking in a random meandering path traversing the DU. The increments will be collected using a dedicated hand trowel instead of the traditional ISM sampling tool because the sandy surface soil at the site cannot be retained in the traditional ISM sampling tool.

Samples will be shipped to a DoD ELAP certified laboratory for analysis. Samples will be analyzed for explosives, perchlorate, and RCRA 8 metals (Table 8‑1). QC samples will be collected at a frequency of 10% of the DUs in the form of triplicate samples. Triplicate samples will be in the form of the primary ISM sample plus two replicate ISM samples (R1/R2). Replicate samples will be collected from the DU at the same time as the primary ISM sample is being collected. The locations of the increments for the two replicate samples will be selected in the same manner as the primary sample (i.e., by walking in separate random meandering paths traversing the DU). MS/MSD samples will be taken at the lab from existing ISM soil sample volumes.

Samples will be labeled as described in Section 4.4.7. The primary sample and the replicate samples will be sent to the primary lab for analysis. The samples will be placed into laboratory supplied containers, documented on the sample and on the COC, and packed in a plastic cooler with ice. One temperature blank per cooler is required. A trip blank will not be required, because analysis for VOCs is not being performed.

Table 8‑1: ISM Soil Samples and Composite Samples for SWMU 74 within Parcel 3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample Type** | Explosives  SW846/8330B | RCRA Metals  SW846 6010C/6020A/7471B | Perchlorate SW846/6850 | SVOCs SW846/ 8270D | **Where Collected** |
| **ISM Samples** Primary | 4 | 4 | 4 |  | Field |
| Replicate at 10% of DUs R1/R2 (10% each) | 1 each (2 total) | 1 each (2 total) | 1 each (2 total) |  | Field |
| MS/MSD (5% each) | 1each (2 total) | 1 each (2 total) | 1 each (2 total) |  | Lab |
|  |  |  |  |  |  |
| **6 point composite** |  |  |  | 4 | Field |
| 10% Field Duplicate (QC) |  |  |  | 1 | Field |
| 10% QA (Secondary Lab) |  |  |  | 1 | Field |
| MS/MSD (5% each) |  |  |  | 1 each (2 total) | Lab |
|  |  |  |  |  |  |
| **Sample Total** | 8 | 8 | 8 | 8 |  |

QA/QC samples will be subjected to the same laboratory handling and analytical procedures as those used on the primary samples, as applicable to the analysis. The RSD for triplicate samples and acceptable percent recovery for the MS/MSD samples will be established during the DQO process. The data collected will be documented in the Final RFI Report.

### Composite Sampling at DUs at SWMU 74

Composite samples will be collected from each of the DUs in SWMU 74 using a dedicated hand tool (**Figure 8‑1**). These samples will not be collected or processed in the same manner as the ISM samples. The composite sample will be comprised of six subsamples, randomly collected from within the DU and will be analyzed for SVOCs (Table 8‑1). QA/QC samples will be collected from 10% of the DUs, and will be comprised of two splits with the primary sample. One split sample will be sent to the primary lab as a blind field duplicate and the second split sample will be sent to the QA (secondary) laboratory. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications.

**Figure 8‑1: Locations of ISM Samples for SWMU 74**

# AOC 89

## Background

### Location, Description, and Operational History

AOC 89 is approximately 6 acres and is located in five separate areas along the north east boundary of Parcel 3. Three of these areas contain U-shaped revetments, one contains an L- shaped revetment, and one contains a rectangular cleared area with shallow trenches along two sides. The use of the L-shaped revetment was not documented in the historical records and is unknown. The remaining four areas were used as temporarily storage areas for military munitions awaiting treatment by either OB or OD (**Figure 1‑3**).

### Waste Characterizations and Contaminants of Potential Concern

The operational history of the FDWA indicates AOC 89 was used for temporary storage of military munitions. Based on this operational history, the COPCs for AOC 89 are explosives, RCRA 8 metals, perchlorate, and SVOCs.

## Previous Investigations

Previous investigations are summarized in Table 4‑1. Previous investigation areas for AOC 89 are illustrated on Figure 9-1. Results of previous investigations for this AOC are discussed in the following sections.

### Non-sampling Data

Previous non-sampling data include historical aerials available for AOC 89 and an archival document search as presented in the Historical Investigation Summary Document (Appendix A) and Table 4‑1.

#### Aerial Photographs

Seven features within AOC 89 were identified by the aerial photograph analysis. Many of the features appear to be craters.

#### Archive Search Report, 1995

Under the requirements of the CERCLA for Army remediation of munitions response sites, an ASR was prepared for FWDA by USACE, St. Louis District in July, 1995 (USACE, 1995). The ASR compiled information obtained through historical research at various archives and records-holding facilities, interviews with persons associated with the site or its operations, review of environmental reports, aerial photographs, maps, and personal visits to the site. The investigation centered on identifying the exact location of potential environmental contamination from the past demilitarization activities occurring on FWDA. A total of 19 numbered sites and two additional locations were identified as specific AOCs and were further investigated during the site visits. Additional investigation/work was recommended for more than half of the sites. The ASR was the source of information leading to the identification of AOC 89.

### Sampling Data

The following is a summary of a previous environmental investigation conducted at AOC 89. Additional information, including document excerpts, from the previous investigative activities performed at this AOC is described in the Historical Investigation Summary Document (Appendix A) and a table summarizing historical soil data collected from this AOC is presented in Appendix C. Potential cumulative risk/hazard was not assessed for previous data; however, the historical data will be included in the evaluation of the risks and hazards in the RFI report.

#### Waste and Underlying Soil Characterization

Three areas of explosives-stained soil north of SWMU 14 (within what later was identified as part of AOC 89), identified as Closed Stained Areas 1 through 3, were investigated.

The primary objectives of the investigations were:

* To characterize the types of waste/debris present;
* To confirm the lateral extent of the waste/debris identified by the geophysical and/or visual surveys;
* To delineate the vertical extent of the waste/debris; and
* To estimate the volumes of waste/debris and potentially impacted soil.

The areas were mapped and investigation trenches were completed using a shielded trackhoe (PMC, 1999a) to allow observation and sampling of waste and underlying soil. Field teams consisted of a UXO-qualified equipment operator, a UXO-qualified safety observer, and an environmental professional. Samples of waste and/or soil were screened in a field laboratory using immunoassay test kits for explosives and an X-ray Fluorescence instrument for metals; field screening results were used to guide further trenching and/or to select samples for off-site laboratory confirmation analyses (PMC 1999a).

Waste characterization samples were collected: representative (grab) waste samples were analyzed for TOC, particle size distribution, and Toxicity Characteristic Leaching Procedure and Synthetic Precipitation Leaching Procedure for explosives and metals. Composite waste samples were submitted for laboratory analysis of total explosives and total TAL metals. Samples from the Parcel 3 SWMUs were also analyzed for total phosphorous because of reported disposal/treatment of munitions containing white phosphorus filler in the Closed OB/OD Area. The current USEPA method for determining white phosphorus concentrations (SW846 7580) was approved in December 1996, after the field investigations had been completed, and thus was not part of the CFP effort.

“Background” soil data were acquired via collection and analysis of near-surface soil samples. Soil samples were collected from 20 locations in two areas believed to be un-impacted/undisturbed by FWDA operations. Samples were collected from each location at depths of 0.5 ft to 1.0 ft bgs. Background samples were analyzed for total explosives, TAL metals, salinity, acidity, and total phosphorus (select samples only). Although data from these “background” locations was submitted to NMED for review as part of the Phase IA Report in November 1999, no comments on, nor approval of, the Phase IA Report was received from NMED and thus these data do not represent approved background values. The “background” data have not been used in evaluation of existing data in the companion Closure Plan Phase I Work Plan.

Confirmatory grab soil samples were submitted for laboratory analysis of explosives and TAL metals once the extent of a trench was beyond the visible limits of waste or contaminated soil (based on field screening results). The purpose of these samples was to document the results of field screening and to evaluate constituent concentrations in the native soils situated just beyond the horizontal and/or vertical extent of waste materials and/or impacted soil. “Representative” soil samples were grab samples collected from generally the same locations (just beyond the horizontal and/or vertical extent of waste materials and/or impacted soil) to characterize soil properties that may affect fate and transport of detected constituents through site soils. Representative soil samples were analyzed for moisture content, cation exchange capacity, TOC, particle size distribution, and pH.

Samples to characterize deeper subsurface soils outside the waste areas were collected during completion of soil borings (which were later completed as groundwater monitoring wells). These samples were analyzed for explosives and TAL metals (PMC, 1999b).

#### Soil Background Study and Data Evaluation Report, 2010

A background study was conducted and used to make a statistical determination on the nature and occurrence of inorganic constituents in soil at the FWDA based on site-to-background comparisons.

In response to this study, the NMED recommended the following two-step approach to assessing arsenic at the FWDA in lieu of traditional site attribution analysis (NMED, 2013; Appendix C):

Step 1. Compare the site (SWMU/AOC) maximum arsenic concentration to the new background reference for arsenic (5.6 mg/kg). If the maximum detected concentration of arsenic from site soil is below 5.6 mg/kg, then no additional action is required and the arsenic may be considered background. If the site maximum, is greater than 5.6 mg/kg, proceed to Step 2.

Step 2. Compare the range of site (SWMU/AOC) data to the range of background data (0.2 to 11.2 mg/kg). If the site range falls within the background range of arsenic, then no additional action is required and the arsenic may be considered background. If the site range is inconsistent with the background range, then additional investigation and/or corrective action may be required.

### Conceptual Model

#### Site Profile and Land Use

AOC 89 is approximately six acres and is located in five separate areas along the north east boundary of Parcel 3. Three of these areas contain U-shaped revetments, one contains an L- shaped revetment, and one contains a rectangular cleared area with shallow trenches along two sides. The use of the L-shaped revetment was not documented in the historical records and its purpose is unknown. The remaining four areas were used as temporary storage areas for military munitions awaiting treatment by either OB or OD. The FWDA is currently in BRAC caretaker status undergoing environmental investigation and remediation. Following environmental remediation, the land will be turned over to the BIA and held in trust for the NN and/or the POZ for unrestricted land use.

#### Nature and Extent of Contamination

The surface soil of AOC 89 should be characterized by collecting surface soil samples using ISM methodology and composite (6-point discrete) samples. Limited soil investigations have been conducted at the AOC. The surface soil will be sampled to determine the nature and lateral extent of contamination in AOC 89.

#### Fate and Transport

If soils are affected at AOC 89, there is a potential for threat to human health and the environment through exposure to surface soils.

#### Data Gaps

Data are needed to identify whether demilitarization activities caused a release to surface soils in the area.Further subsurface investigation may be required to characterize groundwater transport pathways and will be performed under a separate project.

## Investigation Methods

The following section provides details on the data gathering activities conducted to characterize the surface soils within AOC 89 possibly impacted during the mission of the FWDA.

### Contaminants of Potential Concern

As a result of potential demilitarization activities at AOC 89 the COPCs are:

* Explosives
* RCRA 8 metals
* Perchlorate
* SVOCs

### Media Characterization

The presence of affected surface soil at AOC 89 will be evaluated by the collection of ISM soil samples and composite samples.

### Analytical Method

The following analytical methods will be used to analyze samples collected at AOC 89 (discussed further in the UFP-QAPP included as Appendix D):

* Explosives by USEPA method SW846/8330B
* RCRA 8 metals by method 6010C/6020A/7471B
* Perchlorate by USEPA method SW846/6850
* SVOCs by USEPA method SW846/8270D

### Quality Assurance/Quality Control

The QA/QC practices specified in the project for environmental sampling are included in the UFP-QAPP (Appendix D).

## Scope of Activities

The following field activities will be conducted at AOC 89:

* Collection of surface soil ISM samples to identify if explosives, RCRA metals, or perchlorate exceed screening levels in the AOC as a result of munition storage activities.
* Collection of composite surface soil samples to identify if SVOCs exceed screening levels in the AOC as a result of munition storage.

### ISM Soil Sampling at AOC 89

Six ISM samples will be collected from DUs located within AOC 89 in areas suspected to be impacted by historical use. **Figure 9‑2** shows the location of four DUs over the footprint of revetments and two DUs in the cleared area. The locations of DUs may vary based on field conditions. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications.

Each DU will be established as a grid with an area of 10,000 square ft, and 50 increments will be collected from each DU, from a depth of 0-6 inches. The DUs will be a 100 ft by 100 ft square and will be laid out as follows:

* The southwest corner of each grid to be sampled will be located using GPS coordinates and staked (Section 4.4.8).
* The remaining three corners will then be staked and GPS coordinates taken.
* After the four corners are staked, the length of each side of the DU will then be measured with a tape measure, to verify the dimension. Corner locations will be adjusted as necessary.

The increment locations will be selected by walking in a random meandering path traversing the DU. The increments will be collected using a dedicated hand trowel instead of the traditional ISM sampling tool because the sandy surface soil at the site cannot be retained in the traditional ISM sampling tool.

Samples will be shipped to a DoD ELAP certified laboratory for analysis. Samples will be analyzed for explosives, perchlorate, and RCRA 8 metals (Table 9‑1). QC samples will be collected at a frequency of 10% of the DUs in the form of triplicate samples. Triplicate samples will be in the form of the primary ISM sample plus two replicate ISM samples (R1/R2). Replicate samples will be collected from the DU at the same time as the primary ISM sample is being collected. The locations of the increments for the two replicate samples will be selected in the same manner as the primary sample (e.g., by walking in separate random meandering paths traversing the DU). MS/MSD samples will be taken at the lab from existing ISM soil sample volumes.

Table 9‑1: ISM Soil Samples and Composite Samples for AOC 89 within Parcel 3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample Type** | Explosives  SW846/8330B | RCRA Metals  SW846 6010C/6020A/7471B | Perchlorate SW846/6850 | SVOCs SW846/ 8270D | **Where Collected** |
| **ISM Samples** Primary | 6 | 6 | 6 |  | Field |
| Replicates at 10% of DUs R1/R2 (10% each) | 1 each (2 total) | 1 (2 total) | 1 (2 total) |  | Field |
| MS/MSD (5% each) | 1 each (2 total) | 1 (2 total) | 1 (2 total) |  | Lab |
|  |  |  |  |  |  |
| **6 point composite** |  |  |  | 6 | Field |
| 10% Field Duplicate (QC) |  |  |  | 1 | Field |
| 10% QA (Secondary Lab) |  |  |  | 1 | Field |
| MS/MSD (5% each) |  |  |  | 1 (2 total) | Lab |
|  |  |  |  |  |  |
| **Sample Total** | 10 | 10 | 10 | 10 |  |

Samples will be labeled as described in Section 4.4.7. The primary sample and the replicate samples will be sent to the primary lab for analysis. The samples will be placed into laboratory supplied containers, documented on the sample and on the COC, and packed in a plastic cooler with ice. One temperature blank per cooler is required. A trip blank will not be required, because analysis for VOCs is not being performed.

QA/QC samples will be subjected to the same laboratory handling and analytical procedures as those used on the primary samples, as applicable to the analysis. The RSD for triplicate samples and acceptable percent recovery for the MS/MSD samples will be established during the DQO process. The data collected will be documented in the Final RFI Report

### Composite Sampling at DUs at AOC 89

Composite samples will be collected from each of the DUs in AOC 89 using a dedicated hand tool (Figure 9-2). These samples will not be collected or processed in the same manner as the ISM samples. The composite sample will be comprised of six subsamples, randomly collected from within the DU and will be analyzed for SVOCs (Table 9‑1). QA/QC samples will be collected from 10% of the DUs, and will be comprised of two splits with the primary sample. One split sample will be sent to the primary lab as a blind field duplicate and the second split sample will be sent to the QA (secondary) laboratory. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications.

**Figure 9‑1: Historical Sampling Locations (AOC 89)**

**Figure 9‑2: Locations of ISM Samples for AOC 89**

# AOC 90

## Background

### Location, Description, and Operational History

AOC 90 is approximately 1.7 acres and is located in two separate areas south of SWMU 15 along the western edge of Parcel 3. AOC 90 consists of two ponds which are dammed on the downstream end and are located topographically upgradient from all known areas of FWDA operations. One pond is outside of the of the FWDA western property (**Figure 1‑3**).

### Waste Characterizations and Contaminants of Potential Concern

The operational history of the FDWA indicates AOC 90 consists of two ponds. The use of the ponds is unknown; however, based on demilitarization activities performed in Parcel 3 and the operational history of the FWDA, the COPCs for AOC 90 are explosives, RCRA 8 metals, perchlorate, and SVOCs.

## Previous Investigations

Previous investigations are summarized in Table 4‑1. Results of previous investigations for this AOC are discussed in the following sections.

### Non-sampling Data

Previous non-sampling data include historical aerials available and an archival document search for AOC 90 as presented in the Historical Investigation Summary Document (Appendix A) and Table 4‑1.

#### Aerial Photographs

Three features were identified within AOC 90. The features were identified as two ponds and a dam.

#### Archive Search Report, 1995

Under the requirements of the CERCLA for Army remediation of munitions response sites, an ASR was prepared for FWDA by USACE, St. Louis District in July, 1995 (USACE, 1995). The ASR compiled information obtained through historical research at various archives and records-holding facilities, interviews with persons associated with the site or its operations, review of environmental reports, aerial photographs, maps, and personal visits to the site. The investigation centered on identifying the exact location of potential environmental contamination from the past demilitarization activities occurring on FWDA. A total of 19 numbered sites and two additional locations were identified as specific AOCs and were further investigated during the site visits. Additional investigation/work was recommended for more than half of the sites. The ASR was the source of information that led to the identification of AOC 90.

AOC 90 is identified in the Permit as Feature 36 on the 1973 Aerial Photo API-5. Feature 36 is described by API-5 as two ponds, dammed downstream (USACE, 1995). Feature 36 is located in Parcel 3, west of the Hogback and near the western property boundary in the Closed OB/OD Area. One pond was outside the FWDA western property boundary. AOC 90 is topographically upgradient from all known areas of FWDA operations. While the ASR did identify this feature on the 1973 aerial photo, this feature was not among the 19 numbered sites and two additional locations identified as Specific AOCs in need of further investigation.

### Sampling Data

Environmental investigations, with the exception of the soil background study, have not been previously conducted at AOC 90.

#### Soil Background Study and Data Evaluation Report, 2010

A background study was conducted and used to make a statistical determination on the nature and occurrence of inorganic constituents in soil at the FWDA based on site-to-background comparisons.

In response to this study, the NMED recommended the following two-step approach to assessing arsenic at the FWDA in lieu of traditional site attribution analysis (NMED, 2013; Appendix C):

Step 1. Compare the site (SWMU/AOC) maximum arsenic concentration to the new background reference for arsenic (5.6 mg/kg). If the maximum detected concentration of arsenic from site soil is below 5.6 mg/kg, then no additional action is required and the arsenic may be considered background. If the site maximum, is greater than 5.6 mg/kg, proceed to Step 2.

Step 2. Compare the range of site (SWMU/AOC) data to the range of background data (0.2 to 11.2 mg/kg). If the site range falls within the background range of arsenic, then no additional action is required and the arsenic may be considered background. If the site range is inconsistent with the background range, then additional investigation and/or corrective action may be required.

### Conceptual Model

#### Site Profile and Land Use

AOC 90 is approximately 1.7 acres and is located in two separate areas south of SWMU 15 along the western edge of Parcel 3. AOC 90 consists of two ponds which are dammed on the downstream end and are located topographically upgradient from all known areas of FWDA operations. One pond is outside of the of the FWDA western property boundary. The FWDA is currently in BRAC caretaker status undergoing environmental investigation and remediation. Following environmental remediation, the land will be turned over to the BIA and held in trust for the NN and/or the POZ for unrestricted land use.

#### Nature and Extent of Contamination

The surface soil of AOC 90 should be characterized by collecting surface soil samples using ISM and composite (6-point discrete) samples. With the exception of the soil background study, soil investigations have not been performed at this AOC. The surface soil will be sampled to determine the nature and lateral extent of contamination in AOC 90.

#### Fate and Transport

If soils are affected at AOC 90, there is a potential for threat to human health and the environment through exposure to surface soils.

#### Data Gaps

Data are needed to identify whether demilitarization activities caused a release to surface soils in the area.Further subsurface investigation possibly required to characterize groundwater transport pathways will be performed under a separate project.

## Investigation Methods

The following section provides the data gathering activities to be conducted to characterize the surface soils within AOC 90 possibly impacted during the mission of the FWDA.

### Contaminants of Potential Concern

Although the ponds are located topographically upgradient from all known areas of FWDA operations, demilitarization activities were performed within Parcel 3. Therefore, the COPCs for AOC 90 are:

* Explosives
* RCRA 8 metals
* Perchlorate
* SVOCs

### Media Characterization

The presence of affected surface soil at AOC 90 will be evaluated by the collection of ISM soil samples and composite samples.

### Analytical Methods

The following analytical methods will be used to analyze samples collected at AOC 90 (discussed further in the UFP-QAPP included as Appendix D):

* Explosives by USEPA method SW846/8330B
* RCRA 8 metals by method 6010C/6020A/7471B
* Perchlorate by USEPA method SW846/6850
* SVOCs by USEPA method SW846/8270D

### Quality Assurance/Quality Control

The QA/QC practices specified in the project for environmental sampling are included in the UFP-QAPP (Appendix D).

## Scope of Activities

The following field activities will be conducted at AOC 90:

* Collection of surface soil ISM samples to identify if explosives, RCRA metals, or perchlorate exceed screening levels within the ponds.
* Collection of composite surface soil samples to identify if SVOCs exceed screening levels in the ponds.

### ISM Soil Sampling at AOC 90

Four ISM samples will be collected from DUs located within the dry ponds in AOC 90. Figure 10‑1 shows the location of four DUs for AOC 90. The locations of DUs may vary based on field conditions. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications.

Each DU will be established as a grid with an area of 10,000 square ft, and 50 increments will be collected from each DU, from a depth of 0-6 inches. The DUs will be a 100 ft by 100 ft square and will be laid out as follows:

* The southwest corner of each grid to be sampled will be located using GPS coordinates and staked (Section 4.4.8).
* The remaining three corners will then be staked and GPS coordinates taken.
* After the four corners are staked, the length of each side of the DU will then be measured with a tape measure, to verify the dimension. Corner locations will be adjusted as necessary.

The increment locations will be selected by walking in a random meandering path traversing the DU. The increments will be collected using a dedicated hand trowel instead of the traditional ISM sampling tool because the sandy surface soil at the site cannot be retained in the traditional ISM sampling tool.

Samples will be shipped to a DoD ELAP certified laboratory for analysis. Samples will be analyzed for explosives, perchlorate, and RCRA 8 metals (Table 10‑1). QC samples will be collected at a frequency of 10% of the DUs in the form of triplicate samples. Triplicate samples will be in the form of the primary ISM sample plus two replicate ISM samples (R1/R2). Replicate samples will be collected from the DU at the same time as the primary ISM sample is being collected. The locations of the increments for the two replicate samples will be selected in the same manner as the primary sample (e.g., by walking in separate random meandering paths traversing the DU). MS/MSD samples will be taken at the lab from existing ISM soil sample volumes.

Table 10‑1: ISM Soil Samples and Composite Samples for AOC 90 within Parcel 3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample Type** | Explosives  SW846/8330B | RCRA Metals  SW846 6010C/6020A/7471B | Perchlorate SW846/6850 | SVOCs SW846/ 8270D | **Where Collected** |
| **ISM Samples** Primary | 4 | 4 | 4 |  | Field |
| Replicates at 10% of DUs R1/R2(10% each) | 1 each (2 total) | 1 each (2 total) | 1 each (2 total) |  | Field |
| MS/MSD (5% each) | 1each (2 total) | 1 each (2 total) | 1 each (2 total) |  | Lab |
|  |  |  |  |  |  |
| **6 point composite** |  |  |  | 4 | Field |
| 10% Field Duplicate (QC) |  |  |  | 1 | Field |
| 10% QA (Secondary Lab) |  |  |  | 1 | Field |
| MS/MSD (5% each) |  |  |  | 1 each (2 total) | Lab |
|  |  |  |  |  |  |
| **Sample Total** | 8 | 8 | 8 | 8 |  |

Samples will be labeled as described in Section 4.4.7. The primary sample and the replicate samples will be sent to the primary lab for analysis. The samples will be placed into laboratory supplied containers, documented on the sample and on the COC, and packed in a plastic cooler with ice. One temperature blank per cooler is required. A trip blank will not be required, because analysis for volatile organic compounds is not being performed.

QA/QC samples will be subjected to the same laboratory handling and analytical procedures as those used on the primary samples, as applicable to the analysis. The RSD for triplicate samples and acceptable percent recovery for the MS/MSD samples will be established during the DQO process. The data collected will be documented in the Final RFI Report.

### Composite Sampling at DUs at AOC 90

Composite samples will be collected from each of the DUs in AOC 90 using a dedicated hand tool (Figure 10‑1). These samples will not be collected or processed in the same manner as the ISM samples. The composite sample will be comprised of six subsamples, randomly collected from within the DU, and will be analyzed for SVOCs (Table 10‑1). QA/QC samples will be collected from 10% of the DUs, and will be comprised of two splits with the primary sample. One split sample will be sent to the primary lab as a blind field duplicate and the second split sample will be sent to the QA (secondary) laboratory. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications

Figure 10‑1: Locations of ISM Samples for AOC 90

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# AOC 91

## Background

### Location, Description, and Operational History

AOC 91 is approximately 28 acres and is located in the central portion of Parcel 3. This AOC consists of a disturbed area within the firebreak that is east and south of the known demolition area and a second disturbed area with many roads and paths (**Figure 1‑3**).

### Waste Characterizations and Contaminants of Potential Concern

The operational history of the FDWA indicates that AOC 91 contained disturbed areas near the demolition area. Based on the operational history of the FDWA and the observations of disturbed areas, the COPCs for AOC 91 are explosives, RCRA 8 metals, perchlorate, and SVOCs.

## Previous Investigations

Previous investigations are summarized in Table 4‑1. Results of previous investigations for this AOC are discussed in the following sections.

### Non-sampling Data

Previous non-sampling data include review of historical aerials and an archival document search for AOC 91 as presented in the Historical Investigation Summary Document (Appendix A) and Table 4‑1.

#### Aerial Photographs

The features identified within AOC 91 were access roads, debris, excavated areas, and several scarred areas with potential pits.

#### Archive Search Report, 1995

Under the requirements of the CERCLA for Army remediation of munitions response sites, an ASR was prepared for FWDA by USACE, St. Louis District in July, 1995 (USACE, 1995). The ASR compiled information obtained through historical research at various archives and records-holding facilities, interviews with persons associated with the site or its operations, review of environmental reports, aerial photographs, maps, and personal visits to the site. The investigation centered on identifying the exact location of potential environmental contamination from the past demilitarization activities occurring on FWDA. A total of 19 numbered sites and two additional locations were identified as specific AOCs and were further investigated during the site visits. Additional investigation/work was recommended for more than half of the sites. The ASR was the source of information that led to the identification of AOC 91.

AOC 91 is identified in the Permit as Feature 41 on the 1973 Aerial Photo API-5 and Feature 27 on the 1978 Aerial Photo (API-7). Feature 41 is described by API-5 as a disturbed area, within the firebreak, east and south of a known demolition area (USACE, 1995). Feature 27 is described as a disturbed area, with many roads and paths. Features 41 and 27 are located in Parcel 3, east of the Hogback and south of the OB/OD Unit.

### Sampling Data

Environmental investigations, with the exception of the soil background study, have not been previously conducted at AOC 91

#### Soil Background Study and Data Evaluation Report, 2010

A background study was conducted and used to make a statistical determination on the nature and occurrence of inorganic constituents in soil at the FWDA based on site-to-background comparisons.

In response to this study, the NMED recommended the following two-step approach to assessing arsenic at the FWDA in lieu of traditional site attribution analysis (NMED, 2013; Appendix C):

Step 1. Compare the site (SWMU/AOC) maximum arsenic concentration to the new background reference for arsenic (5.6 mg/kg). If the maximum detected concentration of arsenic from site soil is below 5.6 mg/kg, then no additional action is required and the arsenic may be considered background. If the site maximum, is greater than 5.6 mg/kg, proceed to Step 2.

Step 2. Compare the range of site (SWMU/AOC) data to the range of background data (0.2 to 11.2 mg/kg). If the site range falls within the background range of arsenic, then no additional action is required and the arsenic may be considered background. If the site range is inconsistent with the background range, then additional investigation and/or corrective action may be required.

### Conceptual Model

#### Site Profile and Land Use

AOC 91 is approximately 28 acres and is located in the central portion of Parcel 3. This AOC consists of a disturbed area within the firebreak that is east and south of the known demolition area and a second disturbed area with many roads and paths. The FWDA is currently in BRAC caretaker status undergoing environmental investigation and remediation. Following environmental remediation, the land will be turned over to the BIA and held in trust for the NN and/or the POZ for unrestricted land use.

#### Nature and Extent of Contamination

The surface soil of AOC 91 should be characterized by collecting surface soil samples using ISM and composite (6-point discrete) samples. With the exception of the soil background study, soil investigations have not been performed at this AOC. The surface soil will be sampled to determine the nature and lateral extent of contamination at AOC 91.

#### Fate and Transport

If soils are affected at AOC 91, there is a potential for threat to human health and the environment through exposure to surface soils.

#### Data Gaps

Data are needed to identify whether demilitarization activities caused a release to surface soils in the area.Further subsurface investigation possibly required to characterize groundwater transport pathways will be performed under a separate project.

## Investigation Methods

The following section provides the data gathering activities conducted to characterize the surface soils within AOC 91 possibly impacted during the mission of the FWDA.

### Contaminants of Potential Concern

As a result of potential demilitarization activities at AOC 91 the COPCs are:

* Explosives
* RCRA 8 metals
* Perchlorate
* SVOCs

### Media Characterization

The presence of affected surface soil at AOC 91 will be evaluated by the collection of ISM soil samples and composite samples.

### Analytical Methods

The following analytical methods will be used to analyze samples collected at AOC 91 (discussed further in the UFP-QAPP included as Appendix D):

* Explosives by USEPA method SW846/8330B
* RCRA 8 metals by method 6010C/6020A/7471B
* Perchlorate by USEPA method SW846/6850
* SVOCs by USEPA method SW846/8270D

### Quality Assurance/Quality Control

The QA/QC practices specified in the project for environmental sampling are included in the UFP-QAPP (Appendix D).

## Scope of Activities

The following field activities will be conducted at AOC 91:

* Collection of surface soil ISM samples to identify if explosives, RCRA metals, or perchlorate exceed screening levels in the AOC in the disturbed area within the firebreak that is east and south of the known demolition area and in a second disturbed area with many roads and paths.
* Collection of composite surface soil samples to identify if SVOCs exceed screening levels in the AOC in the disturbed area within the firebreak that is east and south of the known demolition area and in a second disturbed area with many roads and paths.

### ISM Soil Sampling at AOC 91

Forty ISM samples will be collected from DUs located within AOC 91 in the disturbed area within the firebreak that is east and south of the known demolition area and in a second disturbed area with many roads and paths. **Figure 11‑1** shows the location of the 32 DUs for AOC 91. The locations of DUs may vary based on field conditions. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications.

Each DU will be established as a grid with an area of 10,000 square ft, and 50 increments will be collected from each DU, from a depth of 0-6 inches. The DUs will be a 100 ft by 100 ft square and will be laid out as follows:

* The southwest corner of each grid to be sampled will be located using GPS coordinates and staked (Section 4.4.8).
* The remaining three corners will then be staked and GPS coordinates taken.
* After the four corners are staked, the length of each side of the DU will then be measured with a tape measure, to verify the dimension. Corner locations will be adjusted as necessary.

The increment locations will be selected by walking in a random meandering path traversing the DU. The increments will be collected using a dedicated hand trowel instead of the traditional ISM sampling tool because the sandy surface soil at the site cannot be retained in the traditional ISM sampling tool.

Samples will be shipped to a DoD ELAP certified laboratory for analysis. Samples will be analyzed for explosives, perchlorate, and RCRA 8 metals (Table 11‑1). QC samples will be collected at a frequency of 10% of the DUs in the form of triplicate samples. Triplicate samples will be in the form of the primary ISM sample plus two replicate ISM samples (R1/R2). Replicate samples will be collected from the DU at the same time as the primary ISM sample is being collected. The locations of the increments for the two replicate samples will be selected in the same manner as the primary sample (e.g., by walking in separate random meandering paths traversing the DU). MS/MSD samples will be taken at the lab from existing ISM soil sample volumes.

Table 11‑1: ISM Soil Samples and Composite Samples for AOC 91 within Parcel 3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample Type** | Explosives  SW846/8330B | RCRA Metals  SW846 6010C/6020A/7471B | Perchlorate SW846/6850 | SVOCs SW846/ 8270D | **Where Collected** |
| **ISM Samples** Primary | 32 | 32 | 32 |  | Field |
| Replicates at 10% of DUs R1/R2 (10% each) | 4 each (8 total) | 4 each (8 total) | 4 each (8 total) |  | Field |
| MS/MSD (5% each) | 2 each (4 total) | 2 each (4 total) | 2 each (4 total) |  | Lab |
|  |  |  |  |  |  |
| **6 point composite** |  |  |  | 32 | Field |
| 10% Field Duplicate (QC) |  |  |  | 4 | Field |
| 10% QA (Secondary Lab) |  |  |  | 4 | Field |
| MS/MSD (5% each) |  |  |  | 2 each (4 total) | Lab |
|  |  |  |  |  |  |
| **Sample Total** | 44 | 44 | 44 | 44 |  |

Samples will be labeled as described in Section 4.4.7. The primary sample and the replicate samples will be sent to the primary lab for analysis. The samples will be placed into laboratory supplied containers, documented on the sample on the chain of custody, and packed in a plastic cooler with ice. One temperature blank per cooler is required. A trip blank will not be required, because analysis for volatile organic compounds is not being performed.

QA/QC samples will be subjected to the same laboratory handling and analytical procedures as those used on the primary samples, as applicable to the analysis. The RSD for triplicate samples and acceptable percent recovery for the MS/MSD samples will be established during the DQO process. The data collected will be documented in the Final RFI Report.

### Composite Sampling at DUs at AOC 91

Composite samples will be collected from each of the DUs in AOC 91 using a dedicated hand tool (**Figure 11‑1**). These samples will not be collected or processed in the same manner as the ISM samples. The composite sample will be comprised of six subsamples, randomly collected from within the DU, and will be analyzed for SVOCs. QA/QC samples will be collected from 10% of the DUs, and will be comprised of two splits with the primary sample. One split sample will be sent to the primary lab as a blind field duplicate and the second split sample will be sent to the QA (secondary) laboratory. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications

**Figure 11‑1: Locations of ISM Samples for AOC 91**

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# AOC 92

## Background

### Location, Description, and Operational History

AOC 92 is approximately 19.7 acres and is located inside of the Inner Fence in the central portion of Parcel 3. This area has been identified as a “demil area.” AOC 92 is identified in the Permit as Feature 31 on the 1973 Aerial Photo API-5 and Feature 21 on the 1978 Aerial Photo API-7. Feature 31 is described as bare areas on a hillside with a loop road around the area, two trenches, three small pits, and three pit scars. Feature 21 is described as bare, rough ground on the side of hill with a loop road and two potential pits (USACE, 1995) (**Figure 1‑3**).

### Waste Characterizations and Contaminants of Potential Concern

The operational history of the FDWA indicates that AOC 92 was a “demil area” and has visible evidence of pits and scaring. Based on the operational history of the FDWA and the observations of disturbed areas, the COPCs for AOC 92 are explosives, RCRA 8 metals, perchlorate, and SVOCs.

## Previous Investigations

Previous investigations are summarized in Table 4‑1. Previous investigation areas for AOC 92 are illustrated on Figure 12-1. Results of previous investigations for this AOC are discussed in the following sections.

### Non-sampling Data

Previous non-sampling data include review of historical aerials and an archival document search for AOC 92 as presented in the Historical Investigation Summary Document (Appendix A) and Table 4‑1.

#### Aerial Photographs

Approximately 14 features were identified within AOC 92. The features were identified as scarred areas and potential pits.

#### Archive Search Report, 1995

Under the requirements of the CERCLA for Army remediation of munitions response sites, an ASR was prepared for FWDA by USACE, St. Louis District in July, 1995 (USACE, 1995). The ASR compiled information obtained through historical research at various archives and records-holding facilities, interviews with persons associated with the site or its operations, review of environmental reports, aerial photographs, maps, and personal visits to the site. The investigation centered on identifying the exact location of potential environmental contamination from the past demilitarization activities occurring on FWDA. A total of 19 numbered sites and two additional locations were identified as specific AOCs and were further investigated during the site visits. Additional investigation/work was recommended for more than half of the sites.

A review of FWDA records located a 1964 map showing AOC 92 labeled as a “demil area.”

### Sampling Data

Environmental investigations, with the exception of the soil background study, have not been previously conducted at AOC 92.

#### Soil Background Study and Data Evaluation Report, 2010

A background study was conducted and used to make a statistical determination on the nature and occurrence of inorganic constituents in soil at the FWDA based on site-to-background comparisons.

In response to this study, the NMED recommended the following two-step approach to assessing arsenic at the FWDA in lieu of traditional site attribution analysis (NMED, 2013; Appendix C):

Step 1. Compare the site (SWMU/AOC) maximum arsenic concentration to the new background reference for arsenic (5.6 mg/kg). If the maximum detected concentration of arsenic from site soil is below 5.6 mg/kg, then no additional action is required and the arsenic may be considered background. If the site maximum, is greater than 5.6 mg/kg, proceed to Step 2.

Step 2. Compare the range of site (SWMU/AOC) data to the range of background data (0.2 to 11.2 mg/kg). If the site range falls within the background range of arsenic, then no additional action is required and the arsenic may be considered background. If the site range is inconsistent with the background range, then additional investigation and/or corrective action may be required.

### Conceptual Model

#### Site Profile and Land Use

AOC 92 is approximately 19.7 acres and is located inside the Inner Fence in the central portion of Parcel 3. This area has been identified as a “demil area.” AOC 92 is identified in the Permit as Feature 31 on the 1973 Aerial Photo API-5 and Feature 21 on the 1978 Aerial Photo API-7. Feature 31 is described as bare areas on a hillside with a loop road around the area, two trenches, three small pits, and three pit scars. Feature 21 is described as bare, rough ground on the side of a hill with loop road and two pits (USACE, 1995). The FWDA is currently in BRAC caretaker status undergoing environmental investigation and remediation. Following environmental remediation, the land will be turned over to the BIA and held in trust for the NN and/or the POZ for unrestricted land use.

#### Nature and Extent of Contamination

The surface soil of AOC 92 will be characterized by collecting surface soil samples using ISM methodology and composite (6-point discrete) samples. With the exception of the soil background study, soil investigations have not been performed at this AOC. The surface soil will be sampled to determine the nature and lateral extent of contamination in AOC 92.

#### Fate and Transport

If soils are affected at AOC 92, there is a potential for threat to human health and the environment through exposure to surface soils.

#### Data Gaps

Data is needed to identify whether demilitarization activities caused a release to surface soils in the area.Further subsurface investigation possibly required to characterize groundwater transport pathways will be performed under a separate project.

## Investigation Methods

The following section provides the data gathering activities to be conducted to characterize the surface soils within AOC 92 possibly impacted during the mission of the FWDA.

### Contaminants of Potential Concern

As a result of potential demilitarization activities at AOC 92, the COPCs are:

* Explosives
* RCRA 8 metals
* Perchlorate
* SVOCs

### Media Characterization

The presence of affected surface soil at AOC 92 will be evaluated by the collection of ISM soil samples and composite samples.

### Analytical Methods

The following analytical methods will be used to analyze samples collected at AOC 92 (discussed further in the UFP-QAPP included as Appendix D:

* Explosives by USEPA method SW846/8330B
* RCRA 8 metals by method 6010C/6020A/7471B
* Perchlorate by USEPA method SW846/6850
* SVOCs by USEPA method SW846/8270D

### Quality Assurance/Quality Control

The QA/QC practices specified in the project for environmental sampling are included in the UFP-QAPP (Appendix D).

## Scope of Activities

RFI delineation activities will be performed to characterize MC within surface soils at AOC 92. Soil at AOC 92 exceeding the screening levels will be removed, and the characterization data will be used to determine soil removal requirements. Soil removal activities will be performed IAW the *Interim Measures Work Plan Parcel 3 Areas of Concern and Solid Waste Management Units, October 2015*. The scope of sampling activities to be performed to support the RFI delineation and soil removal activities will include the following:

* Characterization of surface soils with DUs covering the entire AOC 92 area which is suspected to have been used for demolition operations.
* Collection of surface soil ISM samples to identify if explosives, RCRA metals, or perchlorate exceed screening levels.
* Collection of composite surface soil samples to identify if SVOCs exceed screening levels.

Surface soil characterization results will be presented in the Final RFI Report. Final confirmation sampling results at DUs for which interim removals are performed will also be included in the Final RFI Report. Interim removal actions performed at AOC 92 will be reported in the Final Interim Measures Report.

### ISM Soil Sampling at AOC 92

Because the sampling work being undertaken at AOC 92 is intended to support potential remediation activities, the entire footprint of this AOC will be covered with a total of 80 DUs. To be consistent with ISM sampling activities being performed at other SWMUs and AOCs in Parcel 3, the DUs in AOC 92 will be established as grids that are 100 ft by 100 ft square.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample Type** | Explosives  SW846/8330B | RCRA Metals  SW846 6010C/6020A/7471B | Perchlorate SW846/6850 | SVOCs SW846/ 8270D | **Where Collected** |
| **ISM Samples** |  |  |  |  |  |
| Primary | 80 | 80 | 80 |  | Field |
| Replicates at 10% of DUs R1/R2 (10% each) | 8 each (16 total) | 8 each (16 total) | 8 each (16 total) |  | Field |
| MS/MSD (5% each) | 4 each (8 total) | 4 each (8 total) | 4 each (8 total) |  | Field |
|  |  |  |  |  |  |
| **6 point composite** |  |  |  | 80 | Field |
| 10% Field Duplicate (QC) |  |  |  | 8 | Field |
| 10% QA (Secondary Lab) |  |  |  | 8 | Field |
| MS/MSD (5% each) |  |  |  | 4 each (8 total) | Field |
|  |  |  |  |  |  |
| **Sample Total** | 104 | 104 | 104 | 104 |  |

Samples will be labeled as described in Section 4.4.7. The primary sample and the replicate samples will be sent to the primary lab for analysis. The samples will be placed into laboratory supplied containers, documented on the sample and on the COC, and packed in a plastic cooler with ice. One temperature blank per cooler is required. A trip blank will not be required, because analysis for volatile organic compounds is not being performed.

QA/QC samples will be subjected to the same laboratory handling and analytical procedures as those used on the primary samples, as applicable to the analysis. The RSD for triplicate samples and acceptable percent recovery for the MS/MSD samples will be established during the DQO process.

As stated above, the characterization data will be documented in the Final RFI Report.

### Composite Sampling at DUs at AOC 92

Composite samples will be collected from each of the DUs in AOC 92 using a dedicated hand tool.These samples will not be collected or processed in the same manner as the ISM samples. The composite sample will be comprised of six subsamples, randomly collected from within the DU, and will be analyzed for SVOCs (Table 12‑1). QA/QC samples will be collected from 10% of the DUs, and will be comprised of two splits with the primary sample. One split sample will be sent to the primary lab as a blind field duplicate and the second split sample will be sent to the QA (secondary) laboratory. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications. Composite sample results will also be reported in the Final RFI Report.

Figure 12‑1: Historical Sampling Locations (AOC 92)

Figure 12‑2: Historical Sampling Locations (AOC 92)

Figure 12‑3 shows the location of the 80 DUs to be established at AOC 92. The locations of DUs may vary based on field conditions. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications.

The DUs will be established as follows:

* The southwest corner of each grid to be sampled will be located using GPS coordinates and staked (Section 4.4.8).
* The remaining three corners will then be staked and GPS coordinates taken.
* After the four corners are staked, the length of each side of the DU will then be measured with a tape measure, to verify the dimension. Corner locations will be adjusted as necessary.
* Also, because of potential remediation activities, the corners of the DUs established for AOC 92 will also be surveyed to the nearest foot by a New Mexico-licensed professional surveyor (Section 4.4.8).

Fifty increments will be collected from each DU, from a depth of 0-6 inches. The increments will be collected using a dedicated hand trowel instead of the traditional ISM sampling tool because the sandy surface soil at the site cannot be retained in the traditional ISM sampling tool.

Samples will be shipped to a DoD ELAP certified laboratory for analysis. Samples will be analyzed for explosives, perchlorate, and RCRA 8 metals (Table 12‑1). QC samples will be collected at a frequency of 10% of the DUs in the form of triplicate samples. Triplicate samples will be in the form of the primary ISM sample plus two replicate ISM samples (R1/R2). Replicate samples will be collected from the DU at the same time as the primary ISM sample is being collected. The locations of the increments for the two replicate samples will be selected in the same manner as the primary sample (e.g., by walking in separate random meandering paths traversing the DU). MS/MSD samples will also be collected in the same manner as the primary and replicate samples at a rate of 5% of the DUs.

Table 12‑1: ISM Soil Samples and Composite Samples for AOC 92 within Parcel 3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample Type** | Explosives  SW846/8330B | RCRA Metals  SW846 6010C/6020A/7471B | Perchlorate SW846/6850 | SVOCs SW846/ 8270D | **Where Collected** |
| **ISM Samples** |  |  |  |  |  |
| Primary | 80 | 80 | 80 |  | Field |
| Replicates at 10% of DUs R1/R2 (10% each) | 8 each (16 total) | 8 each (16 total) | 8 each (16 total) |  | Field |
| MS/MSD (5% each) | 4 each (8 total) | 4 each (8 total) | 4 each (8 total) |  | Field |
|  |  |  |  |  |  |
| **6 point composite** |  |  |  | 80 | Field |
| 10% Field Duplicate (QC) |  |  |  | 8 | Field |
| 10% QA (Secondary Lab) |  |  |  | 8 | Field |
| MS/MSD (5% each) |  |  |  | 4 each (8 total) | Field |
|  |  |  |  |  |  |
| **Sample Total** | 104 | 104 | 104 | 104 |  |

Samples will be labeled as described in Section 4.4.7. The primary sample and the replicate samples will be sent to the primary lab for analysis. The samples will be placed into laboratory supplied containers, documented on the sample and on the COC, and packed in a plastic cooler with ice. One temperature blank per cooler is required. A trip blank will not be required, because analysis for volatile organic compounds is not being performed.

QA/QC samples will be subjected to the same laboratory handling and analytical procedures as those used on the primary samples, as applicable to the analysis. The RSD for triplicate samples and acceptable percent recovery for the MS/MSD samples will be established during the DQO process.

As stated above, the characterization data will be documented in the Final RFI Report.

### Composite Sampling at DUs at AOC 92

Composite samples will be collected from each of the DUs in AOC 92 using a dedicated hand tool. These samples will not be collected or processed in the same manner as the ISM samples. The composite sample will be comprised of six subsamples, randomly collected from within the DU, and will be analyzed for SVOCs (Table 12‑1). QA/QC samples will be collected from 10% of the DUs, and will be comprised of two splits with the primary sample. One split sample will be sent to the primary lab as a blind field duplicate and the second split sample will be sent to the QA (secondary) laboratory. Worksheet #18 in the UFP-QAPP (Appendix D) provides sample identifications. Composite sample results will also be reported in the Final RFI Report.

Figure 12‑1: Historical Sampling Locations (AOC 92)

Figure 12‑2: Historical Sampling Locations (AOC 92)

Figure 12‑3: Locations of ISM Samples for AOC 92

# Project management

## Project Requirements

Per Section VII.H.3 of the RCRA Permit, a Final Soil Investigation report that includes an analysis and summary of all required investigations, nature and extent of COPCs, actual and potential receptors, and recommendations for the SWMUs and AOCs will be provided to the NMED for review and approval in accordance with the schedule discussed in Section 13.2.

## Reporting Schedule

The projected schedule for conducting the RFI activities at the SWMUs and AOCs within Parcel 3 is as follows:

Field Activities Start 30 days after receipt of NMED approval of RCRA Facility Investigation Work Plan, weather permitting. Field work, data analysis, and evaluation will take approximately 75 days.

Submittal of Army Draft RFI Report Submitted 60 days following the receipt of validated laboratory data.

Submittal of Final RFI Report Submitted 5 days after receipt and resolution of comments on RFI Report from the Tribes and NMED.

A full schedule for this project is provided as Appendix G of this WP.

## Other Project Plans

A site-specific UFP-QAPP (Appendix D) was prepared to describe the QA/QC procedures to be followed during the RFI WP field activities.

An APP/SSHP has been prepared for the field investigation activities proposed in this RFI WP for the SWMUs and AOCs at Parcel 3 (Appendix E, provided under separate cover).

A WMP has been prepared for the work covered in this RFI WP for the SWMUs and AOCs within Parcel 3 (Appendix F). The WMP identifies types of waste, methodology to characterize, dispose or recycle, and track waste. This plan is closely linked to the Hazardous Waste Contingency Plan and the Environmental Protection Plan (Appendix F).

## Community Relations Plan

The installation-wide Community Relations Plan (TPMC, 2006b) will be adhered to during implementation of the soil investigation activities.

# References

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**APPENDIX A**

**HISTORICAL INFORMATION SUMMARY DOCUMENT**

**APPENDIX B**

**CULTURAL RESOURCES MANAGEMENT PLAN**

*(Appendix B will be submitted under separate cover)*

**APPENDIX C**

**NMED December 18, 2003 letter *Evaluation of Background Levels for Arsenic in Soil***

**Parcel 3 Historical Soil and Sediment Data Summary Table**

**APPENDIX D**

**Uniform Federal Policy for Quality Assurance Project Plan (UFP-QAPP)**

***INCLUDES:***

SOPs for Environmental Field Activities

SOPs for Laboratory Activities

**APPENDIX E**

**Accident Prevention Plan (APP)/ Site Safety and Health Plan (SSHP)**

*(Appendix E will be submitted under separate cover)*

**APPENDIX F**

**Environmental Protection Plan**

*(Appendix F will be submitted under separate cover)*

***Includes:***

Waste Management Plan (WMP)

Hazardous Waste Contingency Plan (HWCP)

**APPENDIX G**

**PROJECT SCHEDULE**

**APPENDIX H**

**RESPONSES TO COMMENTS**