Final

Hazardous Waste Management Unit Removal Action Completion Report HWMU, Parcel 3

Fort Wingate Depot Activity
McKinley County, New Mexico

August 2025

Contract No. W912BV-16-C-0033

Prepared for:

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List of Acronyms and Abbreviations

°F	degrees Fahrenheit
%	Percent
AECOM	AECOM Technical Services, Inc.
ALM	Adult Lead Exposure Model
AOC	Area of Contamination
APPL	Agriculture & Priority Pollutants Laboratories, Inc.
ASR	Archive Search Report
bgs	below ground surface
BIA	Bureau of Indian Affairs
BIP	blown in place
BLU	bomb live unit
BRAC	Base Realignment and Closure
BSP	Blind Seeding Program
CAMU	Corrective Action Management Unit
CDC	Current Detonation Crater
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm	centimeter(s)
COC	chain of custody
COR	Contracting Officer's Representative
CRMP	Cultural Resources Management Plan
CRP	Current Residue Pile
CSM	CSM Environmental, Inc.
DA	Department of the Army
DDESB	Department of Defense Explosives Safety Board
DFW	definable feature of work
DGM	digital geophysical mapping
DL	detection limit
DMM	discarded military munitions
DoD	Department of Defense
DoDI	Department of Defense Instruction
DQCR	Daily Quality Control Report

DQO	data quality objective
DSR	Daily Site Report
ECM	earth covered magazine
EM	Engineer Manual
ERM	Environmental Restoration Manager
ESS	Explosives Safety Submission
FCR	Field Change Request
FWDA	Fort Wingate Depot Activity
GIS	geographic information system
gpm	gallons per minute
GPS	global positioning system
GSV	geophysical system verification
HE	high explosive
HQ	hazard quotient
HI	hazard index
HTRW	hazardous, toxic, or radiological waste
HWMU	Hazardous Waste Management Unit
ID	Identification
IEUBK	Integrated Exposure Uptake Biokinetic
ILB	inspection line barricade
ISO	industry standard object
IVS	instrument verification strip
J	estimated (data qualifier)
JATO	jet-assisted takeoff
lb	Pound
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	limit of detection
LOQ	limit of quantitation
m	meter
MC	munitions constituents
MD	munitions debris
MDAS	material documented as safe

MDEH	material documented as an explosive hazard
MEC	munitions and explosives of concern
mg/kg	milligrams per kilogram
mm	millimeter
MMRP	Military Munitions Response Program
mph	miles per hour
MPPEH	material potentially presenting an explosive hazard
MQO	measurement quality objective
MRP QD	Munitions Response Program Quality Director
MR SPM	Munitions Response Safety Program Manager
MS/MSD	matrix spike/matrix spike duplicate
MSD	minimum separation distance
msl	mean sea level
mV	millivolt
NAD83	North American Datum of 1983
NCR	Nonconformance Report
NEW	net explosive weight
ng/kg	nanograms per kilogram
NMED	New Mexico Environment Department
No.	Number
NPDES	National Pollutant Discharge Elimination System
OB/OD	open burn/open detonation
OBDA	Open Burning and Detonation Area
OESS	Ordnance and Explosives Safety Specialist
PD	point-detonating
PMC	Project Management Company
PPE	personal protective equipment
QA	quality assurance
QC	quality control
R	unusable (data qualifier)
RA	Removal Action
RATO	rocket-assisted takeoff
RC	remote controlled

RCRA	Resource Conservation and Recovery Act
RFD	remote firing device
RPD	relative percent difference
RRD	range-related debris
RSD	relative standard deviation
RSL	Regional Screening Level
RTK	real-time kinematic
SOP	Standard Operating Procedure
SSL	Soil Screening Level
SUXOS	Senior UXO Supervisor
SVOC	semi-volatile organic compound
SWMU	Solid Waste Management Unit
SWPPP	Storm Water Pollution Prevention Plan
TAL	target analyte list
TCLP	toxicity characteristic leaching procedure
TEAD	Tooele Army Depot
TEQ	toxicity equivalence
TFU	Thermal Flashing Unit
TNT	2,4,6-trinitrotoluene
TP	Technical Paper
TPMC	TerranearPMC
TR	target risk
U	not detected (data qualifier)
U.S.	United States
UJ	estimated nondetect (data qualifier)
URS	URS Group, Inc.
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UTL	upper tolerance limit
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer

VOC	volatile organic compound
WP	Work Plan
ZCRE	Zuni Cultural Resource Enterprise

This Removal Action (RA) Completion Report presents the cumulative results of an extensive multi-year RA completed at the Hazardous Waste Management Unit (HWMU) (Open Burn/Open Detonation [OB/OD] Unit) (FTWG-4 002-R-01), hereafter referred to as the HWMU, at Fort Wingate Depot Activity (FWDA) in McKinley County, New Mexico. The HWMU includes 32 acres within Parcel 3 located in the southwestern portion of the FWDA. This Report has been completed pursuant to the FWDA Resource Conservation and Recovery Act (RCRA) Permit Number (No.) NM 6213820974 in accordance with Military Munitions Response Program (MMRP) standards.

The cumulative results of the RA fieldwork completed throughout the FWDA HWMU are documented in this RA Completion Report. The objective of the HWMU RA was to mechanically remove and properly dispose of hazardous wastes and hazardous waste residues historically deposited at the HWMU. The RA fieldwork included intensive mobilization and site setup activities including boundary and topographic land surveys, construction and startup of a Corrective Action Management Unit (CAMU), and establishment of an extensive soil and debris processing plant. Once these facilities were established, grid based soil and debris removal and associated processing activities were completed throughout the HWMU grids. As these activities progressed, munitions-related materials were mechanically separated from the soil matrix and inspected as material potentially presenting an explosive hazard (MPPEH). Following inspection, munitions and explosives of concern (MEC) were stored for future disposal by detonation or were blown-in place (BIP) if deemed unsafe to move. After inspection and verification as safe (i.e., free of explosive hazards), recovered munitions debris (MD) was flashed to facilitate its final RA disposition as material documented as safe (MDAS). Excavated and processed soils were stockpiled, sampled, and submitted to an analytical laboratory for analysis. The analytical results were reviewed and validated by a project chemist and were evaluated for potential risk to human receptors. Clean soil stockpiles were reused as backfill and contaminated stockpiles were disposed of accordingly. Once grids were excavated and processed to completion they were verified as complete by post-excavation digital geophysical mapping (DGM) and confirmation soil sampling. Once DGM and confirmation soil sampling results verified that grids were excavated and processed to completion, the grids were backfilled and restored to promote positive drainage and facilitate vegetation reestablishment.

The RA was completed in accordance with Section III of the RCRA Permit (NMED 2015) to remove MEC, hazardous waste residues (i.e., MD greater than 5/8 inch), and soils with chemical concentrations (i.e., munitions constituents [MC]) above project specific cleanup levels from the HWMU. Based on the comprehensive RA fieldwork completed throughout the Parcel 3 HWMU, no additional active remedial operations (i.e., MEC removal) are warranted for the Site (i.e., the HWMU). Because all MEC and MD items recovered were removed and remaining soils were documented as below residential Soil Screening Levels (SSLs), it is recommended that a RCRA Permit modification be completed to document RA completion at the HWMU.

This RA Completion Report documents and summarizes the cumulative data collected from soils excavated and processed through a closed-loop processing plant including stockpile analyses, confirmation sampling, and MEC removal and disposal from operations completed by URS/AECOM since the inception of the RA fieldwork in 2012. With the exception of 2024 field activities and results, the cumulative RA data summarized in this RA Completion Report was previously approved in a series of HWMU Progress Status Reports as follows:

- HWMU Progress Status Report 2012-2018 (Revision 1) (AECOM 2021a)
- HWMU Progress Status Report 2019 (AECOM 2021b)
- HWMU Progress Status Report 2020 (AECOM 2021c)
- HWMU Progress Status Report 2021 (AECOM 2022)
- HWMU Progress Status Report 2022 (Revision 1) (AECOM 2024a)
- HWMU Progress Status Report 2023 (AECOM 2024b)

The United States (U.S.) Army Corps of Engineers (USACE) Albuquerque District contracted URS Group, Inc. (URS) under FWDA Contract W912QR-04-D-0025 (Delivery Order DM01), to complete the RA at the HWMU. AECOM Technical Services, Inc., (AECOM) was subsequently awarded a contract by the USACE Tulsa District under Contract No. W912BV-16-C-0033 to complete the RA within the HWMU and document procedures, findings, and conclusions of this RA Completion Report, per the New Mexico Environment Department (NMED) approved Work Plan (WP).

1.1 PROJECT PURPOSE AND SCOPE

The RA was completed in accordance with Section III of the RCRA Permit (NMED 2015) to remove MEC, hazardous waste residues (i.e., MD greater than 5/8 inch), and soils with chemical concentrations (i.e., MC) above project specific cleanup levels from the HWMU. The primary tasks included in this RA included:

- Mobilization and site Setup (**Section 2.2.1**)
- HWMU boundary and topographic land survey (**Section 2.2.1**)
- Construction and operation of a CAMU (**Section 2.2.6**)
- Earth covered magazines (ECMs) (**Sections 2.2.5** and **2.2.6**)
- Debris and soil removal (**Section 2.2.3**)
- Debris and soil processing (**Section 2.2.4**)
- Soil stockpile management and characterization sampling (**Section 2.2.9**)
- MD flashing (**Section 2.2.7**)
- MPPEH inspection (**Section 2.2.5**)

- MEC and material documented as an explosive hazard (MDEH) disposal (**Section 2.2.6**)
- MDAS disposal (**Section 2.2.5**)
- Post-excavation DGM (**Section 2.2.8**)
- Confirmation soil sampling (**Section 2.2.10**)
- Site restoration (**Section 2.2.12**)

1.2 REPORT ORGANIZATION

This RA Completion Report is organized into the following sections:

- **Executive Summary:** Summarizes the project scope and contract and presents the management and organization of the comprehensive RA completed at the HWMU since 2012.
- **Section 1 – Introduction and Background:** Presents the project purpose and scope; summarizes the HWMU location, setting, and history; summarizes the results of previous investigations; and identifies key project management personnel.
- **Section 2 – Project Activities and Operations:** Describes the overall RA approach, methods, and procedures used to complete the RA at the HWMU.
- **Section 3 – Removal Action Results:** Summarizes the cumulative results of RA fieldwork completed from 2012 through 2024 throughout the HWMU under multiple contracts and reported in a series of annual Progress Status Reports (AECOM 2021a through AECOM 2024b).
- **Section 4 − Quality Control Activities and Results:** Documents the results of quality control (QC) activities conducted for the RA definable features of work (DFWs).
- **Section 5 − Quality Assurance Activities and Results:** Documents final USACE quality assurance (QA) acceptance of the RA fieldwork completed throughout each of the HWMU RA grids.
- **Section 6 – Summary and Recommendations:** Summarizes achievement of the RA objectives at the HWMU and provides recommendations for the future of the site.

The appendices are organized as follows (unless noted otherwise, the appendices of this cumulative Report are presented in electronic [i.e., PDF] format only):

- **Appendix A – Media Sampling Results:** Presents the cumulative laboratory analytical results tables from the RA soil stockpile sampling and confirmation soil sampling activities.
- **Appendix B – Risk Assessment Tables:** Provides the full set of risk screening tables used to calculate cumulative human health risks from any potentially elevated analyte concentrations identified in the RA stockpile and confirmation soil sample results presented in **Appendix A**.
- **Appendix C – MEC Tracking:** Provides a summary of the MEC identified, tracked, removed, and disposed during the RA fieldwork.

- **Appendix D – Daily Reports and Logs:** Presents the Daily Site Reports (DSRs) generated by the Senior Unexploded Ordnance (UXO) Supervisor (SUXOS) and Daily Quality Control Reports (DQCRs) generated by the UXO Quality Control Specialist (UXOQCS) throughout completion of the RA field activities at the HWMU.
- **Appendix E – HWMU Well Abandonment Documentation:** Includes NMED-approved planning and completion documentation for multiple wells abandoned during the HWMU RA fieldwork.
- **Appendix F – Waste Disposal/Recycling Documentation:** Documents final disposition of the inspected and verified MDAS removed from the HWMU during the RA fieldwork.
- **Appendix G – IVS Report and DGM Data:** Presents the DGM Instrument Verification Strip (IVS) Reports and associated post-excavation DGM data compiled during the HWMU RA.
- **Appendix H – Photo Documentation Log:** Presents photographs summarizing the RA field activities completed at the HWMU.
- **Appendix I − Data Review and Validation:** Provides the data review and validation results for the laboratory analytical results obtained during the RA.
- **Appendix J − Quality Assurance Inspections:** Presents the USACE QA acceptance documentation (i.e., on Forms 6048) verifying the completion of the RA field activities throughout each of the HWMU Grids.
- **Appendix K – Nonconformance Reports (NCRs) and Field Change Requests (FCRs):** Presents the NCRs completed during the RA fieldwork that warranted corrective action documentation and the FCRs completed to document minor deviations from the RA WP implemented to enhance the safety and quality of field activities.
- **Appendix L – Project Correspondence and Approvals:** Presents documentation of significant project correspondence and approvals to facilitate the successful completion of the HWMU RA.

1.3 PROJECT LOCATION AND SETTING

FWDA is located in northwestern New Mexico in McKinley County, approximately 8 miles east of Gallup, New Mexico (**Figure 1-1**). FWDA currently occupies approximately 24 square miles (15,273 acres) of land formerly used to operate a reserve storage facility that provided care, preservation, and minor maintenance of assigned commodities primarily including conventional military munitions. The HWMU includes 32 acres within the 1,805.8-acre Parcel 3 located in the southwestern portion of the FWDA. The HWMU is encompassed by the 104-acre OB/OD Area discussed in **Section 1.4.1** as shown on **Figure 1-2**.

1.3.1 Geology and Hydrology

FWDA is located in an erosional basin within the Navajo section of the Colorado Plateau Physiographic Province. The majority of the installation is underlain by the Chinle Group and dissected by arroyos. The Chinle Group is dominated by calcareous mudstone but also includes occasional fine-grained calcareous sandstone. The softer mudstone is easily eroded to form badlands and arroyos on hillslopes and in eroded valleys. The sandstone is relatively weather-resistant and forms the cap rock of remnant bedrock exposures, especially in the northern portion of FWDA. The Chinle Group consists of four formations including (in ascending order): Shinarump, Bluewater Creek, Petrified Forest (the Blue Mesa, Sonsela, and Painted Desert Members), and Owl Rock Formations.

The northern portion of the installation is typically covered by remnants of the Chinle Group or alluvial deposits. Alluvial deposits are also present along intermittent streams that drain the Hogback and Zuni Mountains that flow through the northern part of the installation. The alluvial grain sizes range from clay to gravel and are typical of braided stream deposits. The alluvial deposits are thickest near major drainages, ranging from 30 feet thick to 150 feet thick just northwest of the installation near the south fork of the Rio Puerco. A Hogback is present as the prominent geologic feature along the western and southwestern boundaries of the installation. It is thought to represent a monocline fold, where westerly dipping Mesozoic bedrock is exposed forming a long, sharp-crested ridge that trends from north to south (TPMC 2008a).

The FWDA lies between the South Fork of the Rio Puerco to the north and the northern foothills of the Zuni Mountain Range to the south. Surface water drainages in this region are intermittent with flow occurring only during, and after, heavy rainfall events and spring snowmelt from the Zuni Mountain Range and the Hogback. Surface drainages in the region generally flow toward the north into the South Fork of the Rio Puerco. A prominent arroyo bisects the HWMU portion of the FWDA (ERM 1995).

Groundwater is present in several of the rock units underlying FWDA. The only formations at FWDA capable of yielding more than a few gallons per minute (gpm) are the Quatowam Alluvium (Quaternary) and the San Andres Limestone and Glorieta Sandstone (Permian). However, minor amounts of groundwater are occasionally present within the Chinle Formation (Triassic) and underlying rock units. Water-bearing formations of Jurassic and Cretaceous ages, capable of yielding 100 gpm or more, are present 4 to 6 miles to the west of FWDA, but not within installation boundaries. Typical FWDA alluvial deposits are made up of gravel, sand, silt, and clay, and are typically recharged from surface runoff, mainly during the wet season (i.e., during the spring snowmelt). Some deposits in the southern part of the installation are also recharged by springs from underlying bedrock aquifers. Similar to surface water, groundwater at the FWDA generally flows from south to north. The region around Gallup, including FWDA, was declared an underground water basin in 1980 by the State of New Mexico. This action prohibited any major new groundwater withdrawals without the approval of the State Engineer. The basin covers 1,439 square miles and includes the communities of Gallup, FWDA, Camerco, Mariano Lake, Navajo Wingate Village, and Rehoboth (TPMC 2008a).

1.3.2 Topography and Soils

FWDA is located in McKinley County, which is bisected by the Great Continental Divide. The elevation at FWDA ranges from 6,500 feet above mean sea level (msl) to 8,250 feet above msl.

FWDA is located within the Zuni Mountains and includes three topographic areas: 1) a rugged north-to-south trending ridge (the Hogback) along the western and the southwestern boundaries; 2) the northern hill slopes of the Zuni Mountain Range in the southern portion of the installation; and 3) the alluvial plains marked by bedrock remnants in the northern portion of the installation. As discussed in **Section 1.3.1**, primary drainage features in the area flow from south to north and eventually discharge to the South Fork of the Rio Puerco. Surface drainage is typically shallow near headwaters and intensifies downstream, resulting in a system of well-developed, steep-walled arroyos that form from the erosion of localized silt-and clay-rich bedrock (ERM 1995).

Soils at the installation are similar to those occurring in cool plateau and mountain regions of New Mexico. Soil thickness varies widely throughout the installation, with alluvial accumulations deepest along canyon floors and in the Rio Puerco Valley. Bedrock exposures are common throughout the area. Soils are generally fragile loams or loam/clay mixtures with variable percentages of silt, sand, gravel, and rock fragments. Wind and water cause extensive soil erosion, especially in areas where vegetation is absent.

1.3.3 Climate

FWDA lies within a semiarid continental climatic region with long and hot summers and mild winters. Average seasonal temperatures vary significantly with elevation and topography. The average annual summer temperature is 70 degrees Fahrenheit (°F) with high temperatures generally in the low 90s. The average annual winter temperature is 27°F with daily temperatures fluctuating between 50 and 70 °F. During the spring, the area experiences strong winds from the west and southwest. Strong winds, high temperatures, and low relative humidity in the area contribute to high evaporation rates. Most precipitation occurs from May through October as localized and brief summer storms. Mean annual rainfall for the area ranges between 10 and 16 inches, while the recorded average annual precipitation for the FWDA is 11 inches. Most of the precipitation occurs as rain or hail in summer thunderstorms, and the rest is from light winter snow accumulations. Spring and fall droughts are common in the region.

1.3.4 Vegetation and Wetlands

Regional vegetation includes grassland and sagebrush communities typically surrounded by pinyon pine/juniper woodland communities. During wet periods of the year, the deep arroyo that bisects the HWMU occasionally becomes flooded and promotes wetland vegetation development. The wetland vegetation communities include a sedge meadow and coyote willow species.

A review of U.S. Fish and Wildlife National Wetlands Inventory did not identify any wetlands within the project area. A wetland delineation survey of the arroyo bisecting the HWMU was completed in November 2012 as part of previous removal work within the HWMU. Wetlands were delineated following the guidelines and criteria of the USACE 1987 Wetlands Delineation Manual and the Arid West Regional Supplement. The delineation concluded that the area of planned clean-up (i.e., including the arroyo) was not a designated wetland and proposed remedial activities would have no negative effects to potential wetlands (URS 2012a). Additional details regarding ecological resources and associated mitigation procedures are discussed in **Section 2.3**.

1.4 FWDA DESCRIPTION AND HISTORY

FWDA is an inactive U.S. Army Depot whose active mission was to receive, store, and ship materials and dispose of obsolete or deteriorated explosives and military munitions. FWDA operated from the mid-1940s until 1993.

The former installation was established as Fort Wingate in 1860. In 1941 Fort Wingate underwent major construction and expansion of the administration and ECM areas. In 1971, the depot was placed in reserve status and renamed FWDA (MKM Engineers, Inc. 2008). In 1975, the installation was placed under the administrative command of Tooele Army Depot (TEAD), located near Salt Lake City, Utah. The active mission of FWDA ceased and the installation closed in January 1993, as a result of the Defense Authorization Amendments and Base Realignment and Closure (BRAC) Act of 1988. In 2002, the Army reassigned many functions at FWDA to the BRAC Division, including property disposal, caretaker duties, management of caretaker staff, and performance of environmental remediation and compliance activities. TEAD retained command and control responsibilities and continued to provide support services to FWDA until January 31, 2008. On this date, FWDA command, control, and support functions were transferred to the White Sands Missile Range, but the BRAC office maintained responsibility for conducting and administering environmental cleanup activities (TPMC 2008b).

FWDA is almost entirely surrounded by federally owned or administered lands including national forest and tribal lands. North and west of FWDA are Navajo Tribal Trust and Allotted Lands. The Bureau of Indian Affairs (BIA) administers the land east and south of Parcel 3. The land to the west is mostly undeveloped and is Tribal Trust and Allotment Land administered by the BIA, Navajo Nation, and individual Native American allottees (MKM Engineers, Inc. 2008).

1.4.1 Open Burning and Detonation Areas

Historical OB/OD activities at the FWDA were primarily conducted within an area designated as the Open Burning and Detonation Area (OBDA). The OBDA was located in a west-central portion of the installation and encompassed the Current and Closed OB/OD Areas. The Closed OB/OD Area was used from 1948 to 1955. Beginning in the mid-1940s, burning and detonation operations at the installation were performed within the Current OB/OD Area which includes the HWMU. **Figure 1-2** shows the location of the HWMU relative to the Current OB/OD Area. In 1980, these operations were permitted and regulated under RCRA Interim Status (ERM 1995). Operations within the closed OB/OD Area were listed on the FWDA RCRA Part A Permit Application dated August 1980. In 2002 the official pathway for environmental restoration activities at the HWMU was documented in the RCRA Permit which was subsequently finalized in 2005. The RCRA Permit was most recently updated in 2015 (NMED 2015).

1.4.2 HWMU History

The comprehensive MEC and MD RA activities documented in this Report were completed throughout the 32-acre HWMU portion of Parcel 3 (1,805.8 acres total). The HWMU is encompassed by the 104-acre OB/OD Area discussed in **Section 1.4.1** as shown on **Figure 1-2**.

The HWMU, is identified in Attachment 12 of the FWDA RCRA Permit. Prior to this RA, the HWMU consisted of a former burning ground, 10 areas identified as Current Residue Piles (CRPs) 1 through 10, and 12 OD craters identified as Current Detonation Craters (CDCs) 1 through 12. A detailed map illustrating the historical CRP and CDC areas and RA grids remediated within the HWMU is included as **Figure 1-3**.

Demilitarization of unserviceable, obsolete, or waste explosives, propellants, munitions, and munitions components was completed at the HWMU. Propellants, small arms, and bulk explosives were burned as a means of disposal at the HWMU. Disposals by detonation were also conducted on the ground surface and within the former detonation craters at the HWMU. The explosive detonations also forced MEC and MD into subsurface soils of the HWMU. The former detonation craters may have occasionally been tamped with earthen covers to minimize fragment dispersal, but residual materials from the historical OB/OD operations were moved and redistributed within the HWMU using a variety of mechanisms including earthmoving operations (e.g., piles of residual materials were pushed onto/over arroyo banks using earthmoving equipment during historical FWDA operations). Natural processes including erosion and surface runoff also contributed to the historical transport and redistribution of munitions-related materials (e.g., MEC and MD deposited in former piles were transported down arroyo banks and into/along arroyo bottoms) (TPMC 2008a).

1.5 PREVIOUS INVESTIGATIONS AND RESPONSE ACTIONS

1.5.1 1992-1993 UXO Survey

Munitions response activities were originally initiated at FWDA in 1992. These activities consisted of surveys conducted by UXB International to support planned environmental investigations of areas that had been identified as potentially impacted by MEC, including the HWMU. The survey activities were limited in nature and were not well documented. Within the defined OB/OD Area, approximately 10,223 ordnance items (live and non-live) were identified and recovered and approximately 874 items were BIP. The consolidated UXO items were disposed using three existing detonation craters within the Current OB/OD Area. A visual UXO survey also identified residue/refuse areas along the length of the arroyo that were marked on figures and incorporated into the field screening program implemented as part of the RCRA Interim Status Closure of the OB/OD Areas. The visual survey was completed radially from the OB/OD facilities to the furthest extent of observed UXO (ERM 1994).

1.5.2 1995 Archive Search Report

Under the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for Army remediation of munitions response sites, an Archive Search Report (ASR) was prepared for FWDA (USACE 1995a). This investigation focused on identifying the exact location of potential environmental contamination from past demilitarization activities that historically occurred at the FWDA. The HWMU was identified as approximately 1,200 acres surrounding the OD/OB grounds previously known as the "UXO kickout area."

Previous investigations (i.e., those completed before 1992), concerning installation operations and decisions leading to closure, were also included in the ASR.

1.5.3 1996-1998 Facility-Wide Removal Activities

Removal activities at various sites throughout the FWDA were completed by CSM Environmental, Inc. (CSM) from 1996 through 1998. MEC activities conducted in and around the HWMU during this time period included clearance along five seismic survey lines, clearance along a survey line for a proposed southern fence line, and clearance of a suspected kick-out area located outside of the eastern fence line designated as the OB/OD Area Buffer Zone. Approximately 262 MEC items were reportedly removed from these areas, including 20 millimeter (mm), 37 mm, and 40 mm projectiles; M20 boosters; bomb live unit (BLU)-2, BLU-3, and BLU-4 bomblets; and various fuzes (CSM Environmental 1998).

1.5.4 1996 Phase IA – Characterization and Assessment of Site Conditions for the Soils/Solid Matrix

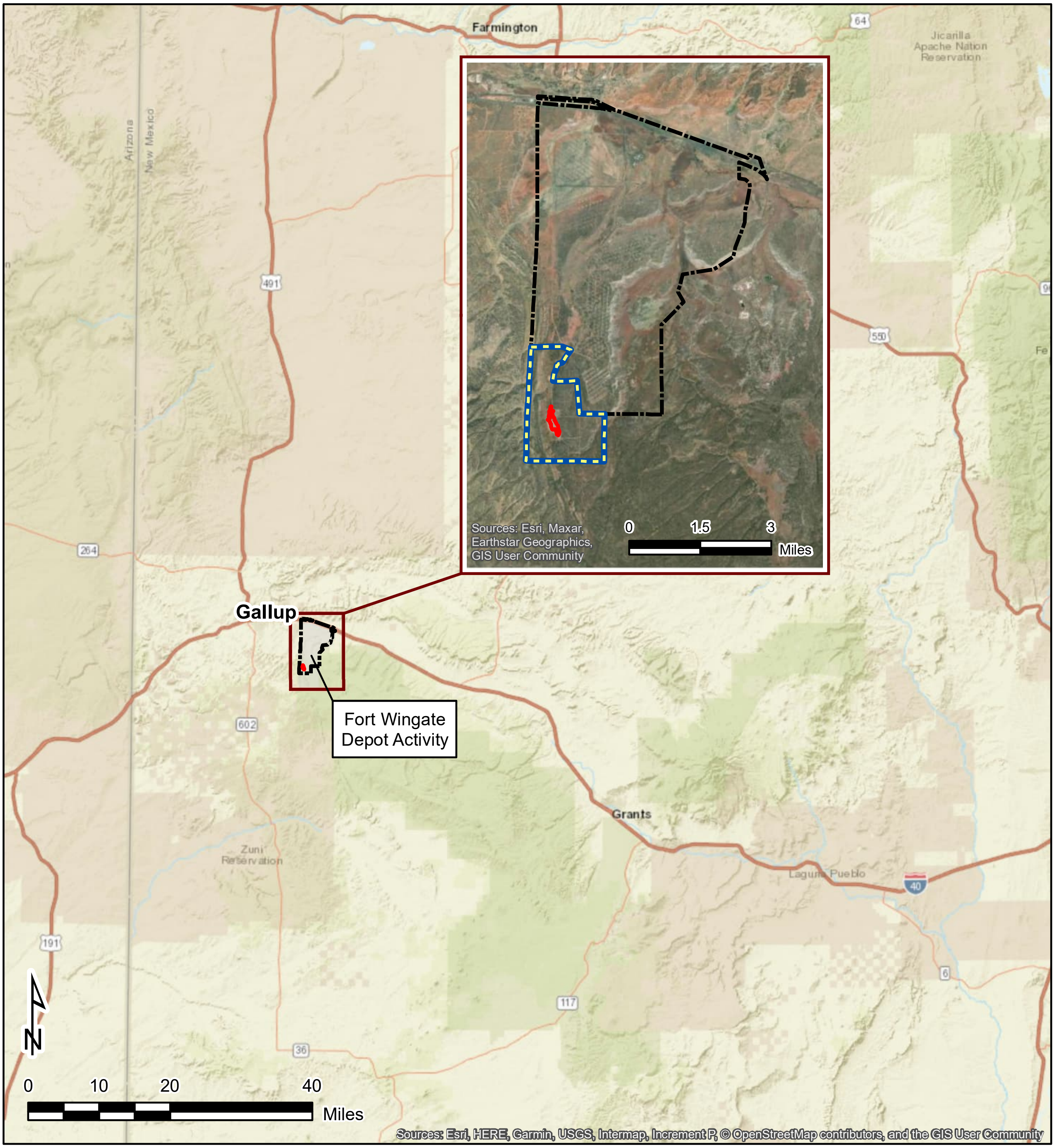
The implementation of RCRA Closure Field Program WPs in 1996 included intrusive investigation (i.e., excavation) of trenches identified by geophysical anomalies, MEC-related debris/residue areas, and detonation craters to characterize environmental impacts from historical disposal activities in these areas. The objective of the investigation was to characterize the types of waste present and confirm the lateral and vertical extents of waste. An ecological habitat survey and wetland evaluation was also completed (PMC 1999).

The investigation activities ultimately characterized the conditions of 10 CRPs and five of 12 CDCs. Seventy trenches (4,567 linear feet) were excavated through the CRPs and CDCs and 44,740 cubic yards of waste were removed. Soil samples were also collected from the bottoms and sides of the trenches and analyzed for metals and explosives to characterize impacts to underlying and adjacent soils (PMC 1999).

CRP1 through CRP3 were small and isolated areas at the southern end of the HWMU created from the demilitarization and disposal of waste materials generated elsewhere at the FWDA. The recovered wastes included fuze cans, fuze pieces, slag, metal, banding, and ash. CRP4 through CRP9 essentially composed one continuous area of debris/residue disposal that appeared to have been pushed off a flat working area along the eastern bank of the main arroyo. Wastes recovered from this area included detonator assemblies; 20 mm, 37 mm, 40 mm, 57 mm, and 75 mm projectiles; fragmentation bomb windings; M83 butterfly bomblets; and wood debris. CRP10 was a single isolated debris/residue pile situated in the main arroyo channel at the northern limit of the formerly active HWMU. The trenching operations completed at the five former detonation craters (i.e., CDC2, CDC4, CDC6, CDC8, and CDC10) identified scattered ordnance fragments, projectiles, ash, dark stained soils, rock fragments, metal banding, and packaging materials (PMC 1999).

1.6 PROJECT MANAGEMENT

To confirm consistency throughout the project, the URS PM and the AECOM PM were the primary points-of-contact between primary project stakeholders (i.e., USACE, BRAC, Fort Wingate Depot Activity, and NMED), and project personnel. The PMs provided USACE monthly project status reports to communicate activities completed during each month of RA fieldwork, difficulties encountered, corrective actions taken, activities planned for the next month, and updates to the project schedule.



Legend

- Installation Boundary
- Parcel 3 Boundary
- HWMU Boundary

FWDA Location Map
Fort Wingate Depot Activity
McKinley County, New Mexico

Drawn By:	Date:
JZ	8/29/2024
Checked By: MG	Project No. 60517380

Figure 1-1

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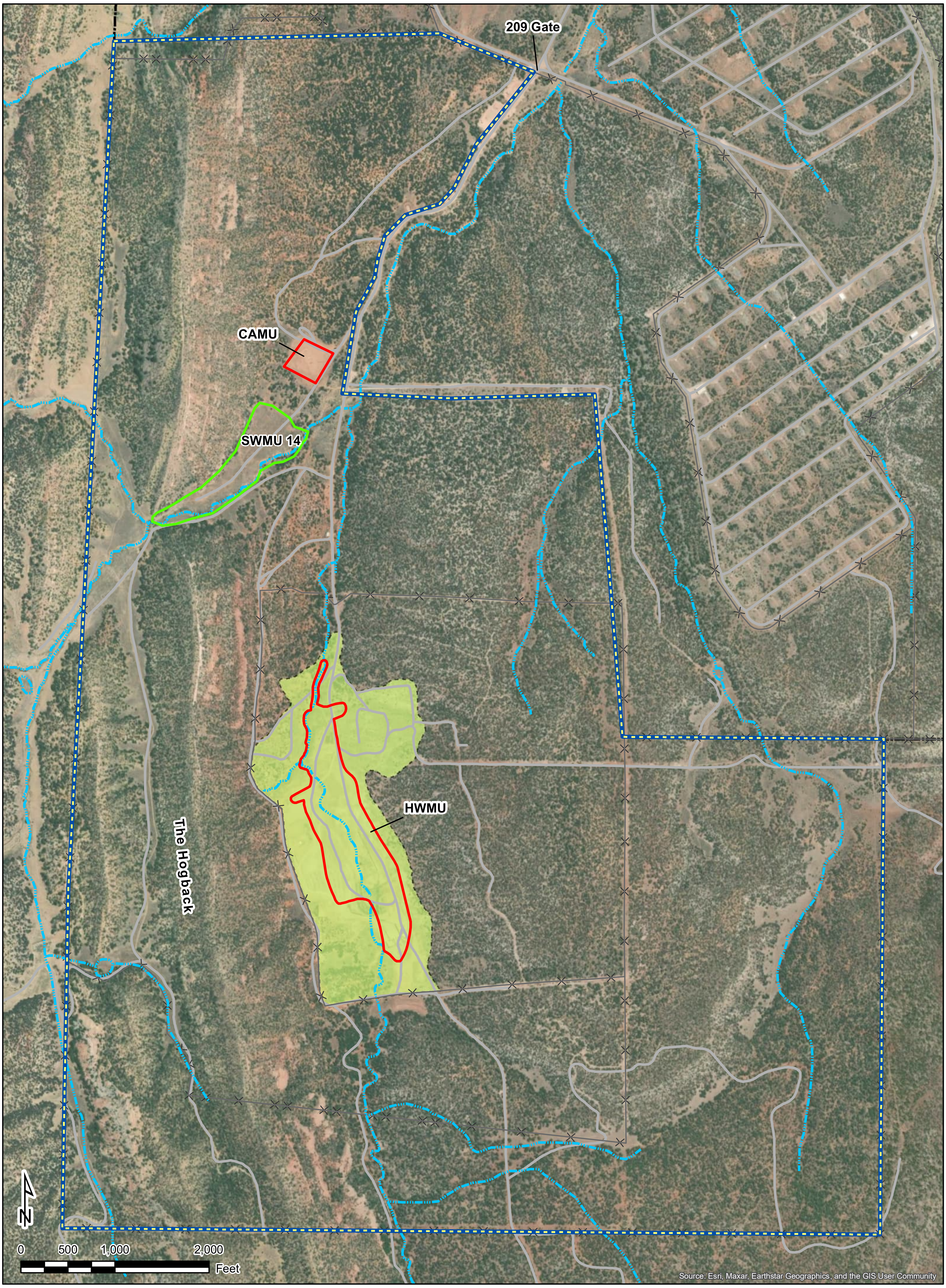
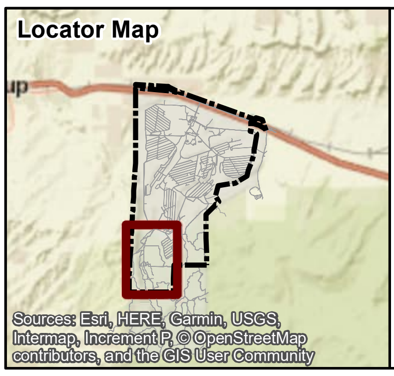


Locator Map



Legend

- Installation Boundary
- HWMU/CAMU Boundary
- SWMU 14 Boundary
- Parcel 3 Boundary
- Current OB/OD Area
- Road
- Fence
- Arroyo

HWMU Location Map
Fort Wingate Depot Activity
McKinley County, New Mexico

Drawn By:	Date:	
JZ	11/11/2024	**Figure 1-2**
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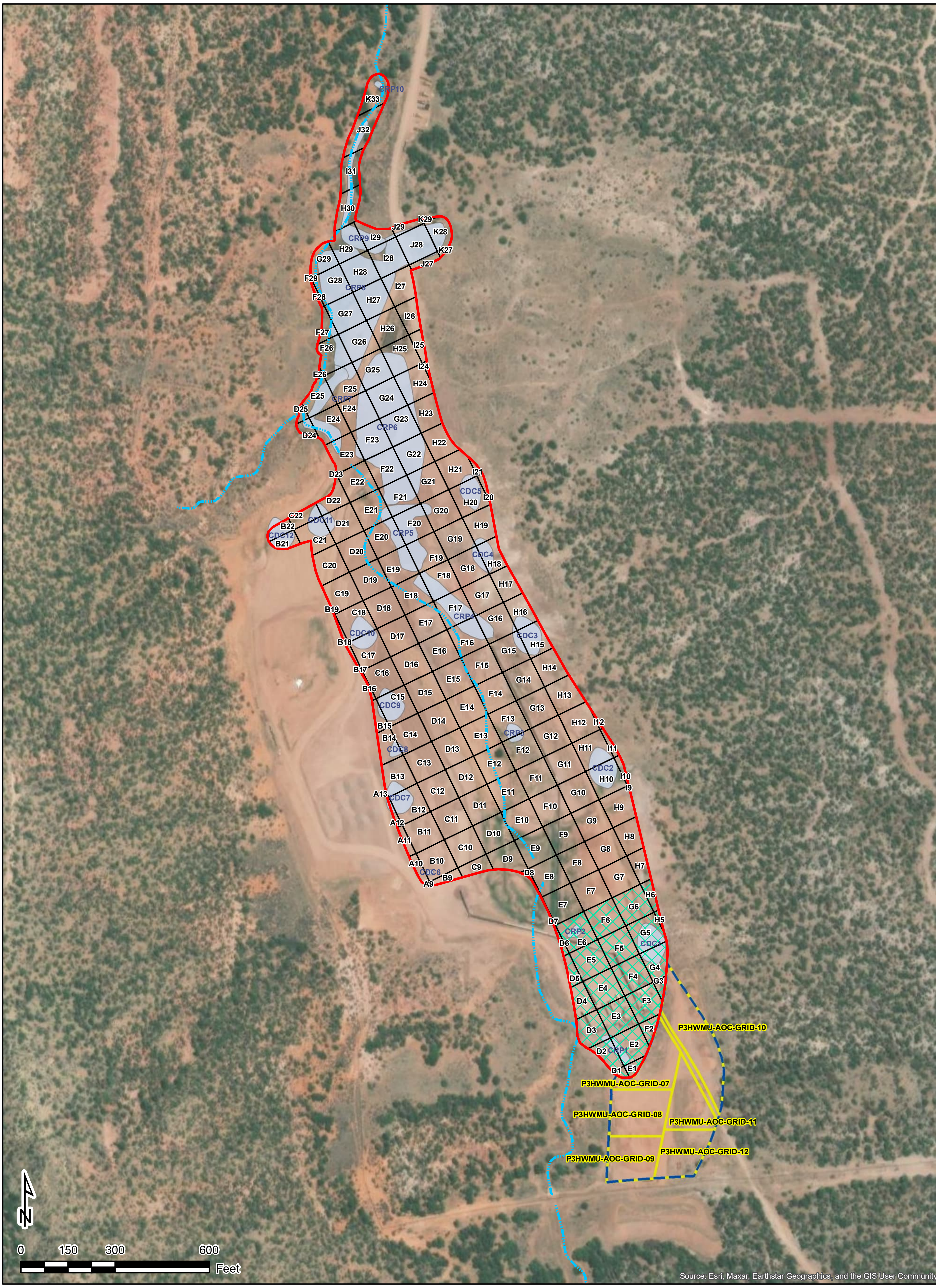

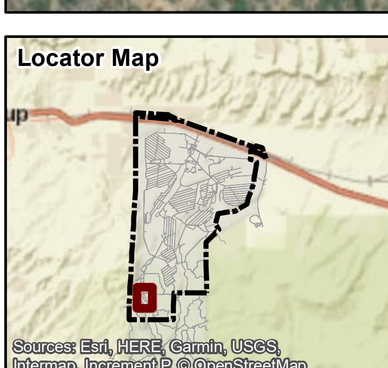

Legend

- Installation Boundary
- HWMU Boundary
- Arroyo
- CRP/CDC Area
- HWMU Survey Grid
- Processing Plant Grid **(Section 2.2.3)**
- AOC Area **(Section 2.2.3)**
- AOC Closure Grid **(Section 2.2.3)**

HWMU RA Details
Fort Wingate Depot Activity
McKinley County, New Mexico

Drawn By:	Date:	
JZ	11/11/2024	**Figure 1-3**
Checked By:	Project No.	
MG	60517380	

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This section summarizes the RA objectives and cleanup standards and presents a description of the cumulative removal activities completed throughout the HWMU. Beginning in 2012, RA fieldwork was completed in accordance with the NMED approved WP (URS 2013). After the original contract expired, starting in 2017, the RA fieldwork was conducted in accordance with updated USACE and Department of Defense (DoD) Guidelines (e.g., DoD Quality Systems Manual Version 4.2 to 5.0) and MMRP standards (e.g., updated requirements of DoD 6055.09 and Engineer Manual [EM] 385-1-97). These Guidelines did not include significant modifications to the RA scope, objectives, or procedures documented in the RA WP (URS 2013).

2.1 RA OBJECTIVES

As detailed in **Section 1**, historical site activities at FWDA resulted in the presence of MEC and associated MC contamination of soils deposited within the HWMU. Demilitarization of unserviceable, obsolete, or waste explosives, propellants, munitions, and munitions components was completed at the Current OB/OD unit historically associated with the HWMU. Propellants, small arms, and bulk explosives were burned at the Site as a means of disposal, and explosives-filled munitions were historically disposed of by controlled detonations.

Based on these historical activities, the overall objective of the RA was to remove munitions-related hazardous wastes (i.e., MEC), hazardous waste residues (i.e., MD), and soils with chemical concentrations (i.e., MC) above project specific cleanup levels from the HWMU in accordance with the Section III of the RCRA Permit (NMED 2015). This objective included the removal of MEC and incidental buried metallic debris greater than 5/8 inch, and MC-impacted soils from the Site. The scope of the RA field activities is summarized in **Section 1.1** and the RA methods and procedures used to achieve the RA objectives are detailed in the subsections below.

2.2 RA FIELD ACTIVITIES

The field activities completed during the RA at the HWMU are summarized from the RA WP in the subsections below.

2.2.1 Mobilization, Site Setup, and Survey

Prior to working at the HWMU, all field personnel were required to obtain site-specific training from the SUXOS, UXOQCS, and UXO Safety Officer (UXOSO). Staging and office areas were established for completing the RA and appropriate contacts were established with local fire, police, and other emergency services.

The HWMU boundary was surveyed to establish the limits of RA fieldwork, two benchmarks were established at the north and south ends of the HWMU, and the grid system used to track RA progress was surveyed by a New Mexico-licensed professional land surveyor. While on-site, each person on the surveying team was escorted by a UXO technician implementing MEC and anomaly avoidance. Survey data were reported in North American Datum of 1983 (NAD83), State Plane, New Mexico West, U.S. Survey feet.

Additional mobilization and site setup activities completed in accordance with the RA WP included the following:

- Required notifications were made and permits obtained in accordance with the RA WP.
- Site access, boundaries, and haul roads were established with road improvements, limited vegetation removal, and signage.
- Additional treatment cells (i.e., one for open burning and one for open detonation) were constructed at the CAMU. Each treatment cell was surrounded on three sides by a horseshoe shaped containment berm constructed of compacted soil.
- Existing ECMs (B-1026, B-1027, B-1028, B-1029, B-1030, B-1037, B-1038, B-1039, B-1040, B-1041, B-1042, and B-1043), located within a fenced area of Block B, were brought to operational status in accordance with the requirements of DoD 6055.09-M (now DDESB 2019) to store MEC and donor explosives.
- Storm water pollution prevention controls were implemented in accordance with a Storm Water Pollution Prevention Plan (SWPPP).
- A large-scale soil and debris processing plant was established in the southern portion of the HWMU during the original RA fieldwork conducted by URS in 2012 through 2015. The processing plant pad was relatively flat and appropriately sized to include space for stockpile management.

2.2.2 Surface Sweep

Detector-aided surface sweeps were completed within HWMU removal grids arroyo areas, soil processing areas, stockpile and staging areas, and other support areas prior to conducting mobilization/site-setup activities and RA intrusive operations. Surface sweeps were conducted by UXO sweep teams equipped with handheld Schonstedt magnetometers and/or White's all-metals detectors (or equivalent). Surface sweep areas were divided into grids and each grid was sub-divided into 5-foot wide search lanes to ensure complete coverage within each grid. UXO technicians walked abreast clearing the search lanes of MPPEH. MEC items identified during surface sweep operations were inspected as detailed in **Section 2.2.5**. The MEC recovered during surface sweep operations were documented, tracked, and disposed along with the MEC recovered from RA excavation and soil processing activities.

2.2.3 Excavation Methods and Sequence

Soils and debris were excavated using remote-controlled (RC) heavy equipment (e.g., excavators, loaders, and dozers). RC equipment excavated HWMU soils and staged the material for conveyance to the processing plant. Soils and debris were excavated from the HWMU grids in layers to minimize the volumes of soils removed wherever possible, and to facilitate inspections and subsequent DGM mapping of the excavated grids. The RC equipment operators were located inside a shielded operating station while performing excavation operations and maintained compliance with the minimum separation distance (MSD) documented in the DoD Explosives Safety Board (DDESB)-approved Explosives Safety Submission (ESS) at all times.

RC equipment operators also used cameras to observe the excavation process on video monitors inside the operating station, and Trimble Global Positioning System (GPS) units mounted on the equipment were used for positional monitoring. However, as documented in FCR 2017 003, summarized in **Section 4.9** and included in its entirety in **Appendix K**, three Pan/Tilt/Zoom cameras were eventually located in optimal locations for the equipment operators to observe the physical positioning of the RC excavators and loaders working in the excavation, so the need for equipment-mounted GPS was eventually discontinued during RA excavation operations.

RC equipment was also initially used to feed materials to the processing plant. The infeed included a grizzly feeder with a 6-inch screen opening. The screen prevented material and potential ordnance larger than 6 inches from entering the plant in order to protect the equipment and plant operators. The oversized materials were generally limited to rock. The oversized materials piles were periodically spread out using RC equipment and visually inspected for MPPEH and MD. Any recovered debris underwent the MPPEH inspection process by qualified UXO technicians.

In general, RA excavation operations were performed in a manner that prevented re-contamination of areas where previous excavation work was completed. To accomplish this, excavation of the HWMU progressed in a logical sequence through the 185 grids shown on **Figure 1-3**. The excavation sequence was optimized to maintain safe side slopes, manage storm water runoff, and control/prevent cross contamination. As shown on **Figure 1-3**, the RA excavation field activities completed in 2012 were initiated in the south end of the HWMU to facilitate establishment and setup of the original soil processing plant described in **Section 2.2.3.1**. A request for an additional Area of Contamination (AOC) was also made to conduct early HWMU RA activities outside of (i.e., to the south of) the Site boundaries as summarized in **Section 2.2.3.2** and further documented in **Appendix F**. Following the initial RA excavation activities summarized in **Sections 2.2.3.1** and **2.2.3.2**, the remaining HWMU grids were generally excavated, processed, and verified on a grid-by-grid basis as detailed by the RA results documented in **Section 3**.

2.2.3.1 Processing Plant Pad Excavation Area

The initial HWMU area excavated to facilitate placement of the RA soil processing plant pad included approximately 3 acres in the southern portion of the HWMU. As shown on **Figure 1-3**, the original processing plant and associated support areas were established within Grids D1 through D6, E1 through E6, F2 through F6, G3 through G6, and H5 through H6. The initial excavation area also encompassed the former CDC01, CRP01 and CRP02. In general, the initial soil and debris was excavated from Grids F2 through F6, G3 through G6, and H5 through H6 and the recovered soils and debris were stockpiled in the adjacent Grids D1 through D6 and E1 through E6 for subsequent processing once plant setup was complete (**Figure 1-3**).

Once these southern Grids were excavated to planned depths, the excavated areas were inspected by UXO technicians using handheld magnetometers and then verified as complete with post excavation DGM and anomaly resolution as detailed in **Section 2.2.8**. Once all DGM anomalies were resolved, confirmation soil samples were collected from the excavated areas as detailed in **Section 2.2.10**.

2.2.3.2 AOC Request

In order to manage the initially excavated and processed RA soils, NMED approval of an extended AOC was requested in a letter dated January 29, 2013. The AOC included approximately 3.7 acres located adjacent to the southeast corner of the HWMU. The primary purpose of the AOC was to facilitate the staging and segregation of remediation waste at FWDA without triggering a new point of generation or placement of waste subject to RCRA requirements. The AOC addressed the following needs:

- Increased the overall separation of work areas resulting in safer work conditions for workers and the environment
- Provided an area to stockpile non-hazardous materials for use as backfill within the HWMU
- Provided an area to separate and stockpile fill for future testing, treatment, and/or disposal

Once the AOC was no longer needed to support RA field activities, closure soil sampling was completed throughout the AOC footprint as documented in an AOC Closure Letter dated October 7, 2015. The closure sampling included six composite surface soil samples collected from the AOC grids shown on **Figure 1-3**. The AOC Request, NMED approval, and AOC Closure Letters are included in **Appendix F**.

2.2.4 HWMU Soil and Debris Processing

The soil and debris processing plant was balance graded to provide a level area for plant construction. Six to eight inches (approximately 4,000 tons) of crushed rock base materials were placed over the plant pad, leveled, and compacted. The plant pad was initially completed in late August 2012 and the plant setup immediately followed. Initial plant construction was completed in late September 2012.

The HWMU soil and debris processing occurred during two separate fieldwork events, from 2012 through 2015 and from 2017 through 2024. During these two field events, the excavation and processing equipment and methods were revised and reconfigured based on lessons learned during execution of the work. Regardless of equipment used or the configuration, the multi-stage processing plant separated MEC and munitions-related debris (i.e., 5/8-inch or larger) from the excavated soil matrix and homogenized the processed soils prior to stockpiling. The plant was operated from a control station, armored in accordance with the DDESB-approved ESS. Cameras located throughout the plant allowed operators constant monitoring and control of all processing equipment. Each staffed inspection location was located beyond the K24 distance in accordance with the ESS and was equipped with an emergency stop switch. Communication systems were installed to allow for continuous communications between the screen plant operator, equipment operators, truck drivers, UXO technicians, supervisors, and Management Personnel. As discussed in FCR 2017 005 (**Section 4.9** and **Appendix K**), adequate lighting was also installed within the plant area in accordance with EM 385-1-1 (USACE 2014) to allow for nighttime operations, if required.

In general, the successive processes within the soil processing sequence included the following:

- Initial ferrous metal removal and MPPEH inspection
- Closed loop ferrous metal removal, screening, and size reduction
- Final ferrous metal removal and MPPEH inspection
- Non-ferrous metal removal and MPPEH inspection

Figure 2-1 presents a generic schematic of the debris and soil processing plant utilized during the RA fieldwork to complete the steps summarized above. This diagram was conceptual in that the types of equipment; quantities of equipment pieces; lengths and sequences of conveyors; and alignments were periodically modified, as needed, to optimize efficiency and achieve performance objectives throughout completion of the RA fieldwork. As an example, FCR 2017 001 discussed in **Section 4.9** (and presented in its entirety in **Appendix K**), facilitated an alternate soil processing plant layout implemented in 2017 to optimize RA soil processing efficiency during field operations. In general, belt conveyors were positioned to transfer excavated soils and debris from the excavation areas to the surge hopper at the processing plant which equalized the loading of materials into the plant.

2.2.5 HWMU MPPEH Inspection Process

RA MPPEH procedures were conducted in accordance with DoD Instruction (DoDI) 4140.62 (DoD 2015) and EM 385-1-97 (USACE 2013a). MPPEH was assessed and its explosives safety status determined and documented prior to transfer within the DoD or release from DoD control. Prior to release, the SUXOS certified that all MPPEH was confirmed and documented as MDAS by authorized and technically qualified personnel after a 100% (percent) inspection and an independent 100% re-inspection. Details of the MPPEH inspection process are summarized as follows:

MPPEH located during field activities was initially 100% inspected by a UXO Technician II meeting the requirements of DDESB Technical Paper (TP) 18 (DDESB 2016).

UXO Technician IIs:

- Made an initial assessment of the explosive safety status of located MPPEH.
- Determined whether items were UXO, discarded military munitions (DMM), MD, or range-related debris (RRD).

An additional UXO Technician III (meeting the requirements of DDESB TP 18):

- Performed 100% re-inspections of recovered items to verify them as free of explosive hazards or other dangerous fillers.
- Confirmed items as UXO, DMM, MD, or RRD.

The UXOQCS:

- Conducted daily audits of the MPPEH inspection procedures employed by the UXO teams and individuals processing MPPEH.
- Conducted and documented random sampling inspections of the MPPEH collected by the UXO teams to further verify explosive safety status determinations.
- Verified that required procedures and responsibilities for processing MPPEH for certification as MDAS were followed throughout completion of the RA fieldwork.

The SUXOS:

- Completed requisition and turn-in documents (i.e., DD Forms 1348-1A) for MDAS (i.e., MD and RRD) transferred for final disposition.
- Performed random checks to certify that MD and RRD items were free from explosive hazards in order to complete DD 1348-1A Forms.
- Certified all MD and RRD as free of explosive hazards, engine fluids, illuminating dials, and other visible liquid hazardous toxic radioactive waste (HTRW) materials.
- Ensured that inspected debris was secured in closed, labeled, sealed, and photo-documented containers.

Munitions that were encountered within the HWMU excavation area and determined to be unacceptable to move outside of the HWMU boundaries by the SUXOS and UXOSO were detonated in place or at a designated and USACE-approved location within the HWMU boundaries. Munitions that were determined acceptable to move by the SUXOS and UXOSO were relocated to the CAMU for immediate disposal or to an ECM for secure storage and later disposal.

As clarified by FCR 2017 006 (**Section 4.9**), prior to public release, the Site Manager or SUXOS certified and the USACE Ordnance and Explosives Safety Specialist (OESS) or UXOQCS verified that secured debris was free from explosive hazards. This process was documented on DD Forms 1348-1 as follows: "This certifies and verifies that the MDAS listed has been 100% properly inspected and, to the best of our knowledge and belief, is free of explosive hazards."

2.2.5.1 Soil Processing Plant MPPEH Inspection Line Barricade Requirements

The requisite shielding used for the inspection line barricades (ILBs) in the soil processing plant were equipped to prevent perforation for an unintentional detonation of a 2,000 pound (lb) AN-M66A2 bomb (see **Section 3.4.1.1**). Per the ESS, the ILB was kept no closer to the excavation than the K24 distance (i.e., 264 feet) for the 2,000 lb AN-M66A2 bomb and no closer to the overhead magnets than the K24 distance (i.e., 74 feet) for the 155mm M795 projectile. Conveyors that passed through the ILB had variable speed drives to provide the MPPEH inspection team sufficient time to complete the inspection process. The ILB inspection team had video displays that displayed incoming materials, and they were in regular radio contact with the entire excavation and processing teams. As documented in the FCRs summarized in **Section 4.9** and included in their entirety in **Appendix K**, the MPPEH ILB personnel supporting ILB inspection activities were modified multiple times to maximize productivity, adhere to Covid protocols, and to maintain adherence to EM 385-1-97 requirements.

As discussed in **Section 4.9** and shown in **Appendix K**, a 2024 FCR was completed to clarify that items initially categorized as acceptable to move MPPEH by the ILB Supervisor and ILB Safety Officer could be removed from the conveyor belt and transported to B Block for future destruction or an additional (i.e., more detailed) MPPEH inspection by the Site Management Team (i.e., Site Manager, SUXOS, UXOSO, and/or UXOQCS). The secondary MPPEH inspection was conducted to reduce the quantity of acceptable to move MPPEH items that potentially required destruction at the CAMU. During this secondary inspection by the Site Management Team, MPPEH were re-categorized as MDAS as warranted. As discussed in **Section 2.2.7**, items determined to be MDAS were transported to the Thermal Flashing Unit (TFU) for flashing, and items determined to be acceptable-to-move MEC were either transported to the CAMU for immediate destruction or stored in one of the ECMs in Block B, pending destruction at a later date.

2.2.6 HWMU MEC Disposal

MEC disposal operations were supervised by the SUXOS and coordinated with the on-site OESS in accordance with the procedures outlined in EM 385-1-97 (USACE 2013a), the contractor Standard Operating Procedures (SOPs) included in the RA WP, and FCR 2019 002 summarized in **Section 4.9** and included in its entirety in **Appendix K**. Transportation of donor explosives was conducted in accordance with applicable sections of 49 Code of Federal Regulations (CFR) Part 397. Sandbags and other engineering controls were implemented as warranted to mitigate blast effects. These controls were used in accordance with HNC-ED-CS-98-7 (USACE 1998), Amendment 2 dated November 2014, HNC Safety Advisory dated 7 November 2011, and DDESB Memo dated 22 May 2014. Tamping (single or multiple items) was used in accordance with DDESB TP 16 (DDESB 2012) and the Buried Explosion Module most current version. The SUXOS made all appropriate notifications prior to each MEC disposal operation.

Donor explosives were initiated by a radio-firing device, non-electric shock tube detonators, or electric blasting caps. Donor explosives, consisting of jet perforators or boosters, were obtained from an explosives vendor, and were stored in two ECMs. In order to ensure that storage space for donor explosives was available, the contents of the ECMs were managed in accordance with DoD 6055.09-9M V7.E5.3 Requirements for Storage of Waste Military Munitions under Conditional Exemption and the DDESB-approved ESS.

Disposal of acceptable to move MEC items was conducted within the CAMU as detailed in **Section 2.2.6.1**. The CAMU is part of Solid Waste Management Unit (SWMU) 14, which is located approximately 0.5 mile north of the HWMU. The CAMU and SWMU 14 locations relative to the HWMU are shown on **Figure 1-2**. Acceptable to move MEC items were initially documented on a MEC Log and stored in an ECM (pending disposal at the CAMU). Once an item was placed into the ECM, a Magazine Data Card was populated with the data. The means and date of disposition was also subsequently documented in the MEC Log (**Appendix C**). Untreated waste military munitions were not shipped off-site during the RA.

Disposal of MEC items that were unacceptable to move off-site (i.e., to the CAMU) were BIP within the boundaries of the HWMU. Following disposal operations, the resulting detonation crater and surrounding surface terrain was inspected by UXO technicians to confirm that all explosives were consumed, verify that no explosive hazards remained, and inspect and remove any resulting MDAS fragments.

2.2.6.1 CAMU Operation

As discussed in **Sections 2.2.5** and **2.2.6**, the CAMU was used to destroy acceptable to move MEC in a controlled environment by either burning or by detonation. The CAMU was constructed and operated in accordance with the FWDA RCRA Permit. In accordance with the RCRA Permit, the throughput of the CAMU could not exceed 200 lbs net explosive weight (NEW) during any single treatment event, 1,000 lbs NEW per week, or 52,000 lbs NEW, annually. It should be noted that, under the original URS RA contract, a Class 1 Permit Modification was submitted to NMED to enhance CAMU operating processes and procedures. The permit modification was submitted to:

- Allow a burn pan to be placed in a separate berm from the OD operations
- Allow for the placement of the burn pan on grade.
- Allow the use of two berms (one for OB and one for OD). Although two berms could be used, in accordance with the permit, OB and OD operations were not conducted at the same time
- Provide the appropriately trained on-site personnel to size the demolition pit in accordance with the safety requirements of each individual demolition operation

The permit modification was approved by NMED in a letter dated February 28, 2014. A copy of this letter is included in **Appendix L**.

Recordkeeping during CAMU operations complied with the FWDA RCRA Permit. A CAMU log was maintained on-site to document the following information after each open burn or demolition shot:

- Volume and type of munitions destroyed
- Method of destruction
- Type and volume of ignition source
- Estimated volume of any incidental solid waste destroyed
- Date and time of the operation
- The logbook also included descriptions of any maintenance activities completed at the CAMU

Wastes (i.e., primarily ash) generated during CAMU operations were accumulated in 55-gallon drums and characterized prior to disposal. Once a drum was full, a sample was collected and analyzed for Toxicity Characteristic Leaching Procedure (TCLP) and total concentrations of TAL metals (i.e., barium, cadmium, chromium, lead, mercury), 2,4-dinitrotoluene, semi-volatile organic compounds (SVOCs), dioxins, and furans. The CAMU waste drums characterized as hazardous waste were transported to a less than 90 day storage area and subsequently transported and disposed of as hazardous by Clean Harbors (i.e., a licensed and certified hauler of hazardous waste). Hazardous waste profiles were generated electronically with Clean Harbors and a Hazardous Waste Manifest was completed for and accompanied each shipment. Each shipment was transported by a hazardous waste transporter. Copies of fully executed hazardous waste manifests are on file in the Administrative Record at FWDA. Non-hazardous ash was disposed at the Northwest New Mexico Regional Landfill. However, starting in February 2024 because it was apparent that most of the ash generated from CAMU operations had analytical results characteristic of hazardous waste, all ash drums produced from CAMU operations after this point were disposed as hazardous waste.

2.2.7 HWMU MDAS Flashing

After being inspected and verified as MDAS, metallic debris removed from the HWMU during the RA was flashed. Each batch of MDAS was weighed prior to flashing, to estimate the quantity of MDAS recovered during the work. The flashing utilized a convective heating process to decontaminate the debris and eliminate potential explosives residues. The flashing unit was a propane fueled, trailer-mounted furnace with a 2,000 lbs per cycle capacity. The unit operated at approximately 1,000 °F and was controlled with automated thermostatic modulation to achieve target temperature range. The unit was controlled remotely and utilized a data logger to record operating parameters.

MD was transported daily from the processing plant to the flashing unit and secured in a lockable roll-off. Unflashed MD was removed from secure storage, placed in baskets, and weighed. Thermocouples were placed in the center of each basket to monitor load temperature. The baskets were placed into the unit and the flashing cycle was started remotely. The data logger recorded furnace and load temperatures and times at periodic intervals. Once the load temperature reached 650°F for 10 minutes, the burner was turned off and the load was allowed to cool. After the cool down cycle, the baskets were removed and once completely cool, the flashed MD was secured in lockable roll-offs for shipment to a recycler for smelting.

As summarized in **Section 4.9**, during the course of project fieldwork, an FCR was implemented in 2019 that provided alternative procedures for jet/rocket-assisted take-off (JATO/RATO) bottles. Instead of flashing with the other metallic debris removed from the HWMU during the RA, JATO/RATO bottles were transported to the CAMU and treated with an open burn process in accordance with CAMU open burning procedures and requirements. JATO/RATO bottles that visually retained their structural integrity (i.e., were potentially energetic) were vented (for safety purposes) prior to being subjected to open burning at the CAMU.

2.2.8 HWMU Post-Excavation DGM

When planned excavation depths were achieved, UXO technicians completed initial instrument-aided visual inspections to verify that no significant debris or anomalies remained prior to collection of post-excavation DGM verification data. If the instrument-aided visual inspections indicated the presence of high anomaly density areas, excavation continued. When instrument-aided visual inspections indicated that no high anomaly density areas were present at the base of an excavated area, a post-excavation DGM verification survey was completed. If the DGM survey identified target anomalies above the target threshold, they were intrusively investigated and resolved. If the DGM survey revealed the presence of high anomaly density areas, those areas were excavated further and remapped with DGM. Any residual anomalies were then intrusively investigated and resolved. The following subsections provide details of the approach, methods, and operational procedures implemented during performance of post-excavation DGM.

2.2.8.1 Geophysical Equipment

The Geonics, Ltd., EM61-MK2 (EM61) is a time-domain electromagnetic DGM system used for the RA DGM verification mapping activities. EM61 sensors detect electrically conductive and magnetically susceptible objects. A current pulse within the transmitter coil creates the primary electromagnetic field. Changes in this primary field set up eddy currents in nearby conductive objects. The changing eddy currents produce secondary or induced electromagnetic fields that emanate from buried objects. The induced electromagnetic field is associated with the decay of eddy currents in metal objects near the sensor and is measured by a receiver coil. The output signal is proportional to the rate of change of the electromagnetic flux through the receiver coil. The receiver is timed to measure the signal within four time gates (216, 336, 660, and 1,266 microseconds) after the primary electromagnetic field has been generated. An anomalous secondary electromagnetic field implies that a metal object is present. The EM61 was set to record a minimum of 10 records per second with four time gates per record. During typical field operations the actual output of the system ranged between 10 and 20 records per second. For the RA DGM verification surveys, the EM61 was deployed on manufacturer-supplied wheels which fixed the coil height at 42 centimeters (cm) above the ground surface.

Real-time kinematic (RTK) GPS was used to position the EM61 data. This system consisted of a rover and base station and provided cm level accuracy. The RTK GPS base station was set up over known benchmarks in close proximity to the HMWU. An RTK rover was mounted over the center of the EM61 coil and interfaced with the data logger to record positional data coincident with DGM instrument readings. Correction data were transmitted from the base station to the rover via radio link. The RTK GPS readings were recorded at a rate of 1 Hertz. The positional information was logged in the projected coordinate system: NAD83, State Plane New Mexico West, U.S. Survey feet.

The 32-acre HMWU was overlaid with a 100-foot-by-100-foot grid system resulting in 185 full and partial grids. Grid corners were established using RTK GPS. The originally proposed size of the RA grids was 200 feet by 200 feet, but this was changed by FCR 2013-002 as discussed in **Section 4.9**. Grids deviated from the idealized 100-foot by 100-foot squares when dictated by site conditions, boundaries, or inaccessible areas. The DGM data were collected along parallel transects spaced 2 feet (0.6 meter [m]) apart, resulting in consistent data density throughout each post-excavation DGM survey area.

2.2.8.2 Geophysical System Verification

A geophysical system verification (GSV) process was used to determine background noise levels and confirm that the geophysical detection system was operating properly. In accordance with the RA WP, the GSV implemented during the RA included two main elements: an IVS and a Blind Seeding Program (BSP). The IVS included an initial instrument demonstration, identification of background noise levels, and twice daily QC checks as summarized in **Section 4.5**. The BSP was part of an overall QC approach to validate the DGM and any resulting intrusive investigations completed during the RA as summarized in **Section 4.6**.

2.2.8.3 Full Coverage Post-Excavation DGM Field Procedures

After UXO Technicians verified that only single point anomalies remained in an excavated area, the UXOQCS with support from the QC Geophysicist buried the required blind seed item(s). Once blind seeding activities were completed, DGM was conducted within each excavated grid to identify anomalies where additional removal activities were needed. DGM data acquisition was completed in accordance with the DGM SOP included in the RA WP. DGM data were typically collected using a single coil, wheeled, man-portable system, but were also occasionally collected using a litter (stretcher) man-portable and manual winch system (i.e., to accommodate rough or steep terrain).

2.2.8.4 DGM Data Processing

DGM data were collected with Nav61 data collection software. Upon completion of the IVS survey, the raw data were downloaded from a Mesa 2 field computer and transferred to data analysts for processing. QC and field DGM data were processed using the procedures listed below:

- Raw geophysical data were imported into TrackMakerMK2 (position/geophysical data-merging program).
- Correctly positioned data files were exported in *.xyz format for use in Oasis Montaj.
- Combined data were input into Seequent Oasis Montaj.
- Data were converted from geodetic latitude/longitude coordinates to NAD83, State Plane, New Mexico West, U.S. Survey feet.
- IVS and field data were leveled to eliminate drift and/or improper nulling (i.e., to mitigate the effect of inadvertently nulling near subsurface metal).
- The latency correction was calculated from the IVS data and applied to the field data and Industry Standard Object (ISO) locations and amplitude responses were measured and documented.

- Static background, personnel test, and cable shake test data were evaluated in profile for spikes and overall noise. Peak responses from the static spike tests were documented.
- DGM field data were evaluated in profile format for spikes, gaps, and sensor failure.
- A set of QC maps were created to evaluate the field data for sample separation, coverage, and velocity. Results of each of these metrics were recorded.
- The data sets were gridded using a grid cell size of 0.53 foot and a blanking distance of 2.0 feet.
- Gridded data were displayed on a map to facilitate target selection and generate final maps.

2.2.8.5 DGM Target Selection, Dig Sheet Development, and Anomaly Reacquisition

Initial target selections were made from the gridded DGM data using Oasis Montaj with the UXO Land module. The following steps were completed for selecting and refining the targets:

- Isolated electromagnetic anomalies were selected from the gridded data using the Blakely test.
- A grid value cutoff level (threshold) was determined in agreement with specific requirements derived from the GSV process and specified in the IVS Reports.
- Data were reviewed visually by the processor and any anomalies that were not selected by the automated process but had a peak value above the threshold, or areas masked by larger adjacent anomalies, were manually selected, and any overlapping or duplicate anomalies were manually removed.
- Anomalies selected were summarized in an anomaly table which included entries for optional columns used in creating dig sheets.
- Any areas with numerous overlapping anomalies that could not be successfully remediated through the selection of point targets were identified with polygons as saturated response areas. Such areas were re-excavated and re-mapped with DGM.

Once post-excavation DGM target anomalies were identified, an intrusive investigation target list was developed based on the criteria summarized above. Dig sheets included all anomalies with peak responses above the required threshold and any manually picked anomalies. Target lists included the following details:

- Title Information
  - Project number
  - Location of the survey (grid)
- Target Information
  - Unique ID number
  - Millivolt (mV) reading

    - Northing and easting positional data
- Dig Results
    - Reacquired instrument response
    - Anomaly description
    - Anomaly type (MEC, MD, RRD)
    - Offset distance
    - Offset direction
    - Depth to center of mass
    - Weight
    - Length
    - Number of pieces
    - Team leader initials
    - Date and time
- Post-dig target anomaly resolution verification
    - Post-dig target anomaly resolution verification check (residual mV response)
    - Verifiers initials
    - Date

Anomaly reacquisition teams reacquired each of the post-excavation geophysical anomalies identified for excavation on the dig sheets using the same instrumentation (i.e., RTK GPS and EM61) that was used for the initial DGM survey. Anomaly reacquisitions were conducted using the following general sequence of procedures:

1. Dig sheets were generated as described above.
2. The dig sheets were given to the intrusive teams, who relocated the targets with RTK GPS and marked the locations for removal.
3. After relocation, an EM61 was used to locate the peak response. The EM61 was passed over each anomaly in two perpendicular directions in order to locate response peaks as accurately as possible.
4. The reacquired peak locations were marked with marking paint or an offset pin flag and/or recorded with RTK GPS.
5. The reacquired peak responses were recorded on the dig sheets.

The anomaly reacquisition teams also documented anomalies that could not be reacquired (i.e., false positives) for follow-up verification by the QC Team. Single point target anomalies were excavated by UXO personnel using shovels and other hand tools. Following excavation, all target anomaly locations were checked with an EM61 to confirm that the anomaly source had been removed. If any residual response was detected, the intrusive investigation continued until any remaining response was below the targeting threshold. The UXOQCS completed QC acceptance sampling inspections of the target anomaly locations and all dig results were reviewed by the QC Geophysicist.

2.2.9 HWMU Soil Stockpile Management

As detailed in **Section 2.2.4**, excavated, and processed (i.e., homogenized) soils were separated into stockpiles for characterization sampling. A stockpile storage grid system was established to manage the RA stockpiles. Each approximately 250-cubic-yard stockpile composed of fully processed and homogenized soils was placed in a grid location and was assigned a unique numeric identifier so that when analytical results were received and validated, the results could be correlated with that specific stockpile. Documentation was maintained onsite that included the following information: stockpile number, date started, date sampled, date sample was received, and final disposition of pile. This information was reported in the DQCRs and DSRs included in **Appendix D**.

2.2.9.1 Soil Stockpile Sampling Method

The purpose of the soil stockpile characterization sampling was to identify and segregate soil stockpiles with chemical concentrations less than the RA screening criteria from those that exceeded the RA screening criteria. The RA screening levels and risk assessment criteria are summarized in **Section 3.1.1** and the soil stockpile sampling analytical results and risk assessment conclusions are summarized in **Section 3.2**.

As documented in **Section 3.2.8**, an additional set of stockpile soil samples (i.e., “stockpile bottom samples”) were also collected, starting in 2020 through 2024, from the surface soil footprints exposed beneath contaminated soil stockpiles and the plastic sheeting they were staged on. These stockpile bottom samples were evaluated for risk in the same manner as the soil stockpile samples were (i.e., as detailed in **Section 3.1.1**), and the stockpile bottom sample results are summarized in **Section 3.2.8**.

For each stockpile, one discrete soil sample was collected, using a Terra Core® sampler, for volatile organic compound (VOC) analyses (Method 8260B) and one 10-point composite soil sample was collected and analyzed for target analyte list metals (Method 6010B/6020A/7471B), SVOCs (Method 8270D), explosives (Method 8330B), polychlorinated biphenyl aroclors (Method 8082A), nitrate (Method 9056A), cyanide (Method 9014), dioxins/furans (Method 8290), and perchlorate (Method 6850) as stipulated in Section III of the FWDA RCRA Permit. Beginning in October 2021, N-nitroso-dimethylamine was analyzed separately using Method 8270D-SIM. To help ensure a representative sample, the subsample points targeted various heights and depths throughout each stockpile. Subsamples were thoroughly mixed in a decontaminated or disposable bowl using a decontaminated or disposable sampling spoon. The samples were submitted to Agriculture & Priority Pollutants Laboratories, Inc. (APPL) in Clovis, California for chemical analyses.

Field QA/QC samples were also collected in the same manner as the investigative samples to help identify potential sources of external sampling contamination or potential errors introduced by sample collection or handling procedures. QA/QC samples were assigned unique identification (ID) numbers and were sent to the laboratory along with the investigative soil samples.

Duplicate samples were collected to assess the precision of sampling and analysis. Duplicate samples were collected at a frequency of 10% at the same time as the initial corresponding investigative samples and were co-located with the investigative sample location. The duplicate samples were packaged and handled identically to the investigative samples, but were assigned a dedicated QA/QC sample ID.

Matrix spike/matrix spike duplicate (MS/MSD) samples were also collected at a frequency of 5% of the soil stockpile samples. The MS/MSD samples were used to assess the potential for matrix effects. Samples were designated for MS/MSD analysis on the sample chains of custody forms submitted to the laboratory as well as on the applicable MS/MSD sample containers.

2.2.10 HWMU Confirmation Soil Sampling

The purpose of the confirmation sampling was to identify any excavated areas where constituents exceeded the RA cleanup criteria stipulated in the RCRA Permit. In accordance with Section III.A.4 of the Class 3 Permit Modification and the NMED approved WP, soil samples were collected from the excavated areas within the HWMU where DGM data demonstrated that subsurface anomalies had been removed. Whenever feasible, confirmation samples were collected within the boundaries of excavated CDCs and CRPs (i.e., when these features were identifiable). However, due to the unanticipated sizes and depths of these features, identifying CRP- and CDC-specific sidewalls and bottoms became too difficult. As a result, to verify that clean soils were present following excavation activities throughout the HWMU, confirmation soil samples were collected and verified as clean from each of the 185 full and partial grids shown on **Figure 1-3**. These grids encompassed the entirety of the HWMU. With concurrence from USACE, partial grids (e.g., those at HWMU boundaries) were occasionally combined into single sampling units (i.e., combined grids) as appropriate, as long as the combined grid sizes did not exceed 10,000 square feet.

Samples consisted of one discrete soil sample for VOCs, and one composite sample collected and analyzed for TAL metals, SVOCs, explosives, polychlorinated biphenyl aroclors, nitrate, cyanide, dioxins/furans, and perchlorate as stipulated in Section III of the FWDA RCRA Permit. Each composite sample included 16 subsamples (each subsample approximately 50 to 60 grams) randomly collected from within each sampling area. Subsamples were thoroughly mixed in a disposable bowl using a disposable sampling spoon. The confirmation soil samples were submitted to APPL in Clovis, California for chemical analyses.

The soil sampling QA/QC procedures (i.e., duplicate and MS/MSD sample collection) implemented during confirmation soil sampling activities were equivalent to those described for the stockpile soil sampling activities detailed in **Section 2.2.9.1**.

The confirmation soil sample analytical results were compared to the RA screening levels and human health risk assessment criteria summarized in **Section 3.1.1**. The RA confirmation sampling analytical results and conclusions are presented in **Section 3.3**.

2.2.11 HWMU Groundwater Monitoring Well Abandonment

Eight groundwater monitoring wells (i.e., CMW06, CMW07, CMW14, CMW17, CMW18, CMW20, CMW21, and FW38) within and in proximity to the HWMU and CAMU were abandoned as shown on **Figure 2-2**. Each well was abandoned in accordance with the RA WP and New Mexico Office of the State Engineer requirements for Well Driller Licensing, Construction, Repair and Plugging of Wells (19.27.4 New Mexico Administrative Code). A plan to plug the wells was filed with and approved by the State Engineer prior to beginning abandonment activities. A plugging record was documented for each well plugged and the records were submitted to the State Engineer no later than 20 days after the well plugging activities were completed. Well plugging records are included in an **Appendix E**. As documented in **Appendix E**, Wells CMW06, CMW20, and CMW21 were abandoned in 2015 during the initial RA field activities. Wells CMW07, CMW14, CMW17, CMW18, and FW38 were subsequently abandoned in 2017 under the new RA contract.

A “mag and dig” process was completed by UXO technicians in support of well abandonment activities. The MEC and anomaly avoidance procedures were used to clear access to each well location, an area around each well, and to expose the well heads. Access routes and sufficient buffer areas around each well were also cleared of any surface hazards and subsurface anomalies prior to implementing well abandonment procedures.

2.2.12 HWMU Site Restoration

Upon completion of RA excavation, confirmation sampling, and DGM verification, and field activities, restoration activities were completed. Restoration activities included backfilling previously open excavation areas/grids. Soil grading activities were also completed to address drainage concerns, mitigate ponding, and to facilitate vegetation reestablishment.

Once stockpile soil samples (**Section 2.2.9**) and confirmation soil samples (**Section 2.2.10**) were laboratory analyzed and evaluated for potential human health risks, the stockpiled soils that achieved the cleanup criteria (i.e., human health risk assessment) were reused to backfill the HWMU as detailed in **Sections 3.2** and **3.3**, respectively. Once backfill was in place, the site was graded to remove ruts and establish positive drainage. Once the site was backfilled and graded, a drought tolerant seed mixture, consisting of species native to northwest New Mexico was spread throughout areas disturbed by RA field activities.

2.3 CULTURAL AND ECOLOGICAL RESOURCE PROTECTION

2.3.1 HWMU Cultural Resources Monitoring

As documented in the Approved Final WP, a Programmatic Agreement among the U.S. Army, the Navajo Nation, the Pueblo of Zuni, and the New Mexico State Historic Preservation Officer was signed in 2008 and is actively acknowledged at FWDA for actions related to closure and post-closure care activities. A Cultural Resources Management Plan (CRMP) was, therefore, prepared in support of the Parcel 3 Closure and Corrective Action at FWDA under a separate cover. The CRMP was prepared pursuant to the FWDA RCRA Permit. Based on the extent of prior disturbances and the nature of the clean-up operations in the HWMU (i.e., excavation and sifting) it was considered unlikely that intact cultural resources would be recovered during this RA. However, efforts to minimize impacts to cultural resources during the RA fieldwork are further summarized in **Section 2.3.3**.

Cultural resources monitoring was also conducted periodically during scheduled processing plant downtimes and when other opportunities became available (e.g., unscheduled maintenance events). A Cultural Resources Management Plan (AECOM 2016) was developed for this project and defined the procedures for cultural resource monitoring.

The Zuni Cultural Resource Enterprise (ZCRE) provided periodic monitoring in accordance with a Programmatic Agreement. UXO technicians escorted ZCRE archaeologists during the monitoring efforts. The primary cultural field monitoring activities included inspections, where the UXO-escorted ZCRE visually scanned stockpiles for potential cultural artifacts or other items of significance. The ZCRE also provided training for the on-site UXO technicians and equipment operators to aid in the identification of potential discoveries during the RA fieldwork. No culturally significant artifacts or other items of cultural significance were identified during the HWMU RA, and ZCRE eventually discontinued soil stockpile monitoring due to the massive quantities of stockpiled soils and the negative results of the initial surveys completed.

2.3.2 Ecological Resources

As discussed in **Section 1.3.4**, wetlands were evaluated at and near the HWMU prior to the intrusive RA fieldwork to assess the presence or absence of wetland vegetation, hydric soils, and hydrology especially in and around the arroyo portion of the Site. Soil test pits were dug to examine soils for evidence of hydric soils and hydrology. A wetland delineation data sheet was completed for areas with the highest potential for wetland characteristics. These areas were generally open and more vegetated with low growing coyote willow (*Salix exigua*). The arroyo portion of the HWMU was ultimately determined not to be a wetland (URS 2012a). The USACE Albuquerque District, therefore, issued a letter dated February 1, 2013, which indicated that the HWMU RA was authorized under Nationwide Permit 38 for Cleanup of Hazardous and Toxic Wastes.

A biological review was also completed in 2012 prior to initiation of the RA fieldwork within the HWMU (URS 2012b). This inventory served as the basis for the Environmental Protection Plan included in the RA WP. Information regarding endangered species, threatened species, and critical habitat was obtained from the U.S. Fish and Wildlife Service New Mexico Ecological Services Field Office website for McKinley County, New Mexico. The species list for McKinley County, New Mexico included seven listed species and 10 species of concern, but the biological review of the HWMU and surrounding areas identified no threatened or endangered species or suitable habitats within the project area. It was ultimately determined that the project would have no significant effects on listed species or critical habitat. Based on this "no effects" determination, the RA complied with Section 7 of the Endangered Species Act (URS 2012b). However, efforts were implemented to minimize impacts to ecological resources during the RA fieldwork as summarized in **Section 2.3.3**.

2.3.3 Mitigation Procedures

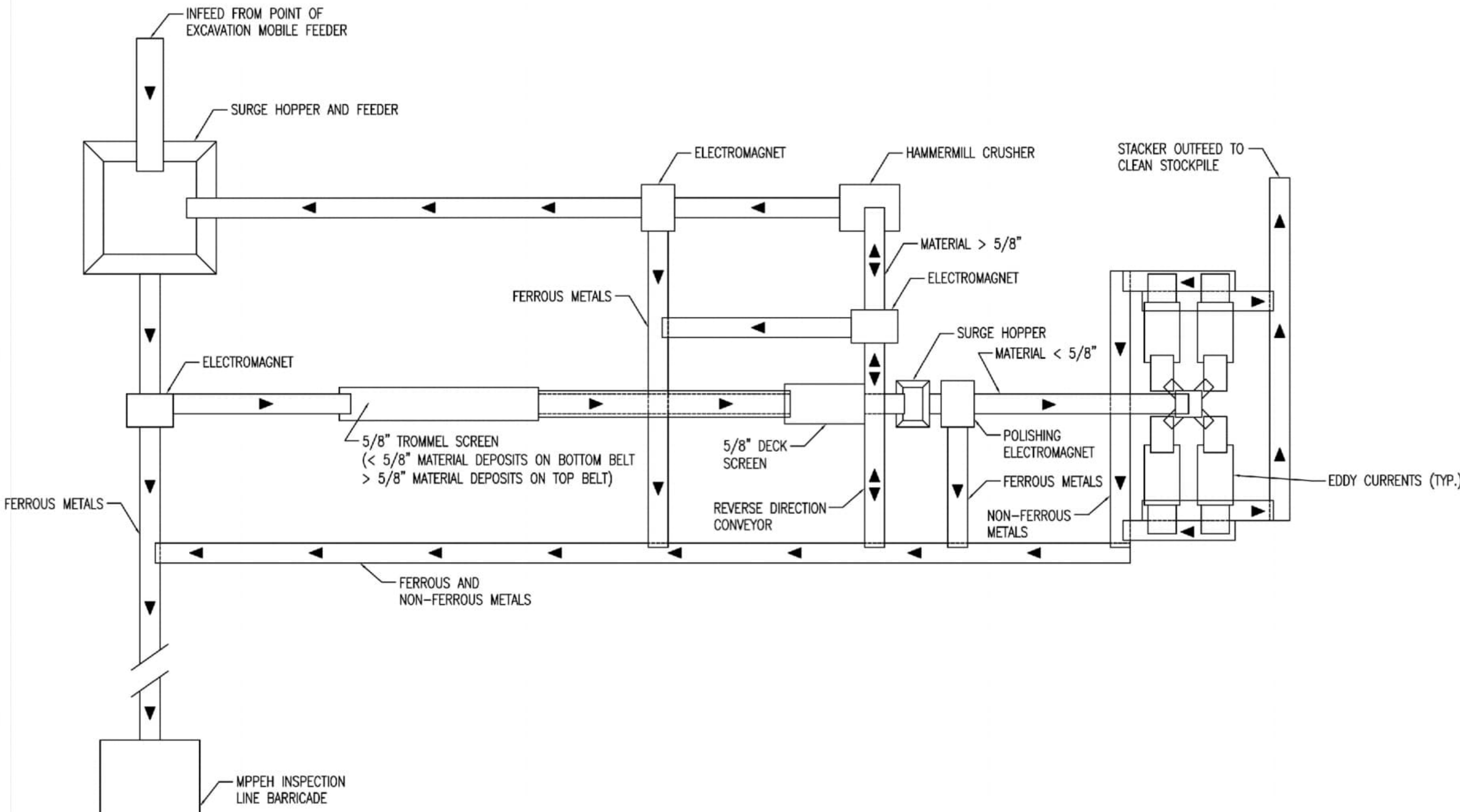
In accordance with the Environmental Protection Plan included in the RA WP, the following procedures were implemented during the RA fieldwork to protect potential cultural (**Section 2.3.1**) and biological (**Section 2.3.2**) resources:

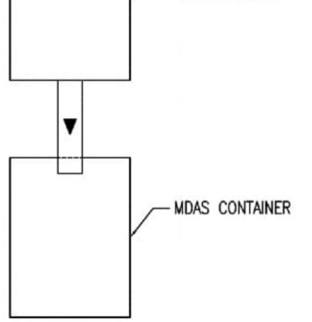
- Excavation activities were limited to the known lateral extent of the HWMU and areas that were designated for soil processing operations.
- A National Pollutant Discharge Elimination System (NPDES) permit was obtained for the HWMU RA. To obtain the NPDES Permit, a SWPPP was submitted and approved in accordance with the permit process. The approved SWPPP pollution prevention controls and procedures were implemented and maintained throughout completion of the RA fieldwork and regular inspections and maintenance activities were completed to ensure that SWPPP measures remained protective of water resources. The controls included installation and maintenance of straw bales, silt fence, straw wattles, and rock checks within the HWMU and CAMU areas.
- Solid waste (i.e., non-metallic debris) generated during RA field activities were placed in proper trash receptacles. Solid waste materials were removed from the site by the local solid waste contractor on a regular basis throughout the project and were disposed of as solid municipal waste.
- Prior to bringing it on-site, equipment was inspected and cleaned of residual soils to prevent egg deposits from plant pests, noxious weeds, and plant seeds from entering the work area.
- No fueling was conducted within arroyos or waterways.
- Ambient Air was periodically monitored for fugitive dust. If measurements exceeded 1.0 milligram per cubic meter at the monitoring point, then dust control measures were implemented at the source to reduce the dust generation. Haul roads were also maintained and wetted as appropriate to reduce dust generation.
- Excavating and grading were completed within arroyo areas in a manner that did not restrict the channel and minimized the potential for upstream flooding.
- Vehicle emissions were controlled through proper maintenance and the use of mufflers in accordance with federal, state, and local rules, laws, and regulations.

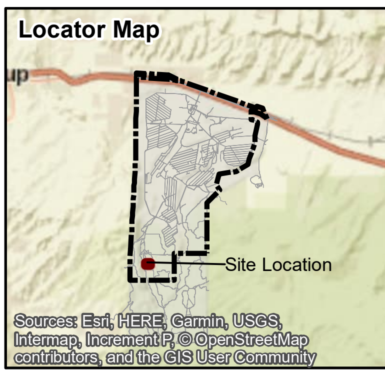
- Only necessary quantities of chemicals were brought on-site during the field activities. Equipment refueling was generally completed with a fuel-truck at the HWMU. Fuel tanks were either double-walled or located within a secondary containment (e.g., berm). A spill kit and fire extinguishers were available during refueling operations.
- Whenever possible, on-site storage areas and other support facilities were located in a manner that minimized impacts to site resources and were approved by the Contracting Officer's Representative (COR) prior to placement.
- Roadways and access routes to the HWMU and CAMU were approved by USACE. Whenever possible, motorized traffic was confined to these established access routes to minimize external impacts to surface topography and vegetation.
- All temporary facilities, work areas, fencing, and other RA equipment/materials were removed from the Site at project completion.

2.4 VISITORS

Authorized visitors are defined as DoD, Department of the Army (DA), USACE, or other personnel (USACE Environmental and Munitions Center of Expertise, DDESB, USACE Headquarters Safety, etc.) conducting project or mission related functions. In addition, QA representatives; safety or quality inspectors (e.g., geophysicists performing QA functions); project management personnel; or NMED, U.S. Environmental Protection Agency (USEPA), or other tribal stakeholder representatives were also considered HWMU RA Site visitors. All authorized visitors to the operations area/exclusion zone were coordinated with the UXOSO and USACE OESS. In accordance with EM 385-1-97 (USACE 2013a), authorized visitors were pre-approved for entry into the exclusion zone and were escorted at all times while in the exclusion zone. No more than two authorized visitors were permitted in the exclusion zone during MEC operations. Visitors on-site during MEC activities were required to log in and out of the Site. The UXOQCS verified that visitors to the site received a safety briefing from the UXOSO and/or SUXOS regarding the site activities scheduled for the day of the visit, the health and safety issues associated with those activities, areas of the site that were off-limits, and confirmed that each visitor was wearing the required personal protective equipment (PPE). Visitors were also briefed on the established danger warning system used on-site by project personnel. The UXOSO documented each visitor briefing and maintained the documentation on-site for the duration of the project.







Note:
This processing schematic is conceptual in that the types of equipment, number of equipment pieces, lengths and sequencing of conveyors, and alignments were subjected to final design modifications and optimization measures. It is important to note that the plant was a tool to achieve the performance standards agreed upon between the Army and NMED. The plant was consistently operated under these performance standards.

Processing Plant Schematic
Fort Wingate Depot Activity
McKinley County, New Mexico

Drawn By:	Date:	
JZ	8/29/2024	**Figure 2-1**
Checked By:	Project No.	
MG	60517380	

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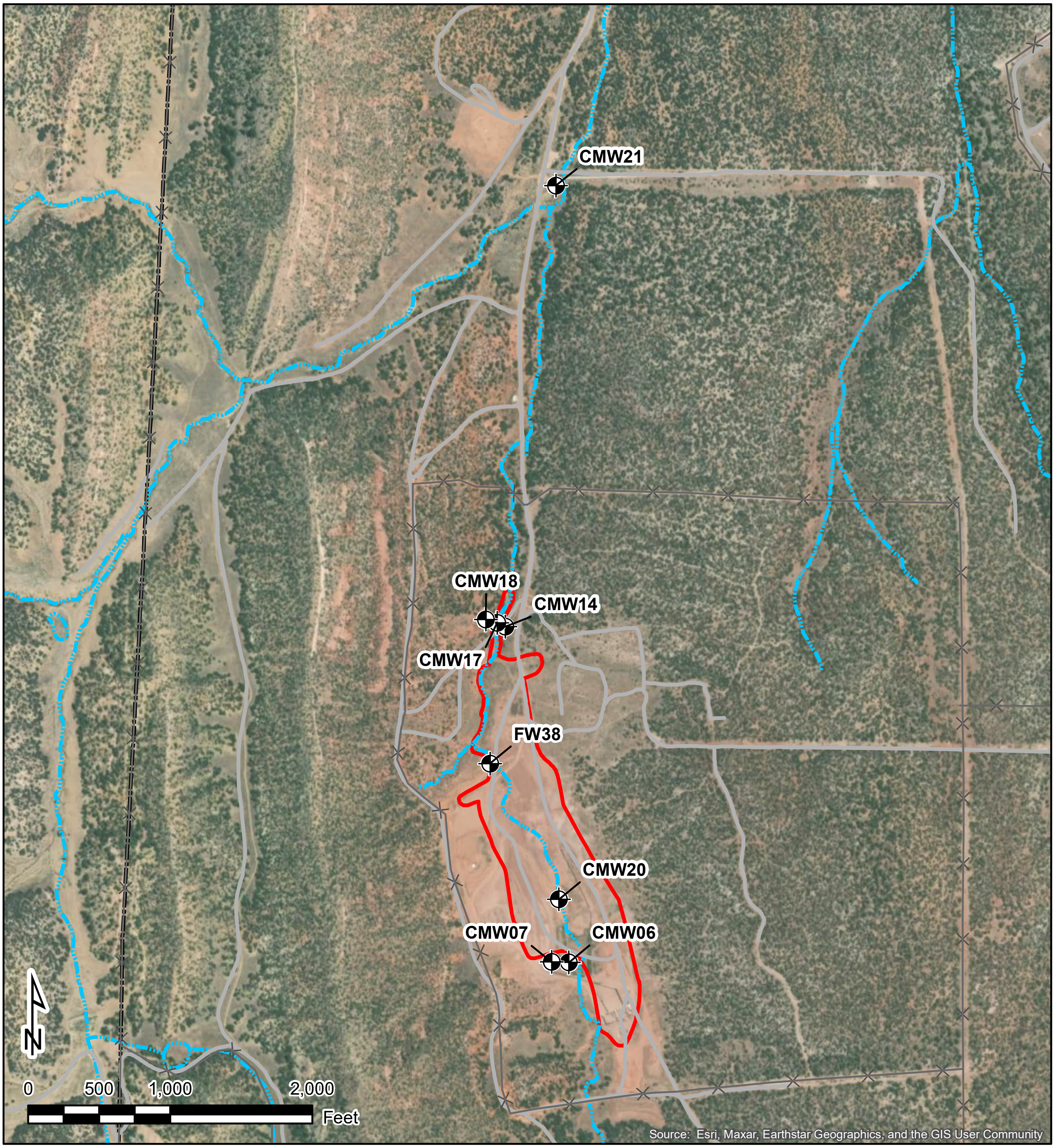

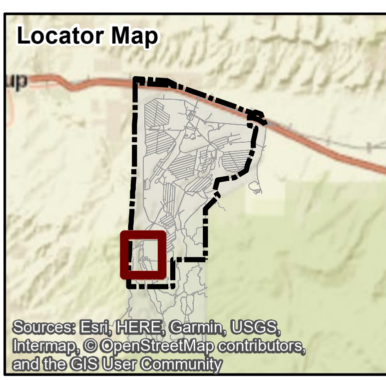

Legend

- Installation Boundary
- HWMU Boundary
- Abandoned Well
- Arroyo
- Road
- Fence

Groundwater Monitoring Well Abandonment Locations
Fort Wingate Depot Activity
McKinley County, New Mexico

Drawn By:	Date:	
JZ	10/11/2024	**Figure 2-2**
Checked By:	Project No.	
MG	60517380	

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This section presents the results of RA field activities completed at the FWDA HWMU since 2012 using the methods and procedures summarized in **Section 2**. **Appendix H** presents a photo documentation log of the RA field activities completed at the HWMU during project fieldwork. In general, the RA results presented in the subsections below are a summary of the results previously presented to project stakeholders in a series of Annual Progress Status Reports completed per the request of NMED as follows:

- HWMU Progress Status Report 2012-2018 (Revision 1) (AECOM 2021a)
- HWMU Progress Status Report 2019 (AECOM 2021b)
- HWMU Progress Status Report 2020 (AECOM 2021c)
- HWMU Progress Status Report 2021 (AECOM 2022)
- HWMU Progress Status Report 2022 (Revision 1) (AECOM 2024a)
- HWMU Progress Status Report 2023 (AECOM 2024b)

The cumulative RA results for the HWMU are presented in the subsections below in a sequence that is consistent with the presentation of results utilized by the Annual Progress Status Reports listed above. The RA data and results from the 2024 fieldwork (i.e., the final year of RA fieldwork) are presented for the first time in the subsections below.

3.1 SOIL SAMPLING RESULTS

All RA soil sample analyses were completed by APPL. APPL is a DoD Environmental Laboratory Accreditation Program certified lab. The cumulative results of RA stockpile soil sampling activities, conducted as discussed in **Section 2.2.9**, are summarized in **Section 3.2** and stockpile sample results are documented in their entirety in **Appendix A**. As documented in **Section 3.2**, an additional set of stockpile-related soil samples (i.e., "stockpile bottom samples") were also collected, starting in 2020 through 2024, from the surface soil footprints exposed beneath stockpiles identified as "contaminated" and disposed as nonhazardous waste at the Northwest New Mexico Regional Solid Waste Authority Landfill. These stockpile bottom samples were collected and evaluated in the same manner as the soil stockpile samples as summarized in **Section 3.2.8**, but the results were not previously documented in the Annual Progress Status Reports. The cumulative results of RA confirmation soil sampling activities, conducted as discussed in **Section 2.2.10**, are summarized in **Section 3.3** and documented in their entirety in **Appendix A**.

Prior to completing human health risk assessments of the RA soil data as detailed in **Section 3.1.1**, all stockpile and confirmation soil sample detections were compared to preliminary RA screening levels. Residential screening values were used for this preliminary screening assessment for both the soil stockpile and confirmation sampling results. NMED Residential SSLs, Residential USEPA Regional Screening Levels (RSLs), and site-specific background concentrations (when available) (Shaw 2010, USACE 2013b, and NMED 2013 [for site-specific arsenic]) were used for the preliminary soil data screening. Associated endpoint concentrations (cancer or non-cancer) were also used in relation to the analytical results for each detected constituent (**Section 3.1.1**).

Limits of quantitation (LOQs), limits of detection (LODs), and detection limits (DLs) were reviewed by the AECOM chemist to verify that they were below the following screening values:

- **Soil Background Levels:** Site-specific soil background levels at FWDA were established in three documents: Soil Background Study and Data Evaluation Report (Shaw 2010), Phase 2 Soil Background Report (USACE 2013b), and an NMED Letter titled Evaluation of Background Levels for Arsenic in Soil at Fort Wingate Depot Activity dated December 18, 2013. When the site-specific background concentration of a metal exceeded the screening value, the site-specific background concentration for that metal was used as the screening value. However, the establishment of an upper tolerance limit (UTL) for antimony was an exception. The screening value for antimony was established to be 95% of the UTL for Soil Unit 350 (i.e., 0.23 mg/kg) based on the 2012 soil background study (i.e., USACE 2013b). This background value for antimony was used in the same manner as the other metals background values during the risk screening (i.e., metals exceeding site-specific background values were included in the calculation of cumulative health risks).
- **NMED Residential SSLs:** The most current residential values were obtained at the time of RA sampling from the NMED Risk Assessment Guidance for Site Investigations and Remediation (htpps://www.env.nm.gov/hazardous-waste/guidance-documents/). The lower of the values for cancer or non-cancer endpoints were selected. This NMED Guidance was updated periodically throughout the duration of the RA field activities, so updates to screening practices were made as new residential SSLs became available. The latest NMED update occurred in November 2022 and was used for screening the 2023 and 2024 soil data (NMED 2022).
- **USEPA Residential RSLs:** If an NMED SSL (NMED 2022) was not available for screening a detected analyte concentration, the residential USEPA RSL was utilized. The RSLs were obtained from the most current Residential Soil Table (i.e., target risk [TR]=1E-06, hazard quotient [HQ]=1.0) in the USEPA's RSL-Generic Tables database. The RSLs were also periodically updated throughout the duration of the RA field activities, so updates to preliminary soil sample screening practices were made accordingly as new RSLs became available. USEPA RSLs based on a carcinogenic endpoint were adjusted by a factor of 10 to achieve the cancer TR of 1E-05 (per NMED guidance). The latest USEPA RSLs used in this report were updated in May 2024 (USEPA 2024b).

3.1.1 Human Health Risk Assessment

RA soil analytical results were also further evaluated for human health risks based on cumulative analytical detections observed in each stockpile and confirmation soil sample. This section describes the general approach that was used to complete the cumulative evaluation of cancer TRs and non-cancer hazards associated with stockpile and confirmation soil samples collected for the HWMU RA. Per NMED Guidance (NMED 2022), all detected organic compounds and metals exceeding site-specific background levels were compared to the NMED Residential SSLs as discussed in **Section 3.1**. Risk screening tables for each collected and laboratory analyzed stockpile and confirmation soil sample are located in **Appendix B**. As updates were released (e.g., to NMED Guidance/SSLs), the risk screening tables shown in **Appendix B** were revised accordingly (i.e., to reflect that the most current screening levels were used at the time that the human health risk assessment was completed). The screening levels for previously collected and risk-evaluated samples reported in Annual Progress Status Reports (AECOM 2021a through AECOM 2024b) were not changed for this HWMU RA Completion Report, as those samples had already undergone the risk-based RA decision-making process.

The target risk and hazard levels, potentially exposed populations, preliminary screening exposure concentrations, comparisons to site-specific background concentrations, calculations of human health risks, risk refinements for non-cancer hazards, and specific evaluations of lead concentrations completed for the RA risk assessments of soil data are summarized in the subsections below. Summaries of the human health risk assessment results are then summarized in **Section 3.2** for RA stockpile soil sample results and in **Section 3.3** for the RA confirmation soil sample results.

3.1.1.1 Target Risk and Hazard Levels

NMED SSLs were based on 1.0E-05 (1 in 100,000) excess cancer TR or a target non-cancer hazard level of 1.0 for noncarcinogens, based on the NMED Risk Assessment Guidance available at the time that each risk evaluation was completed (e.g., latest version was NMED 2022). If an analyte exceeded NMED SSLs, then additional evaluation was completed as discussed in **Sections 3.1.1.2** through **3.1.1.7**.

3.1.1.2 Potentially Exposed Populations

The NMED Risk Assessment Guidance provides screening criteria for three types of populations: residential, commercial/industrial, and construction workers. The residential screening values are generally the most conservative, especially for organic compounds; therefore, residential screening values were used to conservatively evaluate potential risks to human receptors from soil remaining in the HWMU.

3.1.1.3 Preliminary Screening Exposure Concentrations

Detected concentrations of soil analytes were evaluated on a sample-by-sample basis. Therefore, the preliminary screening exposure concentration was the concentration of each chemical detected in a specific sample.

3.1.1.4 Comparison to Site-Specific Background Concentrations

As noted in **Section 3.1**, for metals analytes only, sample concentrations were compared to established site-specific background values (Shaw 2010, USACE 2013b, and NMED 2013). The site-specific background values were included in the risk screening tables originally presented in each HWMU Progress Status Report and now cumulatively included in **Appendix B** of this HWMU RA Completion Report. Metals exceeding site-specific background values were included in the calculation of cumulative health risks as is further detailed in **Section 3.1.1.5**.

3.1.1.5 Calculation of Cumulative Human Health Risk and Hazard

NMED Risk Assessment Guidance requires that the potential cumulative cancer risks and non-cancer hazards be considered in the screening evaluation to conclude whether further evaluation is necessary for RA soil samples. Therefore, screening was performed by comparing maximum chemical concentrations detected in RA soil samples with residential scenario NMED SSLs. In the absence of NMED SSLs, USEPA RSLs were selected, and carcinogenic RSLs were adjusted to a risk of 1.0E-05 per NMED Guidance (i.e., to be consistent with NMED SSLs). Both the NMED SSLs and USEPA RSLs have been updated multiple times since 2012 when the RA fieldwork documented by this Report began. Each annual HWMU RA Progress Status Report documented human health risk assessment results in relation to the latest SSLs/RSLs available at the time that those specific RA data were evaluated. Therefore, the specific NMED SSLs and USEPA RSLs used to evaluate a specific sample are included in the table footnotes of the cumulative RA risk screening tables included in **Appendix B** and originally reported in Annual Progress Status Reports (AECOM 2021a through AECOM 2024b).

NMED SSLs for individual carcinogenic chemicals were based on a cancer TR of 1.0E-05. NMED SSLs for individual noncarcinogenic chemicals were based on a non-cancer hazard level of 1.0. Cumulative screening risks and hazard indices (HIs) were calculated for each sample as follows:

- Cumulative Cancer Risk = ($C_1/SSL_1 + C_2/SSL_2 + \ldots\ldots C_n/SSL_n$) x 1.0E-05
- Cumulative Non-cancer Hazard Index (HI) = ($C_1/SSL_1 + C_2/SSL_2 + \ldots\ldots C_n/SSL_n$) x 1
- Where:
  - $C_1 \ldots C_n$ = Screening exposure concentration for chemical "1" to chemical "n."
  - $SSL_1 \ldots SSL_n$ = Soil screening level for chemical "1" to chemical "n" based on an SSL carcinogenic target risk of 1.0E-05 or noncarcinogenic hazard level of 1.0.

Cancer risks are considered to be additive because there is no threshold below which no adverse effects would occur and there is one common toxicological endpoint. Therefore, if the TR of 1.0E-05 was exceeded by an individual chemical or cumulatively, the sample was considered to pose potential unacceptable cancer risks. However, if a non-cancer HI was greater than 1.0, then those samples were further evaluated (see **Section 3.1.1.6**).

Exposure risks less than the NMED target risk level of 1.0E-05 for cancer and non-cancer HIs less than the NMED hazard level of 1.0 indicated that concentrations for those samples were unlikely to result in adverse human health impacts.

The cumulative human health risks and hazards identified in RA soil samples were detailed in each year's respective RA Annual Progress Status Report. Summaries of the cumulative human health risk assessment results are summarized from previously completed Annual Progress Status Reports in **Section 3.2** for RA stockpile soil sample results and in **Section 3.3** for RA confirmation soil sample results.

3.1.1.6 Risk Refinement

To determine whether or not non-carcinogenic effects were additive, a target organ/system assessment was completed as necessary for each annual reporting period if the cumulative non-cancer HI based on more than one chemical for a sample exceeded 1.0. This process involved calculating non-cancer HIs for each target organ or system to assess whether the non-cancer HI for an organ or organ system exceeded 1.0.

The risk refinement results for the RA soil samples were detailed in each year's respective RA Annual Progress Status Report. Summaries of the human health risk assessment results, including significant risk refinement results, are summarized from previously completed Annual Progress Status Reports in **Section 3.2** for RA stockpile soil samples and in **Section 3.3** for RA confirmation soil samples.

3.1.1.7 Evaluation of Lead Concentrations

Exposure to lead can result in neurotoxic and developmental effects. The primary receptors of concern are children, whose nervous systems are still undergoing development and who also exhibit behavioral tendencies that increase their likelihood of exposure (e.g., pica). These effects may occur at exposures so low they may be considered to have no threshold and therefore are evaluated based on a blood lead level (rather than the external dose as reflected in the reference dose/reference concentration methodology) (USEPA 1994, 1996, 1998, 2016).

The risk evaluation and toxicological approach used by USEPA and other agencies for lead is unique from other chemicals. For residential exposures, USEPA recommends the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children for setting site-specific preliminary risk-based remediation goals. NMED Guidance (NMED 2022) also recommends the use of the IEUBK model for the evaluation of lead exposures for children. The Adult Lead Exposure Model (ALM) is the model currently used by USEPA to evaluate adult exposures in the workplace and is based on a pregnant mother's capacity to contribute to fetal blood lead levels. The models for lead back-calculate to a soil concentration that would not exceed an estimated blood-lead concentration of 10 micrograms per deciliter. NMED guidance (NMED 2022) also recommends the use of the ALM for evaluation of adult exposures to lead. During the RA fieldwork and soil data evaluation completed prior to 2024, the NMED lead SSL for residential exposure was 4.00E+02 milligrams per kilogram (mg/kg). The USEPA updated the residential lead RSL to 2.00E+02 mg/kg in January 2024 (USEPA 2024a). Therefore, all of the 2024 soil data were compared to the prior USEPA lead level of 4.00E+02 mg/kg and the USEPA-updated RSL of 2.00E+02 mg/kg for lead, and all 2024 soil analytical results for lead were less than both criteria. The USEPA-blood lead concentration changed in 2025 but this did not impact the evaluation of blood lead for the HWMU RA because all fieldwork was completed by the end of 2024. Data were evaluated using the standard applicable at the time the field work was completed. HQs were not calculated for lead because there was no established threshold value. For the annual RA risk assessments, the maximum detected lead concentrations were presented as comparisons with the receptor-specific SSL.

Evaluations of lead concentrations detected in RA soil samples were included in each year's respective RA Annual Progress Status Report. Potential risks associated with detected lead concentrations in RA soil samples are included in the human health risk assessment results presented in **Section 3.2** for RA stockpile soil samples and in **Section 3.3** for RA confirmation soil samples.

3.2 STOCKPILE SOIL SAMPLING RESULTS

The stockpile soil sample results from 2012 through 2023 presented in this section are summarized from previous stakeholder approved HWMU Progress Status Reports 2012-2018 (AECOM 2021a), 2019 (AECOM 2021b), 2020 (AECOM 2021c), 2021 (AECOM 2022), 2022 (Revision 1) (AECOM 2024a), and 2023 (AECOM 2024b). Due to a contract change, no RA soil sampling activities were conducted from July 2015 through August 2017, so there were no RA soil data reported for 2016 (i.e., in the 2012-2018 Report [AECOM 2021a]). The RA stockpile soil sampling results from 2024 are being presented for the first time in this cumulative RA Completion Report.

Stockpile soil samples were collected from each approximately 250-cubic-yard RA soil stockpile constructed from RA excavated soils using the methods and procedures detailed in **Section 2.2.9.1**. The full set of stockpile soil sample results from 2012 through 2024 are presented in the "**A.1**" Tables of **Appendix A** and stockpile soil samples with individual chemical exceedances of preliminary SSLs are highlighted in the **Appendix B.1** risk assessment tables. The cumulative stockpile sample results of analytes that exceeded of SSLs are summarized in **Table 3-1** (including the year/Status Report in which each sample was collected/evaluated). **Table 3-2** summarizes the single chemical with laboratory limits that were greater than the NMED SSLs (i.e., N-nitrosodimethylamine) for each year of RA soil sampling and evaluation. It is important to note that there were no detections of N-nitrosodimethylamine at the LOD in any of the RA soil samples submitted for laboratory analysis.

Each stockpile soil sample with analytical results that exceeded the RA screening criteria (i.e., shown in **Table 3-1**), was also further evaluated for human health risk as detailed in **Section 3.1.1**. The human health risk assessment results for each year's stockpile soil samples are summarized in **Table 3-3** and discussed **Sections 3.2.1** through **3.2.7** below. The comprehensive stockpile risk assessment results are presented in their entirety in the "**B.1**" Tables of **Appendix B**. If analytical results for a stockpile achieved the risk screening process, that stockpile was retained for use on-site as backfill within the HWMU.

However, when analytical results indicated that stockpiles were contaminated based on risk assessment results (i.e., as summarized in **Tables 3-1** and **3-3** and detailed in the text of **Sections 3.2.1** through **3.2.7**), those stockpiles were segregated in a contaminated stockpile area and were subsequently disposed of off-site at the Northwest New Mexico Regional Solid Waste Authority Landfill at 101 Red Mesa Bluffs Dr, Thoreau, New Mexico. In these instances, "stockpile bottom samples" were collected from 2020 through 2024 beneath (i.e., within the entire footprint of) the contaminated stockpiles removed from the contaminated stockpile area. These stockpile bottom samples are summarized in **Section 3.2.8**, their analytical results are documented in **Table A.3** of **Appendix A**, and their risk assessment results are documented in **Table B.3** of **Appendix B**.

3.2.1 2012-2018 Stockpile Sampling and Risk Assessment Results (AECOM 2021a)

A total of 1,228 stockpile soil samples were collected from 2012 through 2018 of the RA and their analytical results were evaluated for potential human health risks using the approach summarized in **Section 3.1.1**. As shown in **Table 3-1**, 11 stockpile soil samples had one or more analyte concentrations that exceeded residential screening levels as follows:

- Nine of the 2012-2018 stockpile samples (SKPL 0053, 0065, 0087, 0142, 0156, 0160, 0178, 0423, and 0732) exceeded the residential screening levels (39.1 mg/kg and 36 mg/kg) for 2,4,6-trinitrotoluene (TNT) (maximum detected concentration of 3,000 mg/kg).
- One of the nine samples (i.e., SKPL 0053) with a TNT exceedance also exceeded the screening level (45 nanograms per kilogram [ng/kg]) for dioxins/furans (i.e., 47.0 ng/kg toxicity equivalence [TEQ]).
- One sample (SKPL 0483) exceeded background levels and the residential screening levels for both arsenic (7.07 mg/kg) and iron (54,800 mg/kg) with detected concentrations of 7.4 mg/kg and 94,900 mg/kg, respectively.
- One sample (SKPL 0799) exceeded the background level and residential screening level (0.782 mg/kg) for thallium with a detected concentration of 1.5 mg/kg.

As summarized in **Table 3-3**, additional risk evaluation was completed for the 2012-2018 stockpile soil sample data as summarized in **Section 3.1.1**. As shown in **Table 3-3**, additional risk evaluation of the screening level exceedances shown in **Table 3-1** identified two samples with estimated cancer risk in excess of 1.0E-05 and 11 samples with individual chemical HQs that exceeded 1.0 for a target organ.

Each of the 2012 through 2018 soil stockpiles with sample exceedances shown in **Tables 3-1** and **3-3** and summarized above were disposed of as nonhazardous waste at the Northwest New Mexico Regional Solid Waste Authority Landfill. The analytical results for each stockpile requiring offsite disposal were provided to the landfill for review and acceptance of the material prior to shipment off-site. No hazardous waste soils were generated during the 2012 through 2018 removal activities.

3.2.2 2019 Stockpile Sampling and Risk Assessment Results (AECOM 2021b)

A total of 416 stockpile soil samples were collected during the 2019 RA fieldwork and the analytical results were evaluated for potential human health risks using the approach summarized in **Section 3.1.1**. As shown in **Table 3-1**, only one 2019 stockpile soil sample (SKPL 1416) had a single metal analyte concentration (thallium 0.87 mg/kg) that exceeded its respective residential screening level (0.782 mg/kg) and associated site-specific background concentration (0.213 mg/kg background level).

As summarized in **Table 3-3**, additional risk evaluation of the 2019 screening level exceedance for thallium shown in **Table 3-1** identified no estimated cancer risk in excess of 1.0E-05, but the thallium exceedance did exhibit an HQ that exceeded 1.0 for a target organ. No other screening level, TR, HQ, or HI exceedances were identified in the 2019 stockpile soil sample data. The single 2019 soil stockpile shown in **Tables 3-1** and **3-3** was disposed of as nonhazardous waste at the Northwest New Mexico Regional Solid Waste Authority Landfill. The analytical results for this stockpile were provided to the landfill for review and acceptance of the waste soils prior to shipment off-site. No hazardous waste soils were generated during the 2019 removal activities.

3.2.3 2020 Stockpile Sampling and Risk Assessment Results (AECOM 2021c)

A total of 392 stockpile soil samples were collected during the 2020 RA fieldwork and the analytical results were evaluated for potential human health risks using the approach summarized in **Section 3.1.1**. As shown in **Table 3-1**, 14 stockpile soil samples had one or more analyte concentrations that exceeded residential screening levels as follows:

- 13 of the 2020 stockpile samples (SKPL 1898, 1917, 1971, 1990, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, and 2001) exceeded the residential screening level (36 mg/kg) for TNT (maximum detected concentration of 13,000 mg/kg).
- One of these 13 samples (i.e., SKPL 1993) with the maximum TNT concentration of 13,000 mg/kg, also had an explosives analyte (i.e., 4-amino-2,6-dinitrotoluene) that exceeded its respective residential screening level (7.7 mg/kg) with a detected concentration of 98 mg/kg.
- One additional 2020 stockpile soil sample (SKPL 1988) exceeded background levels and the residential screening levels for both copper (3,130 mg/kg) and lead (400 mg/kg) with detected concentrations of 34,400 mg/kg and 1,500 mg/kg, respectively.

As summarized in **Table 3-3**, additional risk evaluation was completed for the 2020 stockpile soil sample data as summarized in **Section 3.1.1**. The additional risk evaluation identified 14 samples with estimated cancer risk in excess of 1.0E-05 and/or estimated individual chemical HQs that exceeded 1.0. Sample SKPL1993 exceeded for both TNT and 4-amino-2,6-dinitrotoluene, and Sample SKPL1988 had an HQ that exceeded 1.0 for copper. Lead in Sample SKPL1988 also exceeded its residential screening value. These were the same 14 stockpile soil samples that exceeded screening levels as shown in **Table 3-1**.

Each of the 2020 soil stockpiles with exceedances shown in **Tables 3-1** or **3-3** and summarized above, were disposed of as nonhazardous waste at the Northwest New Mexico Regional Solid Waste Authority Landfill. The analytical results for each stockpile requiring offsite disposal were provided to the landfill for review and acceptance of the waste soils prior to shipment off-site. No hazardous waste soils were generated during the 2020 removal activities.

3.2.4 2021 Stockpile Sampling and Risk Assessment Results (AECOM 2022)

A total of 435 stockpile soil samples were collected during the 2021 RA fieldwork and the analytical results were evaluated for potential human health risks using the approach summarized in **Section 3.1.1**. As shown in **Table 3-1**, nine stockpile soil samples had analyte concentrations that exceeded preliminary residential screening levels as follows:

- Eight stockpile samples (SKPL 2051, 2062, 2072, 2074, 2076, 2077, 2103, and 2249) exceeded the residential screening level (36 mg/kg) for TNT (maximum detected concentration of 180 mg/kg).

- One additional 2021 stockpile sample (SKPL 2061) exceeded its background level and residential screening level for lead (400 mg/kg) with a detected concentration of 2,940 mg/kg.

As summarized in **Table 3-3**, additional risk evaluation was completed for the 2021 stockpile soil sample data as summarized in **Section 3.1.1**. As summarized in **Table 3-3**, additional risk evaluation of the screening level exceedances shown in **Table 3-1** identified no samples with estimated cancer risk in excess of 1.0E-05, but all nine samples had individual chemical exceedances of residential non-cancer screening criteria resulting in non-cancer HQs exceeding 1.0 after refinement (**Section 3.1.1.6**).

Each of the 2021 soil stockpiles with sample exceedances shown in **Tables 3-1** and **3-3** and summarized above, were disposed of as nonhazardous waste at the Northwest New Mexico Regional Solid Waste Authority Landfill. The analytical results for each stockpile requiring offsite disposal were provided to the landfill for review and acceptance of the material prior to shipment off-site. No hazardous waste soils were generated during the 2021 removal activities.

3.2.5 2022 Stockpile Sampling and Risk Assessment Results (AECOM 2024a)

A total of 297 stockpile soil samples were collected during the 2022 RA fieldwork and the analytical results were evaluated for potential human health risks using the approach summarized in **Section 3.1.1**. As shown in **Table 3-1**, seven stockpile soil samples had analyte concentrations that exceeded residential screening levels as follows:

- Five 2022 stockpile soil samples (SKPL 2473, 2474, 2499, 2574, and 2645) exceeded the residential screening level (36 mg/kg) for TNT (maximum detected concentration of 70 mg/kg).
- One 2022 stockpile soil sample (SKPL 2649) exceeded the background level and residential screening level for copper (3,130 mg/kg) with a detected concentration of 3,480 mg/kg.
- One 2022 stockpile soil sample (SKPL 2724) exceeded the background level and residential screening level for chromium (96.6 mg/kg) with a detected concentration of 1,280 mg/kg.

As summarized in **Table 3-3**, additional cumulative risk evaluation was completed for the 2022 stockpile soil sample data as summarized in **Section 3.1.1**. As shown in **Table 3-3**, four of the 2022 stockpile soil samples (i.e., SKPL 2474, 2645, 2649, and 2724) with preliminary screening level exceedances shown in **Table 3-1**, also had estimated cancer risk in excess of 1.0E-05 (SKPL 2724 only) and/or hazard indices exceeding 1.0 after refinement (SKPL 2474, 2645, 2649, and 2724).

Stockpile soil samples SKPL 2473, 2499, and 2574, with individual chemical exceedances of the SSLs shown in **Table 3-1**, were inadvertently screened to a target hazard of 1 instead of 1.0. These stockpiles were considered clean and used as clean backfill at the site. These samples and their risk evaluations were presented to NMED in the 2022 HWMU Status Report. No comments were received specific to this aspect of the risk evaluation. The 2022 HWMU Status Report was approved by NMED on February 6, 2024.

As a result, four 2022 soil stockpiles (i.e., SKPL 2474, 2645, 2649, and 2724) were segregated and later disposed of at the Northwest New Mexico Regional Solid Waste Authority Landfill. The analytical results for each stockpile requiring offsite disposal were provided to the landfill for review and acceptance of the material prior to shipment off-site. No hazardous waste soils were generated during the 2022 removal activities.

3.2.6 2023 Stockpile Sampling and Risk Assessment Results (AECOM 2024b)

A total of 278 stockpile soil samples were collected during the 2023 RA fieldwork and the analytical results were evaluated for potential human health risks using the approach summarized in **Section 3.1.1**. As shown in **Table 3-1**, 11 stockpile soil samples had one or more analyte concentrations that exceeded residential screening levels as follows:

- Four of the samples (SKPL 2847, 2956, 2975, and 3004) exceeded the residential screening level (36 mg/kg) for TNT (maximum detected concentration of 240 mg/kg).
- One of the samples (i.e., SKPL 3004) with a residential screening level TNT exceedance, also had metal analyte (i.e., copper) that exceeded its respective background level and residential screening level (3,130 mg/kg) with a detected concentration of 3,300 mg/kg.
- One of the samples (i.e., SKPL 2962) exceeded the residential screening level (6.16 mg/kg) for nitroglycerin with a detected concentration of 8.6 mg/kg.
- One sample (SKPL 2861) exceeded the residential screening level (1.14 mg/kg) for Aroclor 1254 with a detected concentration of 5.6 mg/kg.
- Four of the stockpile samples (SKPL 2772, 2789, 2793, and 2799) exceeded the background level and residential screening level (0.782mg/kg) for thallium (maximum detected concentration of 1.7 mg/kg).
- One Additional 2023 stockpile soil sample (SKPL 2986) exceeded background levels and the residential screening levels for both copper (3,130 mg/kg) and lead (400 mg/kg) with detected concentrations of 16,000 mg/kg and 790 mg/kg, respectively.

As summarized in **Table 3-3**, additional cumulative risk evaluation was completed for the 2023 stockpile soil sample data as summarized in **Section 3.1.1**. As shown in **Table 3-3**, following completion of initial cumulative human health risks, 11 stockpile samples (SKPL 2772, 2789, 2793, 2799, 2847, 2861, 2956, 2962, 2975, 2986, and 3004) showed potential non-cancer HQs for individual chemicals greater than 1.0. Two stockpile samples (SKPL2956 and SKPL2861 showed excess cancer risk greater than the target risk of 1.0E-05. One stockpile sample (SKPL 2976) had no individual chemical exceedances of the cancer endpoint SSLs but had a cumulative excess cancer risk greater than 1.0E-05 (i.e., primarily due to 2-4-Dinitrotoluene detected at 16 mg/kg and TNT detected at 12 mg/kg). Stockpile 2976 was, therefore, considered to exceed the cancer TR of 1.0E-05 and to pose an unacceptable risk to human health as shown in **Table 3-3**. Stockpile SKPL2986 also contained lead at a concentration of 790 mg/kg which exceeded the residential screening value of 400 mg/kg.

The 12 stockpiles shown in **Table 3-3** could have posed unacceptable risks to human receptors so they were disposed of as nonhazardous waste at the Northwest New Mexico Regional Solid Waste Authority Landfill. The analytical results for each stockpile requiring offsite disposal were provided to the landfill for review and acceptance of the material prior to shipment off-site. No hazardous waste soils were generated during the 2023 removal activities.

3.2.7 2024 Stockpile Sampling and Risk Assessment Results

A total of 168 stockpiles were sampled during the 2024 RA fieldwork and the analytical results were evaluated for potential human health risks using the approach summarized in **Section 3.1.1**. None of the 2024 soil stockpiles had analytical sample results for any analytes that exceeded residential screening levels as indicated in **Table 3-1**. In addition, none of the 2024 soil stockpile sample results exceeded their respective cancer TR (i.e., greater than 1.0E-05) or HI of 1.0 as indicated in **Table 3-3**. The 2024 stockpile sample results are presented in their entirety for the first time (i.e., were not documented in a previous Annual Progress Report) in the 2024-specific **Table A.1** of **Appendix A**. The risk assessment results are presented in their entirety for the first time (i.e., were not documented in a previous Annual Progress Report) in the 2024-specific **Table B.1** of **Appendix B**. No hazardous waste soils were generated during the 2024 removal activities and each of the stockpiles analyzed in 2024 were used as backfill for site restoration as discussed in **Section 3.8**.

3.2.8 Sampling Beneath Stockpiles

As summarized in **Sections 3.2.1** through **3.2.7** and in **Tables 3-1** and **3-3**, the soil stockpiles with analytical results above SSLs or risk screening criteria were staged within a contaminated stockpile staging area until they could be properly disposed at the Northwest New Mexico Regional Solid Waste Authority Landfill. Stockpiles were originally placed on plastic sheeting while awaiting sample results. Starting in 2020, the use of plastic sheeting was discontinued due to the amount of plastic debris that was generated and required management. To document that soils beneath contaminated piles were below project SSLs, when contaminated stockpiles were removed for disposal from their staged locations, a "stockpile bottom" soil sample was collected. The stockpile bottom samples were collected from the surface soils underlying the contaminated stockpiles. The surface soils were carefully scraped from each stockpile footprint before the stockpile bottom samples were collected. The stockpile bottom samples were laboratory analyzed and assessed for risk for the same analytes and in the same manner as the stockpile soil samples summarized in **Sections 3.2.1** through **3.2.7**.

The results of these stockpile bottom sampling activities collected from 2020 through 2024 are presented in their entirety in **Table A.3** of **Appendix A**. **Tables B.3** in **Appendix B** presents the risk assessment results for the contaminated stockpile bottom locations shown in **Appendix A**. The **Appendix A.3** and **B.3** tables document that the following stockpile bottom samples were collected and laboratory analyzed:

- 2 stockpile bottom samples were collected and analyzed in 2020.
- 19 stockpile bottom samples were collected and analyzed in 2021.

- 3 stockpile bottom samples were collected and analyzed in 2022.
- 5 stockpile bottom samples were collected and analyzed in 2023.
- 8 stockpile bottom samples were collected and analyzed in 2024.

As detailed in the **Appendix A.3** and **B.3** tables, all stockpile bottom samples collected in 2020, 2022, 2023, and 2024 had sample results that were below residential screening levels for all analytes, and none of the sample results exceed their respective cancer or non-cancer endpoints.

As highlighted in **Table A.3** of **Appendix A**, four of the stockpile bottom samples collected in 2021 (i.e., SKPLBOT-1999, SKPLBOT-2061, SKPLBOT-1998, and SKPLBOT-2000) had 2,4,6-TNT results above screening criteria. As a result, and as shown in the 2021-specific **Table B.3** of **Appendix B**, the surface soil footprints of SKPLBOT-1999 and SKPLBOT-2061 were scraped and resampled (i.e., as SKPLBOT-1999-002 and SKPLBOT-2061-002). **Appendix A.3** and **B.3** both show that these secondary stockpile bottom samples collected from these 2021 sample locations were below screening criteria, had cancer risk less than 1.0E-05 and non-cancer HQs less than 1.0. A logistical decision was made in 2021 not to scrape and resample the soil footprints where Stockpile Bottom Samples SKPLBOT-1998 and SKPLBOT-2000 were collected. Instead, these contaminated soil stockpile footprints were incorporated into a larger L-shaped area where final contaminated stockpiles were subsequently staged until all RA activities were completed in 2024 (see **Figure 3-1**). Following removal and disposal of all contaminated soil stockpiles, this L-shaped contaminated stockpile staging area and another small area to the southeast of the Site (**Figure 3-1**) were scraped to remove any remnant contaminated soils that were staged there. These two final contaminated stockpile staging areas were separated into sampling grids and sampled as discussed in **Section 3.2.8.1**.

3.2.8.1 Final Contaminated Stockpile Staging Area Sampling Event

A final surface soil contaminated stockpile staging area sampling event was completed in November and December of 2024. These soil samples were collected, laboratory analyzed and evaluated for risk to verify that the surface soils remaining beneath the two final areas used to stage contaminated soil stockpiles were not impacted by the staging of contaminated soil. As discussed in **Section 3.2.8**, the two former 2021 contaminated soil stockpile bottom samples (i.e., SKPLBOT-1998 and SKPLBOT-2000) with elevated concentrations of 2,4,6-TNT were encompassed and delineated within the L-shaped contaminated stockpile storage area shown on **Figure 3-1**. This figure shows the final two areas where contaminated soil stockpiles, not accounted for by the stockpile bottom sampling discussed in **Section 3.2.8**, were staged until final completion of the RA in 2024. Once all contaminated stockpile soils were removed, the potentially impacted surface soils within these areas were scraped and the final contaminated stockpile staging area sampling event was completed.

As shown on **Figure 3-1**, these two remaining staging areas were divided into 100-foot by 100-foot grids for final sampling. Samples P3HWMU-CONTAM-01-001, P3HWMU-CONTAM-02-001, P3HWMU-CONTAM-03-001, P3HWMU-CONTAM-04-001, P3HWMU-CONTAM-05-

001, and P3HWMU-CONTAM-06-001) were collected from the L-shaped contaminated stockpile staging area west of the HWMU and Samples P3HWMU-CONTAM-07-001 and P3HWMU-CONTAM-08-001 were collected from an additional staging area that was located east of the soil processing plant near the south end of the HWMU. These grids were sampled and laboratory analyzed in the same manner as the stockpile bottom samples discussed in **Section 3.2.8**.

As highlighted in **Table A.4** of **Appendix A** and in **Table B.4** of **Appendix B**, two of the final contaminated staging area samples collected in November 2024 (i.e., P3HWMU-CONTAM-001-001 and P3HWMU-CONTAM-003-001) had 2,4,6-TNT results above screening criteria. As a result, a surface soil layer was excavated from the footprints of both of these grids and they were resampled for explosives analyses in December 2024 (i.e., Samples P3HWMU-CONTAM-001-002 and P3HWMU-CONTAM-003-002). The tables shown in **Appendix A.4** and **B.4** both show that all analytes detected in the second/re-samples collected from these grids were below screening criteria and had cancer risk less than 1.0E-05 and non-cancer HIs less than 1.0.

3.3 CONFIRMATION SOIL SAMPLING RESULTS

The confirmation soil sample results from 2012 through 2023 presented in this section are summarized from previously approved HWMU Progress Status Reports summarized at the beginning of **Section 3**. The sample results from 2024 are being presented for the first time in this cumulative RA Completion Report (**Section 3.3.7**).

Before completing backfill and restoration activities within each DGM-verified (**Section 2.2.8**) excavation area, confirmation soil samples were collected from the removal grids as shown on **Figure 3-1** and were also originally collected from the extents of excavated CDCs and CRPs where they were identifiable following excavation (i.e., during the 2012 through 2018 field activities). As discussed in **Section 2.2.10,** a small number of partial grids (e.g., those at HWMU boundaries) were occasionally combined into single sampling units (i.e., grids combined) based on how excavation operations were progressing, as long as the combined grid sizes did not exceed 10,000 square feet and USACE concurrence was obtained prior to sampling. As detailed in **Section 2.2.10**, each confirmation sample consisted of one discrete soil sample for VOCs (Method 8260B), and one composite sample collected and analyzed for target analyte list metals (Method 6010B/6020A/7471B), SVOCs (Method 8270D), explosives (Method 8330B), polychlorinated biphenyl aroclors (Method 8082A), nitrate (Method 9056A), cyanide (Method 9014), dioxins/furans (Method 7 8290), and perchlorate (Method 6850). Beginning in October 2021, N-methyl-D-aspartate was analyzed separately using Method 8270D-SIM.

As summarized in **Section 3.1.1**, organic analytical results were compared to both the residential cancer and non-cancer screening levels on a sample-by-sample basis and inorganic analytical results (i.e., detected metals concentrations) were compared to both residential cancer and non-cancer screening levels, as well as established site-specific background levels on a sample-by-sample basis. The full set of confirmation soil sample results from 2012 through 2024 are presented in **Appendix A.2** and the comprehensive risk assessment results are included in **Appendix B.2**. The comprehensive results included in **Appendix A** and **B** are summarized from their respective Annual Progress Status reports in **Sections 3.3.1** through **3.3.6** below, and the latest 2024 data are presented for the first time in **Section 3.3.7**. The years that each RA grid achieved clean confirmation sample results are shown in **Figure 3-1**.

3.3.1 2012-2018 Confirmation Sampling and Risk Assessment Results (AECOM 2021a)

Confirmation soil samples were collected from excavation sidewall/bottom locations within 62 total excavated CDC, CRP, and grid areas during the RA fieldwork completed from 2012 through 2018. The analytical results were evaluated for potential human health risks as summarized in **Section 3.1.1**. No laboratory detections exceeded residential screening levels, had cancer risk greater than 1.0E-05, or non-cancer HQs greater than 1.0. As a result, the confirmation sample results evaluated for 44 grids during the 2012-2018 fieldwork (i.e., Grids A9 through A13, B9 through B16, C9 through C16, D1 through D6, E1 through E6, F2 through F6, G3 through G6, and H5 through H6) were approved for backfill and grading without additional soil removal as shown on **Figure 3-1**.

3.3.2 2019 Confirmation Sampling and Risk Assessment Results (AECOM 2021b)

Confirmation soil samples were collected from 18 excavated grids during the RA fieldwork completed in 2019. The analytical results were evaluated for potential human health risks as summarized in **Section 3.1.1**. No laboratory detections exceeded residential screening levels, had cancer risk greater than 1.0E-05, or non-cancer HQs greater than 1.0. As a result, the confirmation sample results evaluated for 18 grids during the 2019 fieldwork (i.e., Grids B17 through B19, C17 through C20, and D10 through D20) were approved for backfill and grading without additional soil removal as shown on **Figure 3-1**.

3.3.3 2020 Confirmation Sampling and Risk Assessment Results (AECOM 2021c)

Confirmation soil samples were collected from 30 excavated grids during the RA fieldwork completed in 2020. The analytical results were evaluated for potential human health risks as summarized in **Section 3.1.1**. No laboratory detections exceeded residential screening levels, had cancer risk greater than 1.0E-05, or non-cancer HQs greater than 1.0. As a result, the confirmation sample results evaluated for 30 grids during the 2020 fieldwork (i.e., Grids B21, B22, C21, C22, D7 through D9, D21 through D23, E7 through E9, E21, E22, F7 through F9, F21, F22, G7 through G9, G21, G22, H7 through H9, H21 and H22) were approved for backfill and grading without additional soil removal as shown on **Figure 3-1**.

3.3.4 2021 Confirmation Sampling and Risk Assessment Results (AECOM 2022)

Confirmation soil samples were collected from 28 grids and two CRPs excavated during the RA fieldwork completed in 2021. The analytical results were evaluated for potential human health risks as summarized in **Section 3.1.1**. No laboratory detections exceeded residential screening levels, had cancer risk greater than 1.0E-05, or non-cancer HQs greater than 1.0. As a result, the confirmation sample results evaluated for 28 grids during the 2021 fieldwork (i.e., Grids E15 through E20, F15 through F20, G14 through G20, H14 through H20, I20, and I21) were approved for backfill and grading without additional soil removal as shown on **Figure 3-1**.

3.3.5 2022 Confirmation Sampling and Risk Assessment Results (AECOM 2024a)

Confirmation soil samples were collected from 22 grids excavated during the RA fieldwork completed in 2022. Partial grids I9 through I12, located along the eastern boundary of the HWMU were sampled as one combined/single grid. The analytical results were evaluated for potential human health risks as summarized in **Section 3.1.1**. Only arsenic in sample P3HWMU-GRID-G13-001 exceeded residential screening levels. However, based on the Evaluation of Background Levels for Arsenic in Soil (NMED, dated 18 December 2013), which established a background value and site range for consideration during screening, the arsenic grid concentration was compared to the Fort Wingate background range of 0.2 mg/kg to 11.2 mg/kg. The detected confirmation grid concentration of 9.6 mg/kg was within that range and was, therefore, considered to represent background conditions.

No other laboratory detections exceeded residential screening levels, cancer risk greater than 1.0E-05, or non-cancer HQs greater than 1.0 in the 2022 confirmation soil sampling results. As a result, the confirmation sample results evaluated for 22 grids during the 2022 fieldwork (i.e., Grids E10 through E14, F10 through F14, G10 through G13, H10 through H13, I9 through I12) were approved for backfill and grading without additional soil removal as shown on **Figure 3-1**.

3.3.6 2023 Confirmation Sampling and Risk Assessment Results (AECOM 2024b)

Confirmation soil samples were collected from 24 excavated grids during the RA fieldwork completed in 2023. Partial Grids D25 and E25 and E26 and F26 (along the western boundary of the HWMU) and Grids I24, I25, and I26 (along the eastern boundary of the HWMU) were sampled as one combined/single grid in 2023. The analytical results were evaluated for potential human health risks as summarized in **Section 3.1.1**. As documented in the 2023 Progress Status Report (AECOM 2024b), during 2023 confirmation soil sampling activities, thallium was detected above the residential SSL non-cancer endpoint of 0.782 mg/kg in the following samples and at the following concentrations:

- P3HWMU-GRID-E23-001: 1.0 mg/kg
- P3HWMU-GRID-F24-001: 1.7 mg/kg
- P3HWMU-GRID-G23-001: 1.2 mg/kg

Based on these initial 2023 confirmation sample results from Grids E23, F24, and G23, an additional 12 inches of soil was removed from each grid and they were each resampled. The follow-up confirmation sample results obtained from each resampled grid, were all below the RA screening levels for all analytes.

No other laboratory detections exceeded residential screening levels, had cancer risks greater than 1.0E-05, or non-cancer HQs greater than 1.0 in the 2023 confirmation soil sampling results. As a result, the confirmation sample results evaluated for 24 excavated grids during the 2023 fieldwork (i.e., Grids D24, D25, E23 through E26, F23 through F27, G23 through G27, H23 through H27, and I24 through I26) were approved for backfill and grading without additional soil removal as shown on **Figure 3-1**.

3.3.7 2024 Confirmation Sampling and Risk Assessment Results

The 2024 confirmation sample results, are presented in the 2024-specific **Table A.2** of **Appendix A**. The 2024 confirmation sample risk assessment results are presented in **Table B.2** of **Appendix B**.

Confirmation soil samples were collected from 20 grids excavated during the RA fieldwork completed in 2024. The analytical results were evaluated for potential human health risks as summarized in **Section 3.1.1**. No laboratory detections were identified in the 2024 confirmation sample results that exceeded residential screening levels, had cancer risks greater than 1.0E-05, or non-cancer HQs greater than 1.0. As shown in the 2024-specific **Tables A.2** and **B.2** of **Appendices A** and **B**, one of the 20 grids sampled in 2024 (i.e., Grid I26) was originally sampled in 2023 as part of a combined grid sample (i.e., Grid-I24.I25.I26-001). This grid was resampled in 2024 as an individual grid (i.e., Grid I26-001) following additional soil removal activities. In both samples/instances, all analytical results for this resampled grid were below residential screening levels, cancer TR (1.0E-05), and non-cancer HQs (1.0). As summarized on **Figure 3-1**, the confirmation sample results evaluated for the other 19 grids remediated during the 2024 fieldwork (i.e., Grids F28 through F29, G28 through G29, H28 through H30, I27 through I29, I31, J27 through J29, J32, K27 through K29, and K33) were approved for backfill and grading without additional soil removal.

3.4 MEC AND MD RECOVERED

The cumulative MEC and MD RA results from 2012 through 2023 presented in this section are summarized from previously approved HWMU Progress Status Reports summarized at the beginning of **Section 3**. The MEC and MD recovery results from 2024 are being presented for the first time in this Report. The following subsections summarize the cumulative totals of historical munitions-related materials (i.e., MEC and MDAS) recovered from the FWDA HWMU and disposed during this multi-year RA. Due to a contract change, no RA MEC removal operations were conducted from July 2015 through August 2017, so there were no RA data reported for 2016.

3.4.1 MEC Recovered During RA Field Activities

MEC items recovered within the HWMU during RA surface sweep, excavation, soil processing, and follow-up DGM intrusive investigation (**Section 3.4.1.2**) operations were recorded each day in an annual MEC Log. Since most of the MEC items removed during the RA were recovered from soil processing inspection lines, coordinates for recovered MEC items were not documented in the MEC logs. The annual MEC Logs are included in **Appendix C** and the resulting MEC totals are summarized in the bullets below. These MEC totals only include items recovered from within the HWMU (i.e., exclude MEC recovered from other areas of Parcel 3). The MEC quantities recovered from the HWMU during RA field activities during each year of fieldwork are summarized from **Appendix C** as follows:

- **2012-2018:** 19,560 MEC Items

- 2012: 6 MEC Items
- 2013: 54 MEC Items
- 2014: 5,428 MEC Items
- 2015: 7,297 MEC Items
- 2017: 1,997 MEC Items
- 2018: 4,778 MEC Items

- **2019:** 5,029 MEC Items
- **2020:** 14,743 MEC Items
- **2021:** 14,123 MEC Items
- **2022:** 291,286 MEC Items
- **2023:** 640,911 MEC Items
- **2024:** 131,255 MEC Items
- **TOTAL MEC (Recovered from the HWMU during the RA): 1,116,907**

Unacceptable to move MEC items were destroyed by detonation within the HWMU. These items were disposed within a grid that had not yet been excavated and processed (i.e., so the grid would undergo soil sampling following excavation activities at a later date). All other items were considered acceptable to move and were transferred to ECMs for disposal by consolidated shot at a later date. Following detonation in place and consolidated shot operations, the detonation craters and surrounding areas were inspected by qualified UXO technicians to verify that no explosive hazards remained, and that any remnant MD was removed. RA MEC disposal operations are further discussed in **Section 3.5**.

3.4.1.1 AN-M66A2 Bomb Discovery

In November 2014, the discovery of an AN-M66A2, 2,000-lb general purpose bomb that contained 1,146 lbs of high explosive (HE) filler, exceeded the allowable quantity of explosives that could be treated at the CAMU. The item was identified at approximately 18 feet below ground surface (bgs) during excavation sloping activities along the southwestern HWMU boundary. The discovery led the Army to request an Emergency Permit for the onsite treatment of the bomb from the NMED. An Emergency Permit was issued to FWDA on May 12, 2015, to facilitate the bomb's disposal by detonation at a location within the HWMU that had not yet been excavated. Firing operations were initiated with a remote firing device (RFD) and the bomb was detonated at 10:43 a.m. on May 20, 2015.

After a five-minute waiting period, the post-demolition location was inspected by the SUXOS, UXOQCS, the Demolition Team Leader, and the USACE OESS to verify that no treatment residuals remained in the impacted area. The disposal area was backfilled on May 21, 2015. In accordance with the Emergency Permit, a letter detailing the demolition activities was submitted to the NMED within seven days. A copy of the Emergency Permit and the post destruction documentation letter are included in **Appendix F**. The grid where this 2015 MEC disposal operation was conducted (i.e., Grid H16) was subsequently excavated, processed, and verified as being clear of munitions-related debris and potential residual contaminants using post-excavation DGM and confirmation soil sampling.

3.4.1.2 MEC Recovered During Final Post-Excavation DGM

As detailed in **Section 2.2.8** full coverage post-excavation DGM surveys were completed using an EM61 paired with RTK GPS at the base of each excavated HWMU grid once an initial analog survey had been completed to verify that only potential single point anomalies remained within each excavated area. The DGM survey and data processing activities were completed in accordance with the DGM SOP (i.e., SOP No.6) included in the RA WP. All target anomalies above the Site-specific threshold criteria were reacquired with the EM61 and intrusively investigated. Two separate IVS Reports were completed for the HWMU RA (i.e., one for the initial URS contract [URS 2014] and one for the second AECOM contract [AECOM 2018]). A 5 mV threshold was documented in the original URS IVS Report and a 4 mV threshold was documented in the subsequent 2018 IVS Report (AECOM 2018). These IVS Reports and results of the post-excavation DGM surveys are included in **Appendix G**.

The bullets below summarize the few remnant MEC items recovered from DGM target anomaly locations identified above the threshold criteria at the bases of excavated grids. As indicated, MEC was not identified during the post-excavation DGM activities conducted from 2021 through 2024, but was reported during 2018 (AECOM 2021a), 2019 (AECOM 2021b), and 2020 (AECOM 2021c) RA field activities as follows:

- In 2018, seven MEC items (i.e., two 40mm, two 105mm projectiles, one 37mm projectile, and two fuzes) were recovered from five DGM anomaly locations during post-excavation DGM clearance activities completed in Grids C15 and C16. The anomalies detected during the post-excavation DGM survey were recovered from additional intrusive depths between two and 24 inches bgs at the locations shown on **Figure 3-2**. After disposing of the items as discussed in **Section 3.5**, the Grid C15 and C16 areas were remapped with DGM to confirm that they were free of additional anomalies (AECOM 2021a).

- In 2019, two MEC items (i.e., two M404s) were recovered from two separate DGM target anomaly locations during post-excavation DGM clearance activities completed in Grids D11 and D12. The anomalies detected during the post-excavation DGM survey were recovered from additional intrusive depths of 3 and 5 inches bgs respectively, at the locations shown on **Figure 3-2**. After disposing of the items as discussed in **Section 3.5**, the Grid D11 and D12 areas were remapped with DGM to confirm that they were free of additional anomalies (AECOM 2021b).

- In 2020, three individual MEC items (i.e., BLU-4, M120 fuze, and 20mm projectile) were removed from three post-excavation DGM anomaly locations in Grids E21, G9 and H7, respectively. Five additional items (i.e., point-detonating [PD] fuzes) were also recovered from an additional anomaly location within Grid C21 and were disposed of as MEC following MPPEH inspection (**Figure 3-2**). These DGM identified items were recovered from additional intrusive depths of 4 to 6 inches bgs. The items were disposed as discussed in **Section 3.5** and the grids with recovered items were remapped with DGM to confirm that they were free of additional anomalies (AECOM 2021c).

Following removal of the few MEC items summarized above, the final post-excavation DGM survey results for each of the grids within the HWMU are shown on **Figure 3-3**. Note that the standard work practice at the site was to excavate and map one or more grids before moving on to repeat the procedure on the next grid or group of grids. As a result, some inconsistencies can be observed in the geophysical response along grid lines shown on **Figure 3-3**. The HWMU RA IVS Reports and other significant DGM data are compiled in **Appendix G**. Additional DGM data may be provided upon request.

3.4.2 MDAS Recovered

All metallic debris that was removed during the project was inspected, and items verified as MDAS were flashed. The flashing process utilized a convective heating process to decontaminate the debris of potential explosive residues as detailed in **Section 2.2.7**. The total quantities of MDAS removed from the HWMU during the RA are summarized as follows:

- **2012-2018**: Approximately 3,950,000 lbs (1,975 tons) of MDAS were removed (AECOM 2021a).
- **2019:** Approximately 733,000 lbs (366.5 tons) of MDAS were removed (AECOM 2021b).
- **2020:** Approximately 1,560,000 lbs (780 tons) of MDAS were removed (AECOM 2021c).
- **2021:** Approximately 847,000 lbs (423.5 tons) of MDAS were removed (AECOM 2022).
- **2022:** Approximately 1,924,929 lbs (962.5 tons) of MDAS were removed (AECOM 2024a).
- **2023:** Approximately 1,651,359 lbs (826 tons) of MDAS were removed (AECOM 2024b).
- **2024:** Approximately 1,582,118 lbs (791 tons) of MDAS were removed.
- **TOTAL MDAS:** Approximately 12,248,406 lbs (6,125 tons) of MDAS were removed from the HWMU throughout the duration of the RA fieldwork.

All MDAS generated was secured in lockable roll-off containers or drums and shipped offsite for recycling. Each shipment of MDAS was accompanied by a Form 1348-1, documenting the material as MDAS, and a bill of lading. Final MDAS disposition documentation is included in **Appendix F**.

3.5 MEC DISPOSAL

MEC disposal operations of the recovered MEC items summarized in **Section 3.4** and documented in **Appendix C** were supervised by the SUXOS and coordinated with the on-site OESS. All explosive operations followed the procedures outlined in EM 385-1-97 (USACE 2013a) and contractor SOPs as summarized in **Section 2.2.6**. Transportation of donor explosives was conducted in accordance with applicable sections of 49 CFR Part 397. All appropriate notifications were made by the SUXOS prior to conducting MEC disposal operations. Donor explosives were initiated by a radio-firing device, and non-electric shock tube detonators or electric blasting caps. Donor explosives, including jet perforators and boosters, were obtained through an explosives vendor, and were stored in two ECMs (i.e., B1042 and B1043).

MEC detonation operations, of acceptable to move items (i.e., the majority of RA MEC disposed), were conducted within the CAMU, which is part of SWMU 14. The CAMU and SWMU 14 are located approximately 0.5 mile north of the HWMU as shown on **Figure 1-2**. MEC disposal of unacceptable to move items (i.e., BIPs) were detonated within the HWMU boundaries (i.e., within a grid that still required excavation and processing). MEC items detonated in this manner were designated as “BIP” within the tables included in **Appendix C**.

After each MEC disposal operation was completed, a UXO team completed an inspection of the disposal area (i.e., detonation crater and surrounding areas) to confirm that all explosives were consumed by the detonation operation, conducted an MPPEH inspection of any remaining materials, and removed any remnant MD from the area.

3.6 EXCAVATION QUANTITIES

The RA excavation and soil processing field activities completed throughout the HWMU are detailed in **Sections 2.2.3** and **2.2.4**. The final depths of excavation activities completed within each HWMU grid were verified by the final confirmation sampling results summarized in **Section 3.3** and shown on **Figure 3-1** and by the DGM and intrusive investigation results summarized in **Section 3.4** and shown on **Figure 3-3**. HWMU excavation activities were completed to depths up to 30 feet bgs in order to fully remove the historical munitions-related features (i.e., OB/OD craters, CRPs, and CDCs) previously documented within the HWMU and until all DGM target anomalies above the target anomaly threshold were resolved. A topographic survey of the HWMU was completed prior to initiating any excavation work. As excavation of CRPs, CDCs, and grids was completed, a second topographic survey was completed to document the quantity of material excavated from each area. An estimated 818,895 cubic yards of soil were excavated and processed from the HWMU grids from 2012 through 2024. During the initial contract from 2012 through 2015, approximately 103,600 cubic yards were excavated and processed, and during the second contract from 2017 through 2024, a total of 715,295 cubic yards were excavated and processed.

3.7 GROUNDWATER MONITORING WELL ABANDONMENT RESULTS

Eight groundwater monitoring wells previously installed at the HWMU were successfully abandoned within and in close proximity to the HWMU and CAMU as shown on **Figure 2-2**. Each well was abandoned (i.e., plugged) in accordance with the RA WP and New Mexico Guidelines as detailed in **Section 2.2.11**. The New Mexico Office of the State Engineer-Approved Plans and Final Plugging Records for each RA abandoned well are included in **Appendix E**.

3.8 BACKFILL AND RESTORATION RESULTS

Backfill and restoration/revegetation activities were implemented at the HWMU as summarized in **Section 2.2.12**. As discussed in **Section 2.2.12**, the areas of the FWDA impacted by the HWMU RA were re-seeded using drought tolerant species (e.g., buffalograss and blue grama) that were native to northwest New Mexico. Following final RA backfilling and grading, seeding was completed to facilitate final grade surface soil stabilization in order to minimize wind/water erosion and sedimentation. Seeded areas included the 32-acre HWMU, as well as several support areas (e.g., office and parking areas, equipment laydown areas, soil stockpiling areas, and processing plant areas).

Prior to seeding, the seedbed areas were tilled to make them loose and uniform. Erosion controls intended to temporarily stabilize exposed soils (e.g., straw mats, straw bales, straw wattles, silt fence, rock checks, etc.) were also implemented, as necessary. Once the surface preparation activities were completed, the areas were broadcast seeded. Revegetated areas were watered and monitored for establishment by AECOM personnel.

3.9 DATA MANAGEMENT

3.9.1 Electronic Data

RA project data were primarily managed electronically on a secure office network. Access to the project directory was limited to project team members while documents were in development. Once a document was considered complete and ready for technical/quality review, it was moved to a directory with restricted access.

3.9.2 Hardcopy Data

Any significant data collected or documented in hardcopy formats were maintained in field logbooks, were scanned, and/or were otherwise entered into a computer (i.e., with copies saved/maintained in electronic formats).

3.9.3 Geographic Information System (GIS) Data

During the RA field activities, team members used RTK GPS to document the locations of EM61 sensors with cm level accuracy during post excavation DGM and associated anomaly resolution surveys. Trimble GPS units (or equivalent) were also used to:

- Acquire MEC locational data (e.g., when MEC was found in place within the HWMU during post-excavation DGM mapping and associated intrusive investigation operations)
- Orient team members at the site
- Orient equipment for positional monitoring
- Verify previously documented information
- Supplement previously documented information with updated visual information
- Acquire positional/coordinate data for the HWMU and its RA grid system
- Identify and gather any previously undiscovered HWMU information
- Document photographs and significant items of interest identified during RA field activities

All geospatial data were logged in a format compatible with the FWDA's GIS using the NAD83, State Plane, New Mexico West, U.S. Survey feet.

TABLE 3-1
SSL EXCEEDANCES - STOCKPILE SOIL SAMPLES
FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

Stockpile Sample Location	Date Sampled	Chemical in Exceedance of SSL	Result (mg/kg)	Residential SSL Cancer Endpoint* (mg/kg)	Residential SSL Noncancer Endpoint* (mg/kg)	Background Value**	Source (Update year)
2012-2018 Stockpile Soil Sample SSL Exceedances (AECOM 2021a)							
0053	5/29/2014	2,4,6-Trinitrotoluene	59	-	39.1	-	NMED (2012)
0053	5/29/2014	TEQ***	47	45	-	-	NMED (2012)
0065	6/16/2014	2,4,6-Trinitrotoluene	610	-	39.1	-	NMED (2012)
0087	7/14/2014	2,4,6-Trinitrotoluene	130	-	39.1	-	NMED (2012)
0142	9/15/2014	2,4,6-Trinitrotoluene	71	-	39.1	-	NMED (2012)
0156	9/25/2014	2,4,6-Trinitrotoluene	67	-	39.1	-	NMED (2012)
0160	10/2/2014	2,4,6-Trinitrotoluene	3,000	-	39.1	-	NMED (2012)
0178	10/14/2014	2,4,6-Trinitrotoluene	52	-	39.1	-	NMED (2012)
0423	8/16/2017	2,4,6-Trinitrotoluene	870	211	36	-	NMED (2017)
0483	8/23/2017	Arsenic****	7.4	7.07	13	5.6	NMED (2017)
0483	8/23/2017	Iron	94,900	-	54800	22660	NMED (2017)
0732	3/14/2018	2,4,6-Trinitrotoluene	150	211	36	-	NMED (2017)
0799	4/23/2018	Thallium	1.5	-	0.782	0.213	NMED (2017)
2019 Stockpile Soil Sample SSL Exceedances (AECOM 2021b)							
1416	7/11/2019	Thallium	0.87	-	0.782	0.213	NMED (2019)
2020 Stockpile Soil Sample SSL Exceedances (AECOM 2021c)							
1898	8/24/2020	2,4,6-Trinitrotoluene	560	211	36	-	NMED (2019)
1917	9/3/2020	2,4,6-Trinitrotoluene	140	211	36	-	NMED (2019)
1971	10/5/2020	2,4,6-Trinitrotoluene	59	211	36	-	NMED (2019)
1990	10/14/2020	2,4,6-Trinitrotoluene	58	211	36	-	NMED (2019)
1993	10/14/2020	2,4,6-Trinitrotoluene	13,000	211	36	-	NMED (2019)
1994	10/14/2020	2,4,6-Trinitrotoluene	110	211	36	-	NMED (2019)
1995	10/14/2020	2,4,6-Trinitrotoluene	220	211	36	-	NMED (2019)
1996	10/16/2020	2,4,6-Trinitrotoluene	160	211	36	-	NMED (2019)
1997	10/16/2020	2,4,6-Trinitrotoluene	140	211	36	-	NMED (2019)
1998	10/16/2020	2,4,6-Trinitrotoluene	300	211	36	-	NMED (2019)
1999	10/20/2020	2,4,6-Trinitrotoluene	160	211	36	-	NMED (2019)
2000	10/20/2020	2,4,6-Trinitrotoluene	140	211	36	-	NMED (2019)
2001	10/20/2020	2,4,6-Trinitrotoluene	63	211	36	-	NMED (2019)
1993	10/14/2020	4-Amino-2,6-dinitrotoluene	98	-	7.7	-	NMED (2019)
1988	10/13/2020	Copper	34,400	-	3,130	18.4	NMED (2019)
1988	10/13/2020	Lead	1,500	-	400	12.4	NMED (2019)
2021 Stockpile Soil Sample SSL Exceedances (AECOM 2022)							
2051	2/12/2021	2,4,6-Trinitrotoluene	180	211	36	-	NMED (2019)
2061	3/1/2021	Lead	2940	-	400	12.4	NMED (2019)
2062	3/2/2021	2,4,6-Trinitrotoluene	120	211	36	-	NMED (2019)
2072	3/4/2021	2,4,6-Trinitrotoluene	120	211	36	-	NMED (2019)
2074	3/5/2021	2,4,6-Trinitrotoluene	42	211	36	-	NMED (2019)
2076	3/6/2021	2,4,6-Trinitrotoluene	53	211	36	-	NMED (2019)
2077	3/6/2021	2,4,6-Trinitrotoluene	37	211	36	-	NMED (2019)
2103	3/19/2021	2,4,6-Trinitrotoluene	160	211	36	-	NMED (2019)
2249	6/26/2021	2,4,6-Trinitrotoluene	41	211	36	-	NMED (2019)
2022 Stockpile Soil Sample SSL Exceedances (AECOM 2024a)							
2473	2/10/2022	2,4,6-Trinitrotoluene	41	211	36	-	NMED (2021)
2474	2/11/2022	2,4,6-Trinitrotoluene	63	211	36	-	NMED (2021)
2499	3/4/2022	2,4,6-Trinitrotoluene	39	211	36	-	NMED (2021)
2574	4/18/2022	2,4,6-Trinitrotoluene	40	211	36	-	NMED (2021)
2645	7/20/2022	2,4,6-Trinitrotoluene	70	211	36	-	NMED (2022)
2649	7/25/2022	Copper	3,480	-	3,130	18.4	NMED (2022)
2724	9/29/2022	Chromium	1,280	96.6	45,200	18.1	NMED (2022)
2023 Stockpile Soil Sample SSL Exceedances (AECOM 2024b)							
2847	6/26/2023	2,4,6-Trinitrotoluene	63	211	36	-	NMED (2022)
2956	9/11/2023	2,4,6-Trinitrotoluene	240	211	36	-	NMED (2022)
2975	9/25/2023	2,4,6-Trinitrotoluene	59	211	36	-	NMED (2022)
3004	10/13/2023	2,4,6-Trinitrotoluene	65	211	36	-	NMED (2022)
2962	9/15/2023	Nitroglycerin	8.6	313	6.16	-	NMED (2022)
2772	4/21/2023	Thallium	0.87	-	0.782	0.213	NMED (2022)
2789	4/28/2023	Thallium	1.7	-	0.782	0.213	NMED (2022)
2793	5/1/2023	Thallium	0.92	-	0.782	0.213	NMED (2022)
2799	5/2/2023	Thallium	0.95	-	0.782	0.213	NMED (2022)
2986	10/3/2023	Copper	16,000	-	3,130	18.4	NMED (2022)
3004	10/13/2023	Copper	3,300	-	3,130	18.4	NMED (2022)
2986	10/3/2023	Lead	790	-	400	12.4	NMED (2022)
2861	7/10/2023	Aroclor 1254	5.6	2.43	1.14	-	NMED (2022)
2024 Stockpile Soil Sample SSL Exceedances							
No 2024 stockpile soil sample results exceeded SSLs							

Notes:

*Residential SSL Cancer and Noncancer Endpoints reflect the levels published in the NMED Risk Assessment Guidance for Site Investigations and Remediation document, or USEPA RSLs that were current at the time a sample was collected. These sources were updated multiple times during the RA, which explains why SSLs may have changed over time.

**Site-Specific background values are from the 2009 Background Study (Shaw 2010).

***The dioxin and furan result and screening values are presented in ng/kg. TEQ calculation and the TEFs are from the 2005 World Health Organization dioxin TEFs to calculate dioxin TEQ (AECOM 2021a)

****Except for arsenic and antimony, background values were the 95% UTLs from the 2009 Background document. For antimony, the background value was the 95% UTL for soil unit 350ss based on the 2012 USACE background study. The New Mexico default value for arsenic was 7.07 mg/kg; however, Fort Wingate has a site-specific values for arsenic. For arsenic, prior to the 2017 NMED SSL update, according to the December 18, 2013 letter from NMED regarding the arsenic screening procedure, arsenic detections were to be compared to the specified site background reference of 5.6 mg/kg. If the detection was greater than 5.6 mg/kg, then it was compared to the site background range of 0.2 to 11.2 mg/kg. If the result exceeded 5.6 mg/kg, then the NMED SSL of 3.9 mg/kg (June 2012-December 2014) was used to assess risk, and an SSL of 4.25 mg/kg from December 2014 through March 2017. This procedure was adapted by NMED utilizing the two background studies completed at FWDA by Shaw in 2009 and USACE in 2012. Following the March 2017 NMED SSL update, arsenic was screened against the SSL of 7.07 mg/kg (AECOM 2021a).

mg/kg - milligrams per kilogram

ng/kg - nanograms per kilogram

NMED - New Mexico Environment Department

SSL - Soil Screening Level

RSL - Regional Screening Level

TEF - toxicity equivalence factor

TEQ - toxicity equivalence (for dioxin and furan costituents)

USACE - United States Army Corps of Engineers

USEPA - United States Environmental Protection Agency

UTL - upper tolerance limit

"-" - No available value

TABLE 3-2
LABORATORY LIMITS GREATER THAN SSLs
FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

Analyzed Chemical	CAS Number	Residential Value (Cancer Endpoint) (mg/kg)	Residential Value (Noncancer Endpoint) (mg/kg)	Limit of Quantitation* (mg/kg)	Limit of Detection* (mg/kg)	Detection Limit* (mg/kg)	Source (Update Year)
2012-2018 (AECOM 2021a)							
N-Nitrosodimethylamine	62-75-9	0.0226	-	-	0.036	0.024	NMED (2012)
N-Nitrosodimethylamine	62-75-9	0.0234	-	-	0.037	0.025	NMED (2014)
N-Nitrosodimethylamine	62-75-9	0.0234	0.493	-	0.035	0.025	NMED (2017)
2019 (AECOM 2021b)							
N-Nitrosodimethylamine	62-75-9	0.0234	0.493	-	0.035	0.025	NMED (2017)
N-Nitrosodimethylamine	62-75-9	0.0234	0.493	-	0.036	0.025	NMED (2019)
2020 (AECOM 2021c)							
N-Nitrosodimethylamine	62-75-9	0.0234	0.493	0.36	0.036	0.025	NMED (2019)
2021 (AECOM 2022)							
N-Nitrosodimethylamine	62-75-9	0.0234	0.493	0.33 [1]	0.033 [1]	0.023 [1]	NMED (2019)
N-Nitrosodimethylamine	62-75-9	0.0234	0.493	0.023 [2]	0.020 [2]	0.018 [2]	NMED (2021)
2022 (AECOM 2024a)							
N-Nitrosodimethylamine	62-75-9	0.0234	0.493	0.025	0.022	0.02	NMED (2022)
2023 (AECOM 2024b)							
N-Nitrosodimethylamine	62-75-9	0.0234	0.493	0.025	0.022	0.02	NMED (2022)
2024							
N-Nitrosodimethylamine	62-75-9	0.0234	0.493	0.025	0.022	0.02	NMED (2022)

Notes:

*Value may vary based on year.

[1] Laboratory limits prior to October 2021

[2] Laboratory limits beginning in October 2021

CAS - Chemical Abstract Service

mg/kg- milligrams per kilogram

NMED - New Mexico Environment Department

"-" - No reported value

TABLE 3-3
SUMMARY OF RISK SCREENING EXCEEDANCES
FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

Sample Location	Date Sampled	Chemical in Exceedance of SSL	Result (mg/kg)	Residential SSL Cancer Endpoint* (mg/kg)	Residential SSL Noncancer Endpoint* (mg/kg)	Background Value**	Target Cancer Risk	Estimated Cancer Risk***	Target Hazard Quotient	Estimated Hazard Quotient***	Target Organ
2012-2018 (AECOM 2021a)											
SKPL0053	5/29/2014	Dioxin TEQ****	47	45	-	-	1.00E-05	1.04E-05			
SKPL0053	5/29/2014	2,4,6-Trinitrotoluene	59	-	39.1	-			1.00E+00	1.51	Liver
SKPL0065	6/16/2014	2,4,6-Trinitrotoluene	610	-	39.1	-			1.00E+00	15.6	Liver
SKPL0087	7/14/2014	2,4,6-Trinitrotoluene	130	-	39.1	-			1.00E+00	3.32	Liver
SKPL0142	9/15/2014	2,4,6-Trinitrotoluene	71	-	39.1	-			1.00E+00	1.82	Liver
SKPL0156	9/25/2014	2,4,6-Trinitrotoluene	67	-	39.1	-			1.00E+00	1.71	Liver
SKPL0160	10/2/2014	2,4,6-Trinitrotoluene	3000	-	39.1	-			1.00E+00	76.73	Liver
SKPL0178	10/14/2014	2,4,6-Trinitrotoluene	52	-	39.1	-			1.00E+00	1.33	Liver
SKPL0423	8/16/2017	2,4,6-Trinitrotoluene	870	211	39.1	-	1.00E-05	4.12E-05	1.00E+00	2.42	Liver
SKPL0483	8/23/2017	Arsenic	7.4	7.07	13	5.6					GI, Heart, Brain, Kidney
SKPL0483	8/23/2017	Iron	94900	-	54800	22660			1.00E+00	1.73	GI
SKPL0732	3/14/2018	2,4,6-Trinitrotoluene	150	211	36	-			1.00E+00	4.14	Liver
SKPL0799	4/23/2018	Thallium	1.5	-	0.782	0.213			1.00E+00	1.92	Hair, Eyes, Skin
2019 (AECOM 2021b)											
SKPL1416	7/11/2019	Thallium	0.87	-	0.782	0.213	-	-	1.00E+00	1.11	Hair, Eyes, Skin
2020 (AECOM 2021c)											
SKPL1898	8/24/2020	2,4,6-Trinitrotoluene	560	211	36	-	1.00E-05	2.65E-05	1.00E+00	1.56E+01	
SKPL1917	9/3/2020	2,4,6-Trinitrotoluene	140	211	36	-	1.00E-05	6.64E-06	1.00E+00	3.89E+00	
SKPL1971	10/5/2020	2,4,6-Trinitrotoluene	59	211	36	-	1.00E-05	2.80E-06	1.00E+00	1.64E+00	
SKPL1990	10/14/2020	2,4,6-Trinitrotoluene	58	211	36	-	1.00E-05	2.75E-06	1.00E+00	1.61E+00	
SKPL1993	10/14/2020	2,4,6-Trinitrotoluene	13,000	211	36	-	1.00E-05	6.16E-04	1.00E+00	3.61E+02	
SKPL1994	10/14/2020	2,4,6-Trinitrotoluene	110	211	36	-	1.00E-05	5.21E-06	1.00E+00	3.06E+00	
SKPL1995	10/14/2020	2,4,6-Trinitrotoluene	220	211	36	-	1.00E-05	1.04E-05	1.00E+00	6.11E+00	
SKPL1996	10/16/2020	2,4,6-Trinitrotoluene	160	211	36	-	1.00E-05	7.58E-06	1.00E+00	4.44E+00	
SKPL1997	10/16/2020	2,4,6-Trinitrotoluene	140	211	36	-	1.00E-05	6.64E-06	1.00E+00	3.89E+00	
SKPL1998	10/16/2020	2,4,6-Trinitrotoluene	300	211	36	-	1.00E-05	1.42E-05	1.00E+00	8.33E+00	
SKPL1999	10/20/2020	2,4,6-Trinitrotoluene	160	211	36	-	1.00E-05	7.58E-06	1.00E+00	4.44E+00	
SKPL2000	10/20/2020	2,4,6-Trinitrotoluene	140	211	36	-	1.00E-05	6.64E-06	1.00E+00	3.89E+00	
SKPL2001	10/20/2020	2,4,6-Trinitrotoluene	63	211	36	-	1.00E-05	2.99E-06	1.00E+00	1.75E+00	
SKPL1993	10/14/2020	4-Amino-2,6-dinitrotoluene	98	-	7.7	-	1.00E-05	NA	1.00E+00	1.27E+01	
SKPL1988	10/13/2020	Copper	34,400	-	3,130	18.4	1.00E-05	NA	1.00E+00	1.10E+01	GI Effects
SKPL1988	10/13/2020	Lead	1,500	-	400	12.4	NA	NA	NA	NA	High Blood Lead
2021 (AECOM 2022)											
SKPL2051	2/12/2021	2,4,6-Trinitrotoluene	180	211	36	-	1.00E-05	8.83E-06	1.00E+00	5.06E+00	
SKPL2061	3/1/2021	Lead	2,940	-	400	12.4	NA	NA	NA	NA	High Blood Lead
SKPL2062	3/2/2021	2,4,6-Trinitrotoluene	120	211	36	-	1.00E-05	5.92E-06	1.00E+00	3.35E+00	
SKPL2072	3/4/2021	2,4,6-Trinitrotoluene	120	211	36	-	1.00E-05	6.22E-06	1.00E+00	3.38E+00	
SKPL2074	3/5/2021	2,4,6-Trinitrotoluene	42	211	36	-	1.00E-05	2.53E-06	1.00E+00	1.30E+00	
SKPL2076	3/6/2021	2,4,6-Trinitrotoluene	53	211	36	-	1.00E-05	2.77E-06	1.00E+00	1.54E+00	
SKPL2077	3/6/2021	2,4,6-Trinitrotoluene	37	211	36	-	1.00E-05	2.24E-06	1.00E+00	1.10E+00	
SKPL2103	3/19/2021	2,4,6-Trinitrotoluene	160	211	36	-	1.00E-05	7.76E-06	1.00E+00	4.48E+00	
SKPL2249	6/26/2021	2,4,6-Trinitrotoluene	41	211	36	-	1.00E-05	2.91E-06	1.00E+00	1.26E+00	
2022 (AECOM 2024a)											
SKPL2474	2/11/2022	2,4,6-Trinitrotoluene	63	211	36	-	1.00E-05	2.99E-06	1.00E+00	1.75E+00	
SKPL2645	7/20/2022	2,4,6-Trinitrotoluene	70	211	36	-	1.00E-05	3.32E-06	1.00E+00	1.94E+00	
SKPL2649	7/25/2022	Copper	3,480	-	3,130	18.4	1.00E-05	3.00E-07	1.00E+00	1.40E+00	

TABLE 3-3
SUMMARY OF RISK SCREENING EXCEEDANCES
FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

Sample Location	Date Sampled	Chemical in Exceedance of SSL	Result (mg/kg)	Residential SSL Cancer Endpoint* (mg/kg)	Residential SSL Noncancer Endpoint* (mg/kg)	Background Value**	Target Cancer Risk	Estimated Cancer Risk***	Target Hazard Quotient	Estimated Hazard Quotient***	Target Organ
SKPL2724	9/29/2022	Chromium	1,280	96.6	45,200	18.1	1.00E-05	1.33E-04	1.00E+00	1.60E+00	
2023 (AECOM 2024b)											
SKPL2847	6/26/2023	2,4,6-Trinitrotoluene	63	211	36	-	1.0E-05	3.0E-06	1.0E+00	1.8E+00	
SKPL2956	9/11/2023	2,4,6-Trinitrotoluene	240	211	36	-	1.0E-05	1.1E-05	1.0E+00	6.7E+00	
SKPL2975	9/25/2023	2,4,6-Trinitrotoluene	59	211	36	-	1.0E-05	2.8E-06	1.0E+00	1.6E+00	
SKPL3004	10/13/2023	2,4,6-Trinitrotoluene	65	211	36	-	1.0E-05	3.1E-06	1.0E+00	1.8E+00	
SKPL2962	9/15/2023	Nitroglycerin	8.6	313	6.16	-	1.0E-05	2.7E-06	1.0E+00	1.4E+00	
SKPL2976*****	9/25/2023	Cumulative	NA	NA	NA	-	1.0E-05	1.3E-05	1.0E+00	6.0E-01	
SKPL2772	4/21/2023	Thallium	0.87	-	0.782	0.213	-	-	1.0E+00	1.1E+00	
SKPL2789	4/28/2023	Thallium	1.7	-	0.782	0.213	-	-	1.0E+00	2.2E+00	
SKPL2793	5/1/2023	Thallium	0.92	-	0.782	0.213	-	-	1.0E+00	1.2E+00	
SKPL2799	5/2/2023	Thallium	0.95	-	0.782	0.213	-	-	1.0E+00	1.2E+00	
SKPL2986	10/3/2023	Copper	16000	-	3130	18.4	-	-	1.0E+00	5.1E+00	
SKPL3004	10/13/2023	Copper	3300	-	3130	18.4	-	-	1.0E+00	1.1E+00	
SKPL2986	10/3/2023	Lead	790	-	400	12.4	NA	NA	NA	NA	High Blood Lead
SKPL2861	7/10/2023	Aroclor 1254	5.6	2.43	1.14	-	1.0E-05	2.3E-05	1.0E+00	4.9E+00	
2024											
No 2024 stockpile soil sample results exceeded risk screening criteria											

Notes:

* Residential SSL Cancer and Noncancer Endpoints reflect the levels published in the NMED Risk Assessment Guidance for Site Investigations and Remediation document, or USEPA RSLs that were current at the time of sampling. These sources were updated multiple times during the RA, which explains why SSLs may have changed over time.

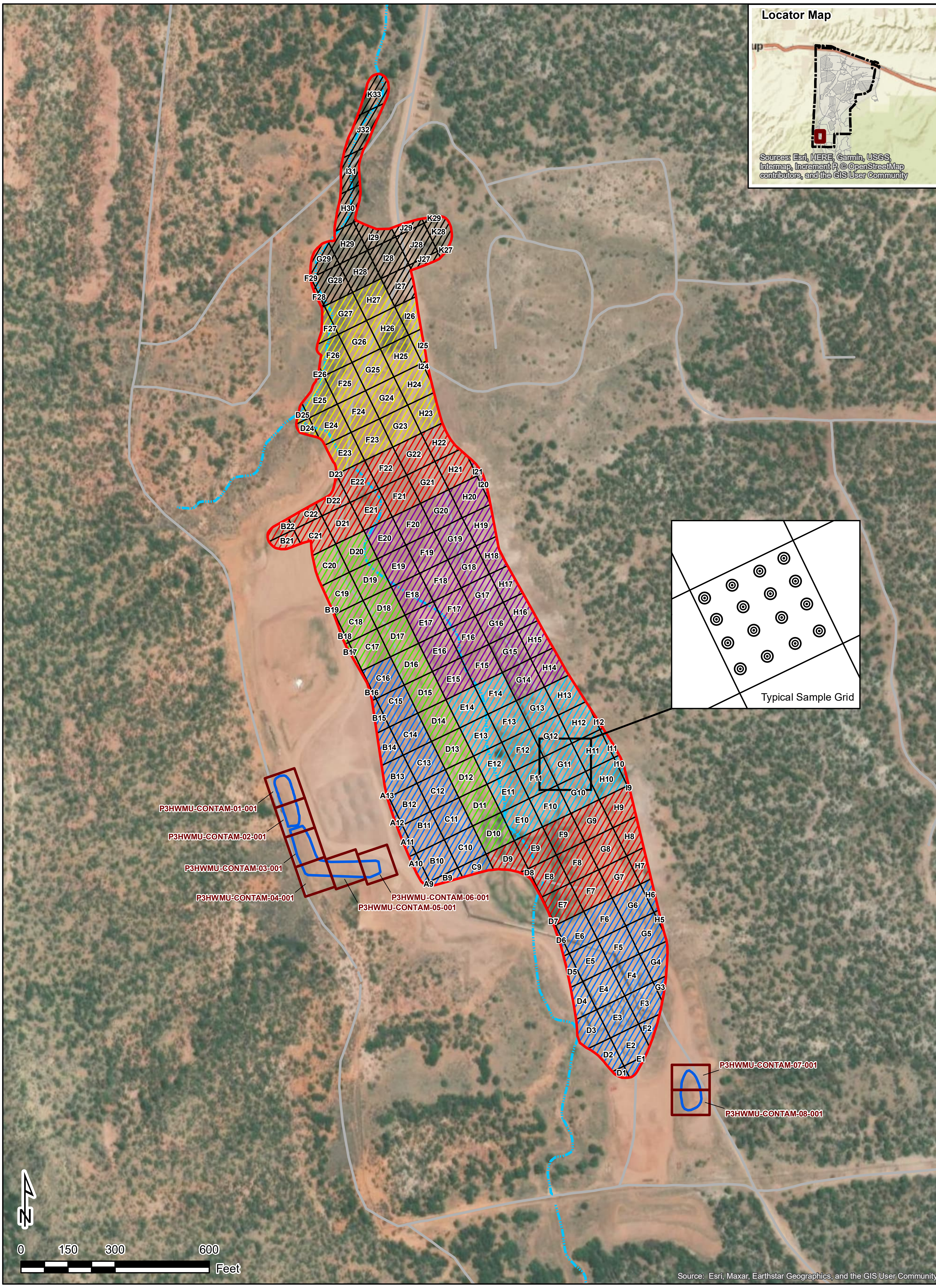
Except for antimony, background values are the 95% UTLs from the 2009 Background document. For antimony, the background value is the 95% UTL for soil unit 350ss based on the 2012 USACE background study (Section 3.1**).

***Although only exceedances are listed, the formula used accounted for all detected analytes in the sample.

**** The dioxin and furan result and screening values are presented in ng/kg. TEQ calculation and the TEFs are from the 2005 World Health Organization dioxin TEFs to calculate dioxin TEQ (AECOM 2021a)

*****The cumulative excess cancer risk for SKPL2976 was 1.3E-05. Primary contributors were 2,4-dinitrotoluene (9.4E-06) and 2.6-dinitrotoluene (2.4E-06).

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
GI - Gastrointestinal
mg/kg - milligrams per kilogram
ng/kg - nanograms per kilogram
NA - not applicable
NMED - New Mexico Environment Department
RA - Removal Action
RCRA - Resource Conservation and Recovery Act
RSL - Regional Screening Level
SSL - Soil Screening Level
TEF - toxicity equivalence factor
TEQ - toxicity equivalence (for dioxin and furan costituents)
USACE - United States Army Corps of Engineers
USEPA - United States Environmental Protection Agency
UTL - Upper Tolerance Limit
"-" - No available value



Legend

- Installation Boundary
- HWMU Boundary
- Arroyo
- Road
- Final Contaminated Stockpile Staging Area
- Final Contaminated Stockpile Sample Grid
- Sampled Grids (2012-2018) - 44 grids
- Sampled Grids (2019) - 18 grids
- Sampled Grids (2020) - 30 grids
- Sampled Grids (2021) - 28 grids
- Sampled Grids (2022) - 22 grids
- Sampled Grids (2023) - 24 grids
- Sampled Grids (2024) - 19 grids
- Composite Sub Sample Location

Note: Grids D7 and D23 were sampled in 2020.

RA Soil Sample Results Summary
Fort Wingate Depot Activity
McKinley County, New Mexico

Drawn By:	Date:	
JZ	11/11/2024	**Figure 3-1**
Checked By: MG	Project No. 60517380	

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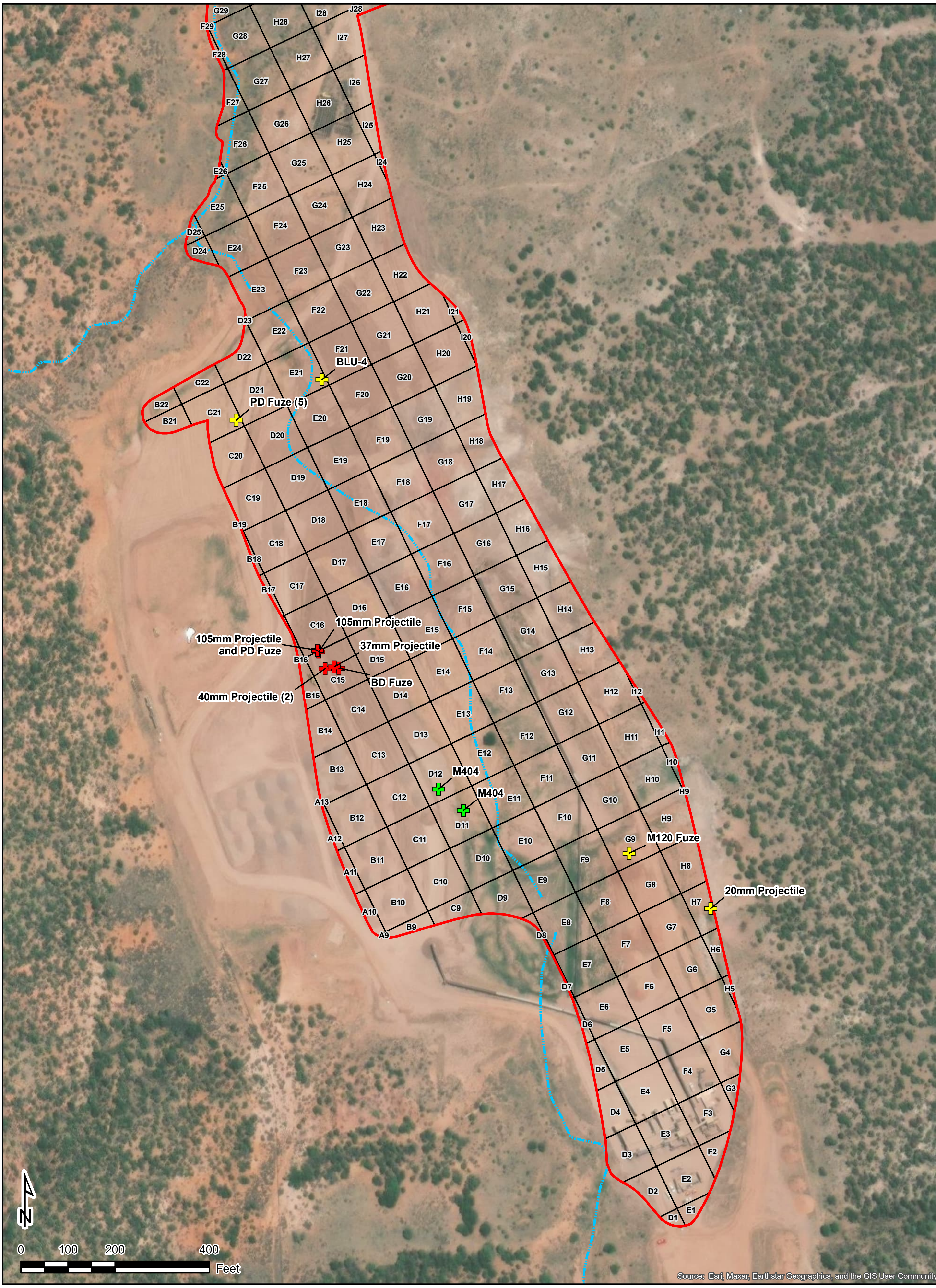


Legend

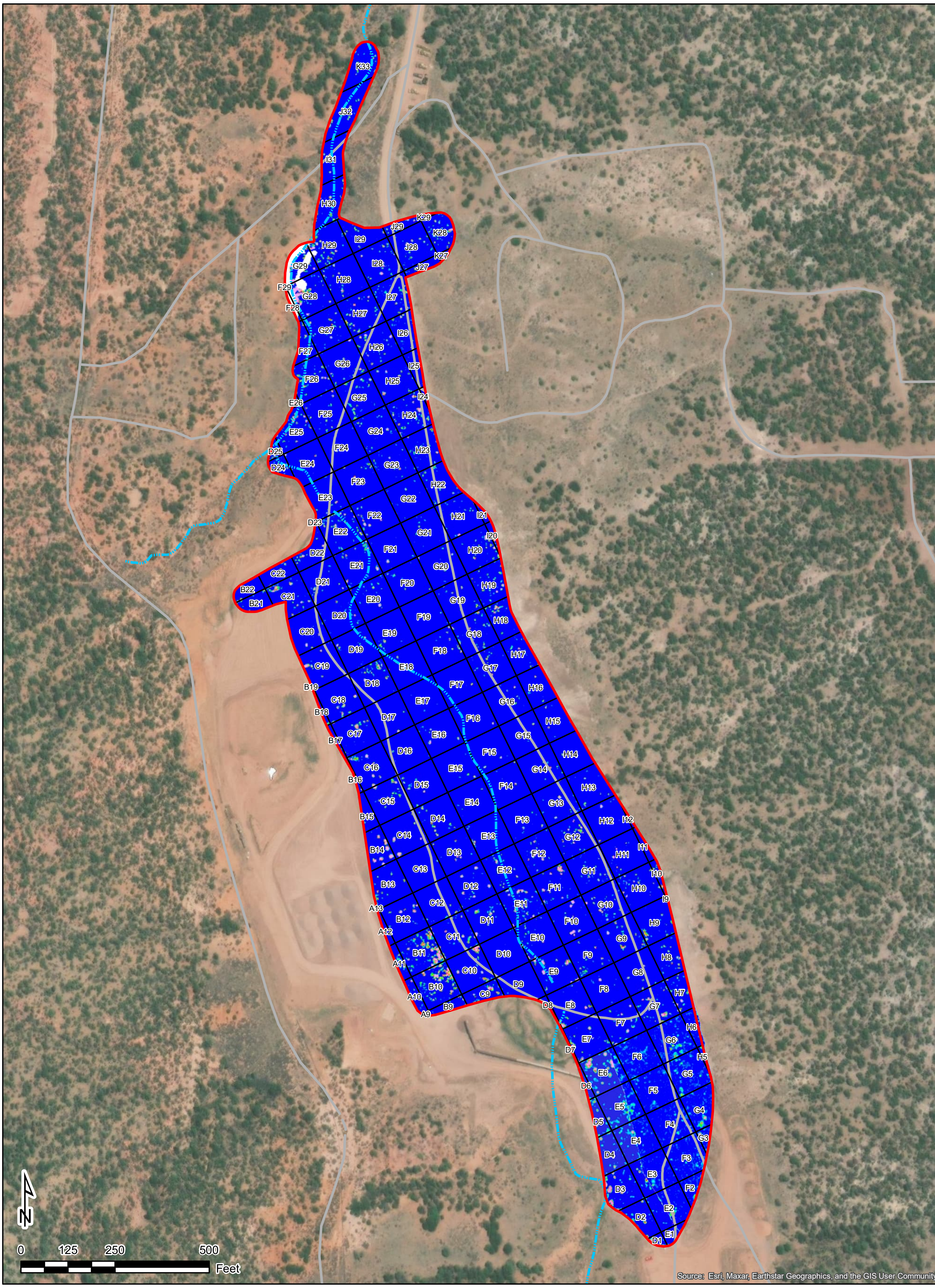
- Installation Boundary
- HWMU Boundary
- Survey Grid
- Arroyo

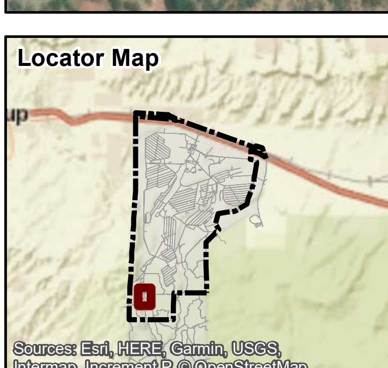
Post-Excavation DGM Recovered MEC

- 2018 (7 MEC Items)
- 2019 (2 MEC Items)
- 2020 (8 MEC Items)

Post-Excavation DGM Recovered MEC
Fort Wingate Depot Activity
McKinley County, New Mexico

Drawn By: JZ	Date: 11/11/2024	**Figure 3-2**
Checked By: MG	Project No. 60517380	





Legend

- Installation Boundary
- HWMU Boundary
- Arroyo
- Road

EM61-MK2A Ch2 (mV): 1 2 3 4 5 6 7 8 9 10 12 14 16 18

Final Post-Excavation DGM Survey Results

Fort Wingate Depot Activity
McKinley County, New Mexico

Drawn By:	Date:	
JZ	11/11/2024	**Figure 3-3**
Checked By:	Project No.	
MG	60517380	

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This section summarizes the QC activities completed during RA fieldwork conducted in accordance with the RA WP and SOPs to verify that the HWMU RA activities were conducted in accordance with USACE, DoD, and MMRP industry standards and guidance. The RA WP and its supporting SOPs comprehensively summarized the project QC program for project personnel including field activities, FCRs, and data/report submittals; equipment and personnel operating criteria; project audits, deficiencies, noncompliance, and associated corrective actions; and all associated documentation and recordkeeping procedures and requirements.

4.1 QUALITY CONTROL PERSONNEL

In general, QC is the function that provides independent review and assessment for the Project Manager, senior management, field personnel, and stakeholders. The UXOQCS worked with the AECOM Munitions Response Program Quality Director (MRP QD), Project Manager, and other project personnel to verify that the quality requirements documented in the RA WP were implemented and maintained during completion of the RA fieldwork at the HWMU. The UXOQCS implemented the three-phase control process, conducted surveillance activities, and performed final QC acceptance inspections of each DFW. In addition, the UXOQCS oversaw project activities that could benefit from process improvements and discussed potential quality issues with the SUXOS, Project Manager, and MRP QD. The RA QC program also included a Project Chemist who reviewed the quality of laboratory analytical data (**Section 4.4**) and a QC Geophysicist who was responsible for the quality of the RA post-excavation DGM data (**Section 4.5**).

4.2 DEFINABLE FEATURES OF WORK (DFWS)

The RA DFWs included the major categories of fieldwork summarized in **Section 1.1** and detailed throughout **Section 2**. The DFWs served as the framework for the QC approach for the RA. The UXOQCS and QC Geophysicist implemented the three phase control system, conducted random daily inspections, and performed final QC acceptance sampling inspections for the DFWs. The UXOQCS and QC Geophysicist verified compliance with project requirements through implementation of the three-phase control system as detailed in **Section 4.2.1**. The RA QC monitoring requirements for each DFW were detailed in Table 4-1 of the RA WP.

The DQCRs, included in **Appendix D**, were used to document the three-phase control process for the DFWs including, but not limited to, daily random inspections, final QC acceptance inspections, and other QC-related data. Final QC acceptance sampling inspections of each completed RA grid were reported to and coordinated with the USACE OESS (i.e., for subsequent final QA inspection as described in **Section 5**. The subsequent QA inspections were also documented by the UXOQCS in the DQCRs.

4.2.1 Three-Phase Control Process

The UXOQCS verified compliance with project requirements through implementation of the three-phase control process (Engineer Regulation 1180-1-6 Contracts-Construction Quality

Management [USACE 1995b] and Engineer Pamphlet 715-1-2 A Guide to Effective Contractor Quality Control [USACE 1990]). This process verified that project activities were completed in accordance with the RA WP and applicable MMRP guidance documents referenced therein.

As detailed in Section 4.7 of the RA WP, the elements of the three-phase control process included: 1) Preparatory phase, 2) Initial phase, and 3) Follow-up phase. Each control phase contributed to obtaining quality RA data; however, the preparatory and initial inspections were particularly valuable in preventing problems. Production work was not performed on a DFW until successful preparatory and initial phase inspections were completed and documented by QC personnel.

4.3 SURVEILLANCE AND INSPECTION

QC field teams conducted surveillance activities and final acceptance sampling inspections to verify compliance with the WP, SOPs, applicable guidance documents, regulations, and sound technical practices. The UXOQCS conducted surveillance activities on a daily basis as part of the follow-up inspection phase to verify, document, and report the ongoing RA status. Project procedures, methods, conditions, products, processes, services, and records were inspected to verify that project quality objectives were consistently achieved. QC surveillance activities and final acceptance sampling inspections were documented in DQCRs and have been incorporated into the project record as shown in **Appendix D**.

RA field inspections also specifically verified that the RA DFWs were being implemented during the RA in accordance with WP requirements. QC field inspections were completed using the same instruments that were being used by the project field teams. Observed MEC activities that did not meet acceptance criteria were controlled as nonconforming conditions and were documented accordingly as detailed in SOP No. 8 (Appendix I of the RA WP). Field data that did meet project acceptance criteria were not released to the client until corrected and verified through the QC inspection process. **Section 4.8** further details the NCR process implemented throughout completion of the RA fieldwork. Typical periodic QC surveillance and inspection activities completed during the RA fieldwork included, but were not limited to the following:

- Inspections of processed stockpiles to verify that no debris larger than 5/8 inch was present.
- Checks of the flashing furnace data output to verify batch operating time and temperatures were reached.
- Placing seeds at various locations in the processing plant to verify proper removal and mechanical function of the processing plant as discussed in **Section 4.6**.
- Placing seeds prior to collecting DGM to verify selection of the seed during DGM collection and processing and recovery of the seed during anomaly reacquisition as discussed in **Section 4.6**.
- Auditing the procedure used for processing MPPEH.
- Conducting random sampling inspections of MPPEH identified to verify the initial explosive safety status determination.

- Verification that stockpiles were properly staged and consolidated for reuse as backfill or disposal based on analytical and risk screening results.

4.4 ANALYTICAL DATA QUALITY

The overall data quality approach and data quality objectives (DQOs) for this RA were detailed in Section 3.1.3 of the RA WP. Specific procedures for equipment maintenance, calibration, analyses, and sampling were completed in accordance with field SOPs documented in Appendix I of the RA WP. Measurement performance criteria and corrective action activities used to verify the quality of RA sampling procedures and data collected were detailed in the RA WP. The data quality assessment of the laboratory analyses completed and results obtained from RA sampling activities are detailed in the subsections below.

4.4.1 Laboratory Analytical Data Quality Assessment

Soil analytical samples (i.e., stockpile and confirmation soil samples), MS/MSD, and duplicate QC samples were submitted to APPL for analyses of potential MC residues in site soils as a result of historical site activities or RA field activities. The laboratory was DoD accredited by the DoD Environmental Laboratory Accreditation Program for the analyses performed. Laboratory SOPs, written in accordance with the DoD Quality Systems Manual, were included in the RA WP to document the specific laboratory methods implemented for the RA including sample preparation, tracking, analysis, and QA/QC procedures.

The usability of stockpile soil (**Section 3.2**) and confirmation soil (**Section 3.3**) sampling data obtained from the HWMU during this RA was determined based on evaluation of the analytical data using precision, accuracy, representativeness, completeness, comparability, and sensitivity parameters. The data usability assessment of the analytical data obtained from RA soil sampling activities is summarized in the subsections below.

4.4.1.1 Precision and Accuracy

The agreement between duplicate/triplicate analyses within control limits indicates satisfactory precision in a measurement system. The recovery of a predetermined amount of a spike within control limits indicates satisfactory accuracy with respect to the method on the individual sample and general matrix. With the exceptions documented in the data validation reports (**Appendix I**), the indicators reviewed for precision, MS/MSD, relative percent differences (RPDs), laboratory duplicates, relative standard deviations (RSDs), and field duplicates were within evaluation criteria. No data were qualified as unusable on the basis of precision. Data qualified on the basis of precision are documented in the corresponding data validation reports (**Appendix I)**.

With the exceptions documented in the data validation reports (**Appendix I**), the indicators reviewed for accuracy (laboratory control sample performance evaluation, MS/MSD, and surrogate spike recoveries) were also within evaluation criteria. Data were qualified as unusable (R) based on laboratory control sample (LCS)/laboratory control sample duplicate (LCSD), MS/MSD, and/or surrogate accuracy. When these evaluation criteria were not met and/or recoveries were below rejection limits, the corresponding data were qualified as R. Data qualified on the basis of accuracy are documented in the corresponding data validation reports (**Appendix I**).

The overall accuracy and precision of the soil data reported for the RA soil sampling at the HWMU during the RA was concluded to be satisfactory for the analyses completed.

4.4.1.2 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent the characteristics of a population. Representativeness is a qualitative parameter addressed by the design of the sampling program (i.e., to verify that the sampling locations selected provide representative data for decision making). The RA assessment of representativeness evaluated whether detections of target analytes in soil samples were significantly greater than corresponding blank contamination levels. Analyte detections that were qualified as not detected (U) due to blank contamination were not considered representative of site contamination. Data qualified due to blank contamination are documented in the corresponding data validation reports (**Appendix I**).

Duplicate samples were collected to assess the effects of sample collection methods and procedures on the analytical results obtained from the laboratory. With the exceptions documented in the data validation reports (**Appendix I**), the overall representativeness of the RA analytical data were determined to be satisfactory.

4.4.1.3 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Data are considered comparable when collection techniques, measurement methods, and reporting procedures are equivalent for the samples within a sample set. SOPs for RA soil sample collection, shipping, and laboratory analyses were implemented as specified in the RA WP, so the comparability of the HWMU RA soil analytical data were identified as comparable to one another.

4.4.1.4 Completeness

Completeness is defined as the number of analytical data points that are judged to be usable (i.e., not rejected) divided by the total number of planned data points for each analyte. This includes J/UJ (i.e., estimated/estimated nondetect) values in accordance with the RA WP. Completeness was 99% for all of the RA soil analytical data, satisfying the 95% completeness goal.

4.4.1.5 Sensitivity

Sensitivity is defined as the capability of a method or instrument to discriminate between measurement responses representing distinct levels of a variable of interest. Sensitivity requirements for the RA analytical data included the establishment of instrument DLs and LOQs. Analytical results greater than the DL, but less than the LOQ were qualified J by the laboratory. Sensitivity was achieved by the laboratory for all analytical parameters and matrices.

4.4.2 Data Verification Guidelines

The AECOM Project Chemist reviewed the data verification performed by the laboratory for completeness, compliance, and accuracy using manual validation. Data verification included review and verification of the following:

- Sample documentation (i.e., chains of custody [COCs])
- Preservation summaries and holding times
- Presence of analyses and analytes requested
- Use of specified sample preparation and analysis procedures
- LODs and LOQs
- Correctness of concentration units

4.4.3 Data Validation Guidelines

The subsequent data validation process built on the initial data verification procedures completed on the RA analytical soil data. Approximately 10% of the data underwent a data recalculation by the Project Chemist. This Stage 2B validation was completed in accordance with the RA WP. The AECOM Project Chemist reviewed and approved the validated analytical data before it was sent for secondary review. Data validation guidelines were developed in accordance with the method requirements, professional judgment, and DoD Quality Systems Manual (Version 5) requirements. The following information was reviewed as part of data validation:

- COC documentation
- Sample receipt, preservation, and integrity logs
- Holding times
- QC sample frequencies
- Initial Calibration
- Calibration Verifications
- Method blanks
- Laboratory control sample/laboratory control sample duplicate recoveries
- Surrogate recoveries
- MS/MSDs recoveries
- Field and laboratory duplicate precision
- Raw data and chromatograms
- Second column confirmation results
- Manual Integrations
- Multiple run samples (e.g., due to QC problems or matrix interference)

- Laboratory resolutions of any identified problems (as warranted)

For samples collected between August 2021 and June 2023 (samples P3HWMU-SKPL-2297 through P3HWMU-SKPL-2833), the data underwent a manual Stage 2A validation (not a Stage 2B validation) as required by the WP, and risk assessments performed during this timeframe were prepared from Stage 2A validated data. The differences between these stages of validation are not considered to impact reported concentrations, so any impacts on the accuracy and precision of the data were minimal. The additional review performed during a Stage 2B validation requires a more thorough review of the instrument QC (not reviewed during a Stage 2A validation), as such, Stage 2B validation qualifiers were not captured in the screening tables. When this validation discrepancy was identified, the data were re-validated in accordance with the Stage 2B validation criteria. This led to qualifier discrepancies that did not impact reported concentrations, the overall quality or completeness of the data, or the risk assessments performed.

All RA analytical data obtained were properly recorded in a Stage 4 Data Package. The data package included a full deliverable capable of allowing the recipient to reconstruct QC information and compare it to QC criteria. Data validation reports included the QC parameters evaluated, extents of any QC outliers, the samples and/or analytes affected by the QC outliers, and the qualifier(s) applied based on each QC outlier. When professional judgment was used to determine how samples were qualified, the data validation report presented sufficient information to support the professional judgment. An overall assessment of the data was included in the data validation reports. Data qualifiers and the reasons for them were documented in the data validation deliverables included in **Appendix I**.

4.5 GEOPHYSICAL QUALITY CONTROL

As discussed in **Section 2.2.8.2**, DGM equipment, operations, and data were verified by the QC Geophysicist including equipment maintenance, daily IVS checks, instrument standardizations checks, battery strength checks, positioning accuracy tests, warm-up tests, null instrument checks, personnel checks, cable shake tests, static tests, standard instrument response tests, static system relaxation tests, latency tests, and repeatability tests. Data download checks were also performed by the geophysical team/Processing Geophysicist and reviewed by the QC Geophysicist along with the field record checks. Following intrusive investigation/resolution of post-excavation target DGM anomalies above the project-specific threshold (as detailed in **Sections 2.2.8.5** and **3.4.1.2**), the UXOQCS conducted final QC acceptance sampling inspections in accordance with Table 4-1 of the RA WP and EM 200-1-15 (USACE 2015) once anomaly locations had been turned over by the intrusive operations teams.

The QC Geophysicist was responsible for overseeing and documenting the QC completed for the RA DGM activities and implementation of the BSP (**Section 4.6.2**) during these operations. The QC of the post-excavation DGM grid verification surveys, using the methods and procedures summarized in **Section 2.2.8** and subsequent intrusive investigation of identified target anomalies summarized in **Section 3.4.1.2**, included checks and reviews of the data deliverables using the measurement quality objectives (MQOs) detailed in Table 4-1 of the Final RA WP.

4.5.1 Instrument Verification Strip (IVS)

Daily QC checks completed at an IVS were used to verify that the geophysical detection systems were operating as designed (i.e., with consistent anomaly detection and location) and to capture levels of background noise associated with site conditions. As discussed in **Section 3.4.1.2**, two separate IVSs (i.e., URS 2014 and AECOM 2018) were established at the HWMU prior to the commencement of RA DGM operations within the HWMU for the two separate HWMU RA contracts and mobilizations. The IVSs were utilized for initial demonstrations and twice daily checks throughout completion of the RA post-excavation DGM fieldwork.

Each IVS consisted of two parallel tracks previously cleared of metallic anomaly sources. The first track was used to verify detection and location of IVS seeds and contained three ISOs buried beneath the track at known locations. The other track was used to measure background response and contained no seeds. Initial demonstrations were completed in accordance with the six-line test procedures, with each track mapped in both directions at slow, normal, and fast paces, along with offset tests where the seeded tracks were mapped at 1 foot and 2 foot offsets on each side of the center line of the track. During ongoing DGM production, survey crews were required to survey each track at the beginning and end of each day, in each direction, and at the normal pace of data acquisition. Continuous noise monitoring was also conducted throughout the collection of production data. Summaries of the daily checks performed and documented at the IVSs included:

- Equipment/Electronics warm-ups for 15-20 minutes (morning only)
- Geodetic functionality test (RTK GPS measurement at a known location)
- Null instruments (before all data files)
- Static background checks with and without standard test objects
- Personnel and cable shake (i.e., vibration) checks (morning only)
- IVS checks including seeded and background tracks

4.6 QC SEEDING PROGRAM

A BSP was implemented as an additional QC control measure during sift plant and inspection operations as summarized in **Section 4.6.1** and to verify that geophysicists, geophysical equipment, and UXO intrusive teams were operating in compliance with plans and procedures during post-excavation DGM and associated intrusive operations as summarized in **Section 4.6.2**.

4.6.1 QC Seeding (Soil Processing)

QC seed items were implemented as a QC measure to show that the sift plant and inspection line operations and personnel were functioning in accordance with the RA WP and performance metrics. At a minimum, the UXOQCS placed one seed each day, at various sift plant process locations, to verify sift plant performance and the associated MPPEH Inspection process. If a seed item was not recovered, the UXOQCS reported the deficiency to the Project Manager, SUXOS, and MRP QD, and a QC determination was made regarding why it was not recovered.

4.6.2 QC Seeding (Post-Excavation DGM Grids)

As discussed in **Section 2.2.8**, DGM blind seeds were placed in excavated grid bottoms to provide ongoing confirmation that targets of interest were detected by geophysical sensors and operators, targeted by the data processors, and recovered during the post-excavation DGM intrusive investigation process. The post-excavation DGM BSP was developed and implemented by the QC Geophysicist and UXOQCS. ISOs were used as blind seeds and were placed at surveyed locations that were blind to the data collection, processing, and post-excavation DGM anomaly dig teams. In accordance with the RA WP, blind seeds (i.e., ISOs) were placed at a rate of at least one seed per team per day. ISOs included small, medium, and large options to represent the different MEC types anticipated at the site (i.e., so they would have similar DGM responses to the anticipated MEC at the site).

The ISOs were emplaced in a way that they were within the detectable range of the DGM sensors, so that any failures to detect seeds would serve as a meaningful indication of a quality failure. The planned locations for seeds were flexible so that they could be placed safely (i.e., following MEC and anomaly avoidance procedures). The ISO burial depths ranged from three to seven times their respective diameters. Seed locations were recorded to an average horizontal accuracy of ±2 cm, to the centers of mass of the ISOs. To verify achievement of the post-excavation DGM anomaly resolution criteria, each QC seed placed was verified to be on the target anomaly dig list and intrusively investigated with other anomalies detected above the project threshold as discussed in **Section 3.4.1.2**. The QC Geophysicist verified that each seed item was recovered and documented appropriately along with the other intrusive investigation results.

4.7 EQUIPMENT MAINTENANCE, TESTS, AND CHECKS

Tools, instruments, and equipment used during the RA fieldwork were maintained in accordance with instrument manufacturer specifications, standard industry practice, and SOPs included in the RA WP. This applied to any equipment used in the field for activities that could affect project quality, including communications equipment, hand-held detectors, GPS units, vehicles/machinery, and PPE. All equipment was maintained and kept in proper working condition. Equipment was visually inspected for damage prior to each use. Preventive maintenance was performed on a regular basis according to manufacturers' operating instructions and recommendations. Critical spare parts were kept on hand to minimize downtime. Any required maintenance activities were recorded in field logbooks.

Pre- and post-operational checks were performed daily to verify that equipment items were capable of functioning in accordance with manufacturer specifications. Following these checks, any equipment that was found unsuitable was immediately tagged as unusable and removed from service. The UXOQCS verified completion of these daily equipment inspections in the DQCRs included in **Appendix D**.

4.7.1 Handling and Storage of Materials and Equipment

The UXOQCS verified compliance with specified requirements for handling of RA materials and equipment. Project field personnel verified that the following requirements were met during handling:

- The selection of equipment utilized for the RA was reviewed to ensure adequacy with respect to capacity, method of use, and conformance with Final RA WP requirements.
- Equipment was inspected and tested at routine intervals to ensure its fitness for service.
- Operators using the equipment were qualified to operate the equipment.
- All project personnel ensured that equipment and materials were stored properly.
- Materials and items were protected in storage to the extent necessary to preserve their usefulness, including the maintenance of protective environments and conditions established by or recommended by the manufacturer or supplier.
- ID markings, tags, and labels were maintained throughout the duration of project field activities.

When shipping materials or equipment, the shipper inspected and verified the contents and serviceability of the items shipped, appropriately packaged the items, and sent packages to the appropriate destinations in accordance with contractual requirements. The MDAS and soil sample shippers verified that COCs and custody/tamper seals were implemented in accordance with the RA WP. MDAS disposal and recycling documentation for the RA is documented in **Appendix F**.

4.8 NONCONFORMANCE/CORRECTIVE ACTION

Nonconformances were addressed with corrective actions in accordance with SOP 8 (i.e., Material or Activity Nonconformance) presented in Appendix I of the RA WP. As part of their normal work duties, project personnel had the responsibility to promptly identify and report conditions observed that were adverse to quality. Circumstances that prevented a work process to deliver products that were compliant with WP requirements were promptly identified, documented as nonconforming conditions, investigated, corrected, and reported in NCRs.

The UXOQCS maintained an NCR log to track and control each nonconforming condition. At a minimum, the logs initially included the date that each nonconforming condition was discovered, an NCR tracking number, a description of the condition, a location where the nonconforming condition was observed, department/manager responsible for the corrective action, and a recommended corrective action. Once the corrective action was identified and implemented successfully, a closure status and date were added to each NCR. The NCR log was maintained in the project file and available on-site for reference. Copies of the NCRs completed during the HWMU RA are included in **Appendix K**. A summary of the HWMU RA NCRs is as follows:

- **2013:** One NCR was completed in 2013 as follows:

- **NCR 2013-001 (initiated September 11, 2013):** MEC disposal operations were conducted without constructing a "demolition pit" in accordance with the FWDA RCRA permit. The corrective action was to complete all future MEC disposal shots within a pit at least 4 feet deep. The pit would then be backfilled following completion of each demolition. The NCR was closed via signatures on September 12, 2013.

- **2014:** Three NCRs were completed in 2014 as follows:
  - **NCR 2014-001 (initiated June 10, 2014):** Soil stockpiles with analytical results above residential SSLs were improperly segregated into the stockpile area used to stage stockpiles with results below residential SSLs. The contaminated soils were subsequently removed from the clean staging area, the area where the contaminated soils were improperly staged was over-excavated, and the impacted area was sampled to verify that all contaminated soils were effectively removed. Additional training was also conducted for all personnel involved with soils handling, and a new Soil Stockpile Tracking Sheet was implemented for future soil stockpiling activities. The NCR was closed via signatures on June 18, 2014.
  - **NCR 2014-002 (initiated July 29, 2014):** A load of processed soils was relocated to the below residential SSLs clean stockpile staging area prior to receipt of clean analytical results from the laboratory. The analytical results subsequently revealed that the stockpiles were not contaminated above residential SSLs, so they were acceptable to remain in the below residential SSLs stockpile area. However, all personnel received additional training regarding proper handling of stockpiled soils. The NCR was closed via signatures on August 5, 2014.
  - **NCR 2014-003 (initiated August 28, 2014):** Geophysical QC data were collected without RTK positional corrections. The IVS seed response peaks were recorded, but the targeted seed positions could not be recovered. However, the IVS seed responses were within expected tolerances and compared favorably to the post-production IVS data. Therefore, it was recommended that the data be accepted without reservation. Personnel were reminded to observe visual cues on the GPS hardware and the quality indicator on the acquisition software graphical interface. The NCR was closed via signature on September 5, 2014.

- **2018:** Four NCRs were completed in 2018 as follows:
  - **NCR 2018-001 (initiated January 8, 2018):** DGM QC seed (buried north-south horizontal at 4 inches bgs) was not recovered during post-excavation DGM intrusive anomaly removal operations in Grid A10. A corrective action was implemented to reinforce and review intrusive procedures with the field teams and to verify that only personnel with EM61 field training would operate the instrument during all future reacquisition and resolution operations. The corrective action also included reverification of all 14 target anomalies within Grid A10 plus ten additional anomalies in adjacent grids. The UXOQCS conducted real-time verification of final mV response readings for these reverified anomaly locations with no discrepancies noted. The NCR was closed via signatures on January 19, 2018.

- **NCR 2018-002 (initiated January 27, 2018):** Post-excavation DGM data collected on January 27, 2018, in Grid C10 overlapped with data that were previously mapped and intrusively investigated in adjacent grids. Despite intrusive results that listed these targets as resolved, it was clear that some responses were still above the project threshold. A corrective action was implemented to reverify and re-dig multiple targets in adjacent Grids B9 and B10. Target locations were relocated and flagged with RTK GPS, reacquired with the EM61, and intrusively investigated until the final mV readings at each location were verified as below the project threshold. The UXOQCS conducted real-time reverification of final mV response readings for the reverified anomaly locations with no discrepancies noted. The NCR was closed via signatures on February 6, 2018.
- **NCR 2018-003 (initiated February 9, 2018):** Post-excavation DGM data collected on February 9, 2018, in Grids A10, C11, and K11 did not meet the criteria of 95% coverage. Challenging terrain (e.g., excavation pits, soil stockpiled in adjacent grids) were observed as being associated with the DGM coverage deficiencies. As a corrective action, the data collection teams collected additional DGM data by encircling the challenging terrain features with the EM61 and recording the positional data with RTK GPS to effectively log the terrain obstacles. Photographs were also taken of each impacted grid and were transmitted along with the raw data to ensure there were no resulting DGM data gaps along the impacted boundaries of Grid K11. Grid K11 infill data were subsequently collected and submitted with a subsequent DGM submittal package. The NCR was closed via signatures on March 9, 2018.
- **NCR 2018-004 (initiated May 12, 2018):** Post-excavation DGM data collected on May 12, 2018, in Grids L8, L9, and K9 did not meet the criteria of 95% coverage. As a corrective action, additional training was conducted to reinforce DGM data collection speed. The maximum collection speed documented in the December 2017 IVS Report was 3.3 miles per hour (mph), so the collection team practiced walking with the EM61 at a rate less than 3.1 mph until the team members effectively demonstrated this ability. In addition, spot checking noise between line segments indicated that incremental exceedances of the 3.3 mph velocity metric did not adversely affect the data quality within the aforementioned grids. Although excessive velocities could produce noise that could cause an increased false positive rate, there was no indication that the velocity exceedances addressed by this NCR were significant enough to have created such a condition. Other dynamic performance metrics including coverage, down-line sample spacing, and blind seed detection all passed project-specific MQOs. The NCR was closed via signatures on May 22, 2018.

- **2019:** One NCR was completed in 2019 as follows:
  - **NCR 2019-001 (initiated July 9, 2019):** During July 8, 2019, soil screening operations, a 4-lb M83 fragmentation bomb was identified and documented as unacceptable to move by the ILB SUXOS and UXOSO. On the subsequent morning of July 9, 2019, the M83 item was in its designated location (i.e., BIP pan) outside the ILB and was instead moved into a TFU basket at the TFU. This NCR (Severity Level 2) was identified as a systemic failure that could have undermined the ability to ensure and demonstrate confidence in RA quality and/or safety. The corrective action implemented involved an immediate Safety

Stand Down throughout the Site. All personnel were briefed on individual roles and responsibilities and applicable portions of the RA WP. A written set of corrective action procedures (i.e., "MDAS Container Trailer Driver" and "Unacceptable to Move MEC Procedures for the ILB") was developed for and attached to this NCR (see **Appendix K**). These procedures were briefed to the project team and posted in the ILB, control station, TFU, and MDAS trailer. The primary procedural improvements included the following:

1. Requiring Control Station personnel to verify the successful transfer of the BIP via camera when directed by the ILB. The Control Station camera had a better viewing angle of the BIP pan.

2. Requiring verification and accountability of all BIPs by ILB personnel prior to movement or transfer of the MDAS trailer from the ILB to the TFU.

3. Requiring a visual inspection of the MDAS trailer contents prior to transfer from the ILB to the TFU. Any orange-painted metal would be verified as not MEC.

To verify that all personnel understood the enhanced BIP reporting procedures, a new "BIP Seed" QC procedure was implemented for future soil screening operations. This new seeding program became an ongoing RA soil screening tool to ensure that all personnel remained thoroughly familiar with MEC reporting procedures during soil screening operations as detailed in **Appendix K**. This NCR was closed via signatures on July 10, 2019, but the new procedures detailed therein were maintained for the duration of the HWMU RA.

- **2020:** One NCR was completed in 2020 as follows:
  - **NCR 2020-001 (initiated October 16, 2020):** The USACE OESS reported a damaged TFU basket to the UXOQCS on October 16, 2020. Following investigation, it was determined that, on the morning of October 8, 2020, an energetic release occurred in the TFU unit during MDAS flashing operations, resulting in damage to the basket, but the event was not properly reported by the SUXOS to other management personnel. This NCR was identified as Severity Level 1 and a careful root cause analysis was completed as detailed in this NCR (see **Appendix K**). This analysis determined that the TFU event that caused the basket damage was the likely result of an unintentional energetic release, rather than an unintentional detonation, based on the limited damage to the basket. The TFU, therefore, functioned as designed and it was common to hear occasional audible reports from the TFU during thermal treatment activities.

    The nonconformance from this event was ultimately determined to be a failure to properly report property damage to Project Management and USACE, and a reduction in the number of UXO technicians within the ILB (i.e., implemented as a result of COVID-19 requirements) was observed as a potentially contributing factor to the energetic release event. Multiple corrective actions were implemented under this NCR to correct/enhance 1) the HWMU Inspection/Management System and 2) the TFU Management System. As detailed in **Appendix K**, a Safety Stand Down was completed and documented as part of this NCR, and the employee who neglected to report the damage was removed from the Site.

No NCRs were warranted or completed for the HWMU RA fieldwork completed from 2021 through 2024.

4.9 FIELD CHANGE REQUESTS

Throughout completion of the multiyear RA, changes to the processes and procedures documented in the RA WP were occasionally issued through the FCR process. Each FCR required USACE approval prior to implementation. An FCR Form was completed to document the changes to each approved RA process and procedure. Field team members assigned to perform or supervise the tasks that required changes in process/procedure were responsible for initiating, completing, and submitting the FCR forms for review and approval. The FCR forms produced during the RA included multiple reviews and approvals from the AECOM Project Manager; MRP QD and/or Munitions Response Safety Program Manager (MR SPM); Senior UXO staff (i.e., SUXOS, UXOSO, and UXOQCS); and QC Geophysicist (if DGM-specific); as well as from the USACE COR prior to process alteration and incorporation as a revised WP element.

FCRs completed for the RA were numbered sequentially on an annual basis for each year that FCRs were warranted. The completed and signed FCRs were maintained in the project file and were available on-site for the duration of HWMU RA fieldwork. Copies of the FCRs completed for the HWMU RA are included in **Appendix K**. A brief summary of these FCRs is as follows:

- **2013:** Eight FCRs were completed in 2013 as follows:
  - **FCR 2013-001:** This FCR required a minor change to the Accident Prevention Plan/Site Safety and Health Plan used for the HWMU RA fieldwork. The change noted that, in accordance with EM 385-1-1, fire extinguishers maintained in Site vehicles were 5 lbs rather than 20 lbs.
  - **FCR 2013-002:** This FCR changed the HWMU RA grid size from 200-foot by 200-foot to 100-foot by 100-foot grids as discussed in **Section 2.2.8**.
  - **FCR 2013-003:** This FCR modified the procedure for verifying flashing unit temperatures with thermocouples instead of test coupons using the process, procedure, and target temperature requirements detailed in **Section 2.2.7**.
  - **FCR 2013-004:** This FCR required a minor change to the Accident Prevention Plan/Site Safety and Health Plan used for the HWMU RA fieldwork noting a change to the contractor's Regional Health and Safety Officer (i.e., from Dennis Day to Tony Indorato).
  - **FCR 2013-005:** This minor FCR addressed that the MSDs documented in the DDESB approved ESS were compliant for circumstances where unarmored mobile operator stations were constructed in the bed of a heavy duty pickup truck.
  - **FCR 2013-006:** This FCR clarified minor revisions to the excavation procedures noted in the RA WP. The FCR noted that excavation procedures should proceed in a manner that

would prevent re-contamination previously excavated areas (i.e., rather than generically excavating from south to north as had previously been stated in the RA WP).

- **FCR 2013-007:** This FCR revised the WP for safety purposes to clarify that the eddy current separator operator should remain outside the K18 and K24 overpressure distance (with proper hearing protection) when unacceptable to move MEC items were transferred away from the sift plant equipment (by RC operators) for subsequent BIP MEC disposal operations.
- **FCR 2013-008:** This FCR clarified that the MPPEH inspection process (i.e., not just a post-burn residue inspection) was needed for all of the non-ferrous materials collected at the eddy current separator and that any discovered MEC items required transport to an ECM or the CAMU for subsequent disposal.

- **2014:** Eight FCRs were initiated in 2014 (but only seven were completed) as follows:
  - **FCR 2014-001:** This FCR modified the WP language to ensure safety during the collection of stockpile soil samples as discussed in **Section 2.2.9**. The new language clarified that composite samples would be collected from subsample locations within each 250-cubic yard stockpile at various heights and depths throughout each stockpile (i.e., to obtain results representative of each stockpile). The method involved collection of subsamples from materials deposited directly from conveyors, but this was ultimately deemed an unsafe procedure.
  - **FCR 2014-002:** This FCR facilitated minor changes to the screening plant described in the RA WP. An additional screen was added to the deck screen and a soil shredder was added to the eddy current in order to remove rocks from the screening process and to break up clay-rich soil clogs during soil processing activities as discussed in **Section 2.2.4**.
  - **FCR 2014-003:** This FCR was implemented to improve efficiency and verify the quality of the TFU by adding thermostatic modulation (i.e., to verify that the target temperature of each basket was reached for the 10-minute timeframe) as detailed in **Section 2.2.7**.
  - **FCR 2014-004:** This FCR added a Night Operations Lighting Plan and other provisions to the Accident Prevention Plan in order to increase processing plant production.
  - **FCR 2014-005:** This minor FCR provided WP clarification that only hazardous soil stockpiles required placement on a liner covering with plastic or placement in a lined roll-off until disposal (i.e., these additional containment procedures were not required for characterized non-hazardous stockpiles).
  - **FCR 2014-006:** This initiated FCR regarding stockpile soil sampling procedures was not signed or implemented. It is, therefore, not included in **Appendix K**.
  - **FCR 2014-007:** Because the material resulting from the polishing magnet was generally very small, dense, and not conducive to flashing, this FCR removed a previous requirement that all materials removed from the polishing magnet be flashed. **Section 2.2.4** provides additional details regarding this process.
  - **FCR 2014-008:** This minor FCR revised the Night Operations Lighting Plan (see FCR 2014-004 above) to convert previously recommended mobile lighting to permanently

mounted lighting but maintained the use of additional portable lighting on an as necessary basis.

- **2017:** Six FCRs were completed in 2017 as follows:
  - **FCR 2017-001:** This FCR initiated soil processing plant layout and equipment modifications to optimize the RA field operations discussed in **Section 2.2.4**.
  - **FCR 2017-002:** This FCR clarified a minor change noting that pre-excavation DGM "may" be completed in areas adjacent to the HWMU boundary to aid in determining areas that are "HWMU-like," instead of saying "will" be completed. This change was implemented in consultation with the USACE OESS, because DGM was not considered a useful tool for this based on site conditions actually observed in the field (as detailed in **Appendix K**). It is important to note that this DGM effort noted in the WP was not intended as a final record for closure of Parcel 3 or to revise the HWMU boundary identified by the Permit.
  - **FCR 2017-003:** This FCR initiated a minor change to the RA equipment associated with the excavation methods described in **Section 2.2.3**. Under this FCR, three pan/tilt/zoom cameras were located in optimal locations on equipment (i.e., replaced Trimble GPS units for positional monitoring) so that operators could better observe the physical positioning of the RC excavators and loaders working in the HWMU.
  - **FCR 2017-004:** This FCR implemented minor changes to the WP that allowed for additional flexibility in staffing the ILB in order to more effectively conduct the MPPEH inspection process discussed in **Section 2.2.5**.
  - **FCR 2017-005:** This FCR required the installation of additional adequate lighting within the debris and soil processing plant (**Section 2.2.4**) to facilitate potential nighttime operations if required.
  - **FCR 2017-006:** This FCR implemented minor revisions to the MPPEH inspection process (**Section 2.2.5**) language of the WP to clarify that (in accordance with EM 385-1-97), "Prior to public release, the Site Manager or SUXOS will certify that the debris is free of explosive hazards and the USACE OESS or UXOQCS will verify the MPPEH inspection process."

- **2019:** Two FCRs were completed in 2019 as follows:
  - **FCR 2019-001:** This FCR implemented minor exceptions to the MDAS flashing process (**Section 2.2.7**) by adding an exception to the original approach that, "…all MDAS that is generated during the separation process will be flashed…" Special procedures were added to treat JATO/RATO bottles with open burn procedures at the CAMU. The large size of these items made open burning a more safe, effective, and efficient treatment process.
  - **FCR 2019-002:** This FCR implemented minor changes to the MEC disposal operations (**Section 2.2.6**) included in the RA WP. These changes were made in accordance with USACE directives to confirm that MEC disposal operations were being conducted in compliance with the latest applicable guidance and industry standards.

- **2020:** One FCR was completed in 2020 as follows:
  - **FCR 2020-001:** This FCR provided additional clarification regarding the previous FCR 2017-004 (see above) for additional flexibility for staffing the ILB during the MPPEH inspection process (**Section 2.2.5**). The staffing flexibility continued to maintain accordance with USACE EM 385-1-97 requirements.

- **2024:** One FCR was completed in 2024 as follows:
  - **FCR 2024-001:** This minor FCR was initiated at the beginning of the 2024 field season (i.e., the first week after the holiday break) when the UXO Site Management Team determined that approximately 30% of the previously designated acceptable to move MPPEH items stored in B Block were MDAS. The recategorization ultimately reduced UXO Technician exposures to unnecessary burning and explosive operations. As discussed in **Section 2.2.5**, based on this FCR, the WP text was clarified with additional text to indicate that following the initial ILB MPPEH inspection process, an additional MPPEH inspection may be completed to potentially reduce the quantity of MPPEH items requiring destruction at the CAMU.

4.10 STOP WORK AUTHORITY

If any conditions were identified during completion of the RA fieldwork that were adverse to quality, all employees had the authority to stop work until those conditions were resolved. Stop work requests could be issued for a specific process or task so that as much fieldwork as possible could continue. If a stop work condition was initiated, the UXOQCS immediately notified the SUXOS, Project Manager, MR SPM, MRP QD, and USACE OESS (as appropriate) of the stop work situation and began the corrective action process. When stop work conditions were warranted to address project quality and/or safety concerns NCRs and/or FCRs were initiated as warranted. **Sections 4.8** and **4.9** detail how the project NCRs and FCRs were used to correct affected work that was not allowed to resume until the adverse conditions had been resolved and approved by the Project Management team.

4.11 PROCESS IMPROVEMENT PROGRAM

The UXOQCS briefed the process improvement program to RA field personnel during their initial training and during the preparatory phase of the three-phase control process. Briefings emphasized the importance of employee participation in improving processes. It was the responsibility of the QC program and management personnel to emphasize that "quality must be caused, not controlled." During completion of the RA fieldwork, this process improvement program yielded the FCRs that are summarized in **Section 4.9**. In addition to the FCR process, several unique circumstances, caused by difficult site/environmental conditions and operational constraints, arose during completion of the HWMU RA fieldwork. These situations required project personnel to adapt, develop, and implement innovative strategies and procedures for the safe and effective execution of the RA fieldwork throughout the HWMU.

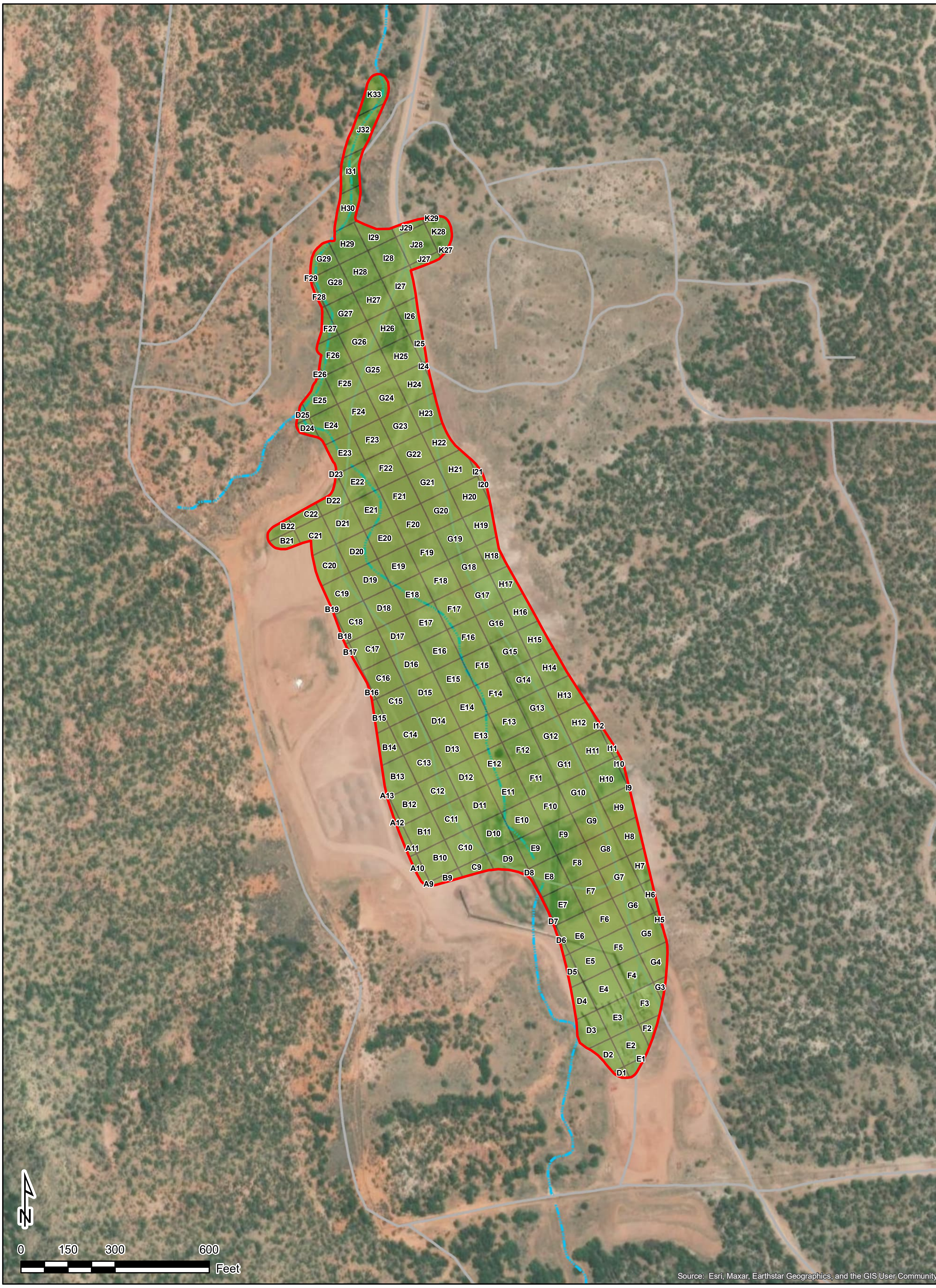
This section summarizes the USACE QA activities completed for the RA fieldwork completed at the FWDA HWMU from 2012 through 2024.

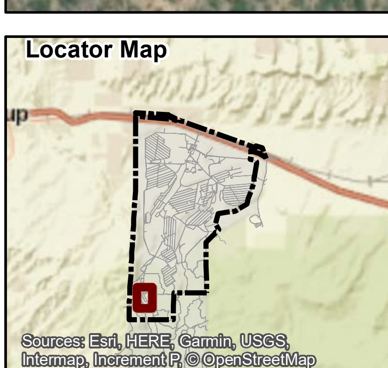
5.1 QUALITY ASSURANCE ACTIVITIES

QA oversight was completed by on-site USACE OESSs who worked with the 2012 through 2015 URS UXOQCS and the 2017 through 2024 AECOM UXOQCS to ensure that RA DFWs were completed in a manner that achieved the RA objectives. The OESSs were on site to evaluate the RA field activities in real-time and to verify that the approved planning documents (i.e., the Approved Final HWMU RA WP and its ESS) and associated guidance documents were followed during completion of RA field activities and achievement of project DQOs. QA inspections and audits were completed in accordance with established USACE guidelines and project-specific USACE QA Surveillance Plans.

The HWMU grid-specific USACE QA acceptance procedures completed under the original URS 2011 through 2015 Contract were enhanced for the subsequent work completed under the 2017 through 2024 AECOM Contract. During the 2011 through 2015 fieldwork, ENG Form 6048s were not used by the USACE OESS to document grid-specific concurrence with the completion of the Soil Processing Plant Grids shown on **Figure 1-3**. Instead, the USACE OESS QA inspection/approval process was generally completed concurrent with the URS UXOQCS final acceptance sampling inspections. As a result, the 2011 through 2015 completed grids were QC-/QA-approved simultaneously as documented in the **Appendix D** DQCRs completed from 2011 through 2015. The RA field activities and data were presented to the Army in a Draft HWMU Removal Report (URS 2016) that was reviewed and approved by the Army.

For the 2017 through 2024 HWMU RA fieldwork, the USACE OESS QA activities were documented for each completed RA grid using USACE Munitions Response QA Report Forms (i.e., ENG Form 6048s). The USACE QA Form 6048s are included in **Appendix J**, to document USACE OESS approval that each completed HWMU RA Grid was remediated in accordance with the MQOs and acceptance criteria documented in the HWMU RA WP. Final USACE QA acceptance of the subsurface RA completed throughout each of the 185 full and partial HWMU grids is shown on **Figure 5-1**.





Legend

- Installation Boundary
- HWMU Boundary
- Grid Passed QA Inspection
- Arroyo
- Road

HWMU QA Results
Fort Wingate Depot Activity
McKinley County, New Mexico

Drawn By:	Date:	
JZ	11/11/2024	**Figure 5-1**
Checked By: MG	Project No. 60517380	

As discussed in **Section 2.1**, the RA was conducted in accordance with Section III of the RCRA Permit (NMED 2015) to remove munitions-related hazardous wastes (i.e., MEC), hazardous waste residues (i.e., MD greater than 5/8 inch), and soils with chemical concentrations (i.e., MC) above project specific cleanup levels from the HWMU. The RA completed throughout the FWDA Parcel 3 HWMU fulfilled the RA objectives to:

- Excavate, sift, stockpile, test, and dispose of mass quantities of debris, soil, munitions, and improved conventional munitions historically deposited and otherwise buried throughout the HWMU.

- Place clean soils (as determined by testing) back into excavation areas (i.e., grids) with clean excavation bottoms (i.e., based on laboratory confirmation sample results).

- Additional RA tasks included the construction, operation, and maintenance of a sifting plant to process all excavated materials; the disposal of MEC; and the inspection, certification, explosive safety characterization, and disposal or recycling of all MPPEH and RRD removed.

- While completion of the HWMU RA would accomplish a significant portion of the Closure Requirements of Section III of the RCRA Permit, it was not intended as the official closure of the HWMU.

The comprehensive RA fieldwork conducted throughout the HWMU, as documented in a series of Annual Progress Status Reports (AECOM 2021a through AECOM 2024b) and **Sections 2** through **5** of this comprehensive RA Completion Report, has achieved the Corrective Action Completion Performance Objective documented for the Site in the RA WP.

6.1 HWMU RECOMMENDATIONS

No additional active remedial operations (i.e., MEC removal) are warranted for the HWMU based on the comprehensive RA fieldwork completed throughout the Parcel 3 HWMU; all MEC and MD items recovered were removed and all remaining site soils were documented as below NMED residential SSLs. As a result, it is recommended that a RCRA Permit modification be completed for closure of the HWMU based on the following:

1. The completion of RA activities.
2. Updated site conditions following the RA.
3. RCRA Permit conditions have been achieved.
4. No additional remedial activities within the HWMU are required.

Based on the extensive history of OB/OD operations conducted within the Parcel 3 HWMU, the significant quantities of munitions removed from the HWMU, and potential quantities that may be present outside of the HWMU, land use restrictions and/or other site controls may still be warranted for portions of the surrounding area following completion of this RA.

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Due to their excessively large file sizes, the cumulative HWMU Removal Action Completion Report Appendices will be submitted as separate files