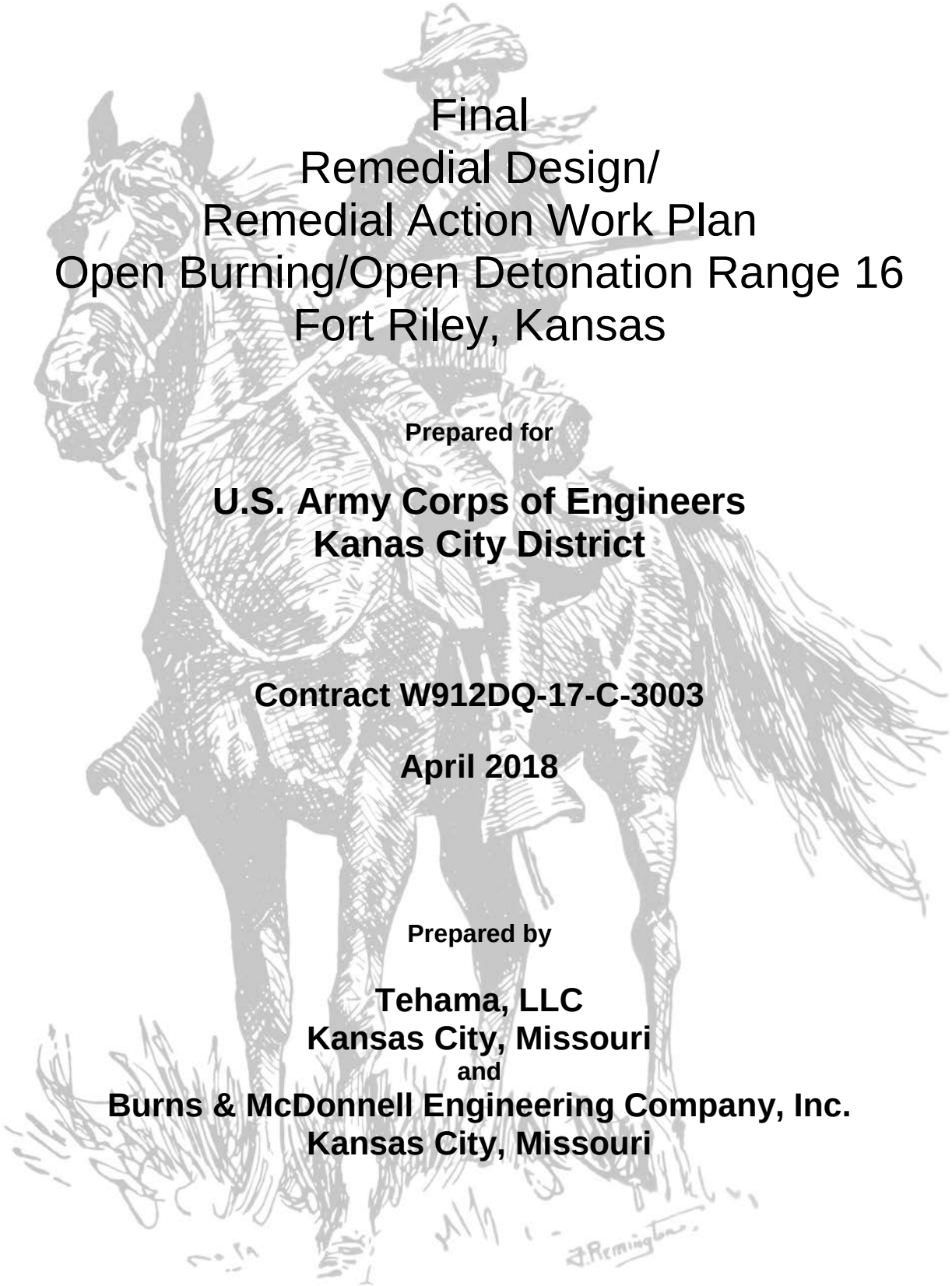
Final
Remedial Design/
Remedial Action Work Plan
Open Burning/Open Detonation Range 16
Fort Riley, Kansas

U.S. Army Corps of Engineers
Kanas City District

Contract W912DQ-17-C-3003

April 2018



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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
µg/kg	Micrograms Per Kilogram
APP/SSHP	Accident Prevention Plan/Site Safety and Health Plan
ARAR	Applicable or Relevant and Appropriate Requirements
ASR	Annual Summary Report
BATF	Bureau of Alcohol, Tobacco, Firearms, and Explosives
BER	Bureau of Environmental Remediation
bgs	Below Ground Surface
BIP	Blown in Place
BLRA	Baseline Risk Assessment
BMcD	Burns & McDonnell Engineering Company, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm/sec	Centimeters Per Second
COC	Contaminant of Concern
COR	Contracting Officer's Representative
CSM	Conceptual Site Model
cy	Cubic Yard
DA	Department of the Army
DDESB	Department of Defense Explosives Safety Board
DMI	Demil Metals Incorporated
DMM	Discarded Military Munitions
DoD	United States Department of Defense
DoDI	Department of Defense Instruction
DOT	United States Department of Transportation
DPTMS	Directorate of Plans, Training, Mobilization, and Security
EMP	Fort Riley Environmental Management Plan
EMR	Electromagnetic Radiation
EOD	Explosive Ordnance Disposal
EPP	Environmental Protection Plan
ESS	Explosive Safety Submission
E-STOP	Emergency Stop
ºF	Degrees Fahrenheit
FS	Feasibility Study
HDPE	High Density Polyethylene
HFD	Hazardous Fragment Distance
HI	Hazard Index
GC	Gas Chromatography
IC	Institutional Control
IDW	Investigation-Derived Waste
IME	Institute of Makers of Explosives

Abbreviation	Term/Phrase/Name
IRP	Installation Restoration Program
ISCP	Fort Riley Installation Spill Contingency Plan
IWSA	Installation-Wide Site Assessment
KDHE	Kansas Department of Health and Environment
KSWQS	Kansas Surface Water Quality Standard
LBA	Louis Berger Associates
LBG	Louis Berger Group
LFTC	Landfarm Treatment Cell
LTM	Long-Term Monitoring
MC	Munitions Constituents
MCL	Maximum Contaminant Level
MD	Munitions Debris
MDAS	Material Documented As Safe
MEC	Munitions and explosives of concern
mg/kg	Milligrams per kilogram
MGFD	Munition with the Greatest Fragmentation Distance
mm	Millimeter
MPPEH	Material Potentially Presenting an Explosive Hazard
MRS	Munitions Response Site
MSD	Minimum Separation Distance
NCP	National Contingency Plan
NPL	National Priorities List
OB/OD	Open Burning/Open Detonation Ground
OESS	Ordnance and Explosives Safety Specialist
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbon
PCA	1,1,2,2-Tetrachloroethane
PCE	Perchloroethylene
PE	Professional Engineer
PESI	Pre-Excavation Soil Investigation
PG	Professional Geologist
PID	Photoionization detector
PM	Project Manager
PMP	Project Management Plan
POP	Period of Performance
PPE	Personal Protective Equipment
PWE	Directorate of Public Works – Environmental Division
QA	Quality Assurance
QC	Quality Control
QCSR	Quality Control Summary Report
QCI	Quality Conformance Inspections

Abbreviation	Term/Phrase/Name
RAO	Remedial Action Objectives
RA(O)/LTM	Remedial Action Operation and Long-Term Monitoring
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RD/RA WP	Remedial Design/Remedial Action Work Plan
RG	Remedial Goal
RI	Remedial Investigation
RIP	Remedy In Place
ROD	Record of Decision
RPMP	Real Property Master Plan
RRD	Range Related Debris
RSL	Regional Screening Level
RSK	Kansas Risk -Based Standards
SPCCP	Fort Riley Spill Prevention, Control, and Countermeasures Plan
SSHP	Site Health and Safety Plan
SUXOS	Senior UXO Supervisor
SVOC	Semivolatile Organic Compound
SWPPP	Stormwater Pollution Prevention Plan
TCE	Trichloroethylene
Tehama	Tehama, LLC
UFP-QAPP	Uniform Federal Policy-Quality Assurance Project Plan
US Army	United States Army
USACE	United States Army Corps of Engineers
USACE-KCD	United States Army Corps of Engineers, Kansas City District
USAEC	United States Army Environmental Command
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance
UXOQCS	UXO Quality Control Supervisor
VOC	Volatile Organic Compound

1.0 INTRODUCTION

1.1 Purpose of Work Plan

The United States Army Corps of Engineers, Kansas City District (USACE-KCD), contracted Tehama, LLC (Tehama) to execute a Remedial Design/Remedial Action (RD/RA) through Remedy in Place (RIP) followed by three years of Long-Term Monitoring (LTM) at the Open Burning/Open Detonation Ground (OB/OD) Range 16 Operable Unit (OU) 006, located at Fort Riley Kansas. This work is being performed by Tehama under Contract Number W912DQ-17-C-3003, Requisition/Purchase Number W58XUW71633327 with a Period of Performance (POP) start date of 25 September 2017. The scope of work includes the following performance objectives:

1. Approved Site Health and Safety Plan;
2. Achieve RIP in 24 months from award date;
3. Complete Remedial Action Operation and Long-Term Monitoring [RA(O)/LTM]; and
4. Approved Landfarm Operation and Closure

This Remedial Design/Remedial Action Work Plan (RD/RA WP) presents the remedial design and remedial action procedures that will be implemented for the completion of this project. As outlined in the Record of Decision (ROD) [The Louis Berger Group, Inc. [LBG]-Burns & McDonnell Engineering Company, Inc. [BMcD], 2016], selected remedies for the OB/OD site include soil excavation, on-site treatment, and disposal; groundwater and surface water monitoring; and institutional controls (ICs).

This RD/RA WP was developed consistent with applicable United States Environmental Protection Agency (USEPA) guidance documents, including:

- *Guidance for Scoping the Remedial Design* (USEPA, 1995a); and
- *Remedial Design/Remedial Action Handbook* (USEPA, 1995b).

1.2 Site Background

1.2.1 Historical Background

Centrally located between the cities of Salina and Topeka, Kansas, the Fort Riley Military Installation is over 100,000 acres in size and includes portions of three counties: Riley, Clay, and Geary. There are six cantonment areas in Fort Riley, including: Main Post, Camp Forsyth, Camp Funston, Camp Whiteside,

Marshall Army Airfield, and Custer Hill. The OB/OD Site is located approximately 2.5 miles to the northeast of Custer Hill (Figure 1-1).

Prior to 1942, the OB/OD site was used for ranching and farming. In 1942, the land was obtained by the military and has been in use by the United States Army (US Army) from 1942 to the present for munitions burning and detonation. Historic and present site use has not changed, although detonation activities have diminished. The active portion of the site is an area approximately 700 feet by 550 feet and in the shape of an L (Figure 1-2).

1.2.2 Current Site Usage

Currently, the 71st Explosive Ordnance Disposal (EOD) Detachment at Fort Riley handles ordnance materials from Fort Riley, the United States Department of Defense (DoD), and other state and federal agencies. Since 1991, the 71st EOD Detachment has been responsible for providing support to military installations, operations, and exercises; and to civilian and federal authorities within an operational area that includes the states of Kansas, Nebraska, Missouri, and South Dakota.

Ordnance was formerly disposed of by the 774th EOD Detachment at the OB/OD site by open burning and open detonation. Currently, only open detonations for emergency disposal of ordnance and training are conducted. Open detonation occurs on open ground and creates crater-like pits, which typically reach a maximum size of 25 feet in diameter and 10 to 15 feet in depth. At present, there are three active detonation pit areas, two metal debris pits, and two non-active burn pits at the OB/OD site. Open detonation is currently being conducted at the Northwest, West, and East Demolition Pits (Figure 1-2). Open detonation at the site is dynamic; generally, detonations are conducted within the same area but may not be within the same pit.

Land use at the OB/OD site is classified as “training/ranges” under the Fort Riley Real Property Master Plan (RPMP) and it is anticipated that land use activities will remain unchanged into the foreseeable future.

1.2.3 Enforcement Activities

Effective June 1991, the Department of the Army (DA) (Fort Riley) entered into a FFA, Docket No. VII-90-F-0015, with the State of Kansas, Kansas Department of Health and Environment – Bureau of Environmental Remediation (KDHE-BER) and USEPA, Region VII to address environmental pollution subject to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Contingency Plan (NCP), and /or the Resource Conservation and Recovery Act (RCRA)

(USEPA, 1991a). On July 14, 1989, the USEPA proposed inclusion of Fort Riley on the National Priorities List (NPL) pursuant to CERCLA.

Pursuant to the FFA, Fort Riley conducted an Installation-Wide Site Assessment (IWSA) in 1992 (Louis Berger & Associates [LBA], 1992) to identify sites having the potential to release hazardous substances to the environment. The IWSA identified the OB/OD (OU 006) as a potential area of concern requiring further evaluation. Based on the findings of the IWSA, a number of environmental investigations were conducted at the OB/OD (OU 006). A summary of these investigations is included in the ROD [LBG-BMcD, 2016]. In February 2011, the United States Army Environmental Command (USAEC) performed a Program Management Review of the Installation Restoration Program (IRP) at Fort Riley and requested that a Remedial Investigation/Feasibility Study (RI/FS) be performed at the OB/OD (OU 006). As a result, the OB/OD (OU 006) was formally designated as an OU (OU 006) on May 12, 2011.

RI field activities were conducted between 2011 and 2013 and included monitoring well installation; piezometer abandonment; and the collection and analysis of soil, dry sediment, surface water, and groundwater samples for Volatile Organic Compounds (VOCs), Semivolatile Organic Compounds (SVOCs), perchlorate, explosives, and metals. RI screening values for groundwater and/or surface water were USEPA Maximum Contaminant Levels (MCLs), KDHE Kansas Risk -Based Standards (RSKs) (non-residential groundwater), or USEPA Regional Screening Levels (RSLs) (tapwater). Screening values for soil samples were KDHE RSK (non-residential soil pathway) or USEPA RSL (industrial soil). The findings of the RI field activities were reported in the *Remedial Investigation Report, Open Burning/Open Detonation Ground (Range 16), Operable Unit 006 at Fort Riley, Kansas* (LBG-BMcD, 2013) and are presented below.

- **Volatile Organic Compounds (VOCs)** – Trichloroethylene (TCE) and 1,1,2,2-tetrachloroethane (PCA) were the most common exceedances of the Kansas RSKs and/or USEPA RSL screening levels. Exceedances for these two VOCs are concentrated in the area of the metal debris pits for the surface and subsurface soil media, down gradient of the pits for the groundwater, and in the surface water at locations where the groundwater discharges to the surface water. Field screening results and laboratory results indicated the majority of TCE exceedances in soil were in the subsurface interval in the area of the metal debris pits, with the highest laboratory results at locations MD-25 (10 feet below ground surface [bgs]; 181 milligrams per kilogram [mg/kg]) and ME-26 (11.5 feet bgs; 84.5 mg/kg). Within the area of the metal debris pits and directly up-gradient of the soil VOC exceedances, there was an approximate 10 foot by 10 foot area that

could not be sampled due to the indication of metal when sounded by a magnetic locator which could indicate the presence of munitions.

- **SVOCs** – There were no exceedances of SVOCs in the surface or subsurface soils. In groundwater, bis(2-ethylhexyl)phthalate was detected sporadically with two detections above the screening level and benzo(a)pyrene was detected once at a level slightly above the screening level.
- **Explosives** – There were no exceedances of explosives in any of the media sampled.
- **Perchlorate** – There were no exceedances of perchlorate in any of the media sampled.
- **Metals** – There were no exceedances of metals in any of the media sampled.

The *Feasibility Study Report, Open Burning/Open Detonation Ground (Range 16), Operable Unit 006 at Fort Riley, Kansas* (LBG-BMcD, 2014a), developed and evaluated remedial alternatives to allow for the selection of an appropriate remedy for remediating the contamination associated with the OB/OD (OU 006). The FS Report was accepted by the KDHE and USEPA on February 28, 2014, and July 23, 2014, respectively.

The *Proposed Plan, Open Burning/Open Detonation Ground (Range 16), Operable Unit 006, Fort Riley, Kansas* (LBG-BMcD, 2014b), was issued to inform the public of Fort Riley's, USEPA's, and KDHE's preferred remedy based on information in the RI and FS Reports. The intention was to solicit public comments pertaining to the remedial alternatives evaluated, including the preferred alternative. Submitted on June 9, 2014, the PP was accepted by the KDHE and USEPA on June 12, 2014, and June 30, 2014, respectively, with no comments.

1.2.4 Contamination Source Area

The principal source of contamination at the OB/OD site is TCE-contaminated soil located in the area of the metal debris pits (source area). The source area is contributing to the groundwater and surface water contamination present at the site. There is no known historical or current use of solvents or knowledge of solvent disposal at the OB/OD site.

1.3 Description of the Remedy

The selected remedy for remediation of the soil, groundwater, and surface water contamination at the OB/OD site is: soil removal with on-site treatment, groundwater/surface water monitoring, and ICs through the Fort Riley RPMP.

The selected remedy reflects the long-term site management plan for the OB/OD site. The remedy relies on source area removal to prevent contamination present in the soil from leaching into the groundwater and migrating to the surface water. Secondarily, impacted groundwater and surface water will be addressed through natural processes such as volatilization, biodegradation, and dispersion. Impacted soil with contaminant concentrations exceeding its calculated risk-based remedial goal (RG) of 10.72 mg/kg for TCE and 14.4 mg/kg for PCA will be excavated and treated on site by landfarming. The excavated material will be treated in a landfarm treatment cell (LFTC) until contaminant concentrations are below their KDHE RSKs for non-residential soil-to-groundwater of 84.2 µg/kg for TCE and 29.4 µg/kg for PCA.

Monitoring of groundwater and surface water will be conducted to ensure contaminant concentrations present in the groundwater and surface water are continuing to decrease in concentration, the contaminant plumes are continuing to decrease in size, and the remedy is not adversely impacting water quality. The projected timeframe for impacted groundwater and surface water remediation is unknown at this time and will be evaluated after a minimum of eight rounds of groundwater monitoring have been completed and trend analysis is finalized. Additional information on contaminant trend analysis will be included in the LTM Plan which will be submitted following completion of the RA. The use of ISCO may significantly reduce timeframe. The base of the excavation will be in contact with the top of bedrock, which is where limited amounts of perched groundwater can be found. Depth to GW is approximately 15 feet below ground surface in the area of the excavation and is seasonally variable.

ICs implemented through the Fort Riley RPMP will control and limit development, and other activities at the site. ICs include restricting changes in land use; limiting access; prohibiting the installation of drinking water wells and groundwater/surface water use; and involving Fort Riley Directorate of Public Works – Environmental Division (PWE) personnel in the proposed future plans. Furthermore, because the OB/OD site is an active range located within the Impact Area and is currently used for ordnance disposal, the site is gated with severely restricted access that is controlled through range controls.

Closure for the OB/OD site will be unobtainable because the site is an active range located within the Impact Area currently used for ordnance disposal and as such may pose risks due to the potential presence of unexploded ordnance (UXO), and munitions and explosives of concern (MEC).

1.4 Work Plan Organization

This RD/RA WP is organized as follows:

- Section 1.0 Introduction – Includes a discussion of the purpose and scope of this RD/RA WP, description of the remedy, and the work plan organization.
- Section 2.0 Site Background and Setting – Includes a description of the regional and site specific setting; local climatology, demography and ecology; and the conceptual site model.
- Section 3.0 Remedial Action – Presents the Remedial Action Objectives, clean up levels, and a description of the remedy.
- Section 4.0 RD/RA Scope of Work – Includes RD/RA details, including an overview of the planning documents, description of the field activities, RD/RA communication, and schedule management.
- Section 5.0 Project Management – Provides a description of the roles and responsibilities of RD/RA team members.
- Section 6.0 References – Provides the references used in preparing this RD/RA WP.
- Tables
- Figures
- Appendices

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2.0 SITE BACKGROUND AND SETTING

This section presents a discussion of the background information on the OB/OD, the physical setting of the OB/OD, and a conceptual site model.

2.1 Location and Physical Description

The Fort Riley Military Reservation is centrally located between the cities of Salina and Topeka in north central Kansas. The reservation is over 100,000 acres in size and includes portions of Riley, Clay, and Geary Counties. The developed areas of Fort Riley are divided into six cantonment areas: Main Post, Camp Forsyth, Camp Funston, Camp Whitside, Marshall Army Airfield, and Custer Hill. The OB/OD site is located approximately 2.5 miles to the northeast of Custer Hill, in the Impact Area, and outside of the developed areas of Fort Riley (Figure 1-2).

The OB/OD site is located within Range 16 in the southern part of the Impact Area; approximately 2,300 feet north of Vinton School Road (Figures 1-1 and 1-2). The active portion of the site is an inverted L-shaped area and consists of an area approximately 700 feet by 550 feet. The OB/OD site is a sparsely vegetated area underlain by rocky soil (regolith) and bedrock that consists of alternating shale and limestone beds. Controlled burning is conducted by Fort Riley on a regular basis for the management of the tall-grass prairie ecosystem, as well as to control wild fires. Ephemeral streams are present to both the east and west of the active portion of the OB/OD site. A wet weather spring is also present within the active portion of the site (Figure 1-2).

2.2 Regional Setting

The topography of Fort Riley and the surrounding area consists of a low plain that has been eroded by streams and rivers. The area is designated as the Osage Plains section of the Central Lowlands physiographic province (Schoewe, 1949). Sedimentary bedrock strata dip gently to the west-northwest. East-facing escarpments of more resistant rock units are separated by gentle, westward sloping plains. The resulting topography can be divided into upland areas with bluffs along alluvial valleys, and lowland areas that consist of alluvial plains and associated terraces. The upland areas are dissected by numerous ephemeral, intermittent, and perennial streams; the lowlands areas occur along the banks of the major rivers in the area: the Republican, Smoky Hill, and Kansas Rivers (Jewett, 1941).

The geology of Fort Riley and the surrounding area consists of Pennsylvanian and Permian Age sedimentary rock overlain by eolian and fluvial deposits of Pleistocene and Recent Age (Jewett, 1941). The Nemaha Anticline is the prominent structural feature in the area, and Fort Riley is situated on the

western limb of this fold within the Salina Basin (Merriam, 1963). Bedrock dips gently (approximately 30 feet per mile) to the west-northwest and consists of alternating beds of limestone and shale of the Permian Chase and Council Grove Groups. The Barneston Formation of the Chase Group (composed of the Fort Riley Limestone, Oketo Shale, and Florence Limestone Members) is the uppermost bedrock in the upland areas. This sequence of interbedded limestones and shales continues to depths of several hundred feet. The bedrock surface has been eroded by the major rivers and streams. The major streams tend to flow to the east and south due to topography. The rivers are broad, shallow, and slow-moving.

In the major river valleys, alluvial sand, silt, and gravel deposits reach a thickness of approximately one hundred feet near the rivers and decrease in thickness toward the margins of the floodplain. Alluvium and loess cover portions of the upland areas, including terraces underlain by Buck Creek terrace deposits (Fader, 1974). These terrace deposits include both alluvium and loess. Eudora and Kenesaw soils are developed throughout Fort Riley (Jantz et al., 1975). Eudora silt loams are well drained, have moderate permeability, and normally form in coarse, silty alluvium on high flood plains or low terraces.

2.3 Site-Specific Setting

2.3.1 Soil

The OB/OD site is underlain by regolith (the layer of soil and loose rock overlying the bedrock) consisting of residual silty clays that grade into weathered bedrock. The regolith is composed of the Smolan silty loam and the Wymore silty clay loam (Jantz et al., 1975). The Smolan soils are commonly found in terrace and upland areas adjacent to the Kansas and Republican River valleys and are formed from loess deposits. The Wymore silt, also formed from loess deposits, is also found in the upland areas. Soils originating from the weathering of terrace bedrock formations are also found in the upland areas.

2.3.2 Geology

The OB/OD site is underlain by an alternating sequence of limestone and shale of the Permian Chase and Council Grove Groups. Bedrock present at the OB/OD site includes the Blue Springs Shale Member, Kinney Limestone Member, Wymore Shale Member, Schroyer Limestone Member, and Havensville Shale Member. The Threemile Limestone Member and Speiser Shale Member underlie the Havensville Shale Member. The bedrock at the OB/OD site generally dips toward the southwest. The localized bedrock dip is slightly steeper toward the southwest in the eastern portion of the site, but levels out in the western portion of the site. Descriptions of the specific bedrock units encountered at the OB/OD site are provided below.

- **Florence Limestone Member –** The Florence Limestone generally consists of a fossiliferous light to yellowish-gray limestone with chert and shale (Zeller, 1994). The Florence Limestone was not observed at the OB/OD site during RI field activities but outcrops north of the study area.

- **Blue Springs Shale Member –** The Blue Springs Shale generally consists of a red to gray shale with minor amounts of limestone (Zeller, 1994). A description of the Blue Springs at the OB/OD site Area is a greenish-gray to dark reddish-brown, dry, slightly-calcareous shale with a measured thickness of 21 feet. At the OB/OD site, the three detonation pits, two metal debris pits, and a portion of the north burn pit are located within the Blue Springs Shale Member.

- **Kinney Limestone Member –** The Kinney Limestone generally consists of two gray, fossiliferous, limestone beds separated by gray, fossiliferous shale (Zeller, 1994). The Kinney Limestone at the OB/OD site is a pale-yellow, moist to wet, slightly-weathered, cherty limestone with an approximate thickness of 4 feet. A portion of the north burn pit is located within the Kinney Limestone Member.

- **Wymore Shale Member –** The Wymore Shale consists of gray and yellowish-gray shale with varicolored red, green, and purple beds, and limestone and fossiliferous beds in the lower portions (Zeller, 1994). The Wymore Shale at the OB/OD site is a gray to greenish-gray, calcareous shale that is wet in the upper zone, dry in the middle portion, and moist to wet in the lower portion. The Wymore has an approximate thickness of 25 feet. The south burn pit and spring are located within the Wymore Shale Member.

- **Schroyer Limestone Member –** The Schroyer Limestone consists of a chert-bearing, light-gray to nearly white limestone with a 3-foot, non-cherty section in the upper portion (Zeller, 1994). The Schroyer at the OB/OD site is a wet, crystalline, medium-hard to dense, gray to pale- yellow limestone with an average thickness of 9 feet. A majority of the western ephemeral stream and the southern portion of the eastern ephemeral stream lie in the Schroyer Limestone Member.

- **Havensville Shale Member –** The Havensville Shale consists of gray calcareous shale with thin limestone beds (Zeller, 1994). The Havensville Shale at the OB/OD site is a dark gray, dry, calcareous, subplaty shale with an average thickness of 15 feet. The Havensville underlies the southern portion of the OB/OD site.

- **Threemile Limestone Member –** The Threemile Limestone consists of a light-gray to nearly white limestone with chert-bearing zones. Massive non-cherty beds are located in the middle and lower portions of the member (Zeller, 1994). The Threemile Limestone at the OB/OD site is a dark gray limestone with interbedded shales with a measured thickness of 12 to 20 feet.

- **Speiser Shale –** The Speiser Shale consists of fossiliferous shale underlain by a limestone in the upper portion of the unit while the remainder of the unit is composed of varicolored beds with red as the predominant color (Zeller, 1994). The Speiser Shale has a measured thickness of 15 to18 feet.

2.3.3 Hydrogeology

Groundwater at the OB/OD site is present from up-gradient aquifer recharge and through precipitation. Precipitation that falls on the site infiltrates downward through the soil into the underlying bedrock. During rain events, overland flow also occurs from the higher elevation portions of the site to the two ephemeral streams located to the east and west of the site. Groundwater moves horizontally along bedding planes in the shale and limestone formations and vertically through joints and fractures. Joint sets running east-northeast and north-northwest are present at the site in the bedrock. Additional fractures are also possible at the site due to the historical and continued use of the site as a range for detonation of explosives. Spring and wet weather seeps are present at the OB/OD site. The wet weather seeps, which are located within or near the drainage areas, produce water mainly after heavier precipitation events. The spring produces water on a more consistent basis; however, it is more commonly dry than flowing.

Groundwater at the OB/OD site is found mainly within two horizons, the regolith/weathered bedrock horizon and the Threemile Limestone Member. Depth to groundwater is approximately 15 ft bgs in the area of the excavation, and varies seasonally. Groundwater typically flows toward the south-southwest within the regolith. Hydraulic conductivity testing at Monitoring Well OB-05-15, which is screened within the regolith, resulted in a conductivity value of 4.05×10^{-3} centimeters per second (cm/sec) and at Monitoring Well OB-97-06, which is screened within the Schroyer Limestone Member, resulted in a conductivity value of 5.30×10^{-2} cm/sec (LBG-BMcD, 2013).

2.3.4 Surface Water Drainage

During rainfall events, surface runoff from the surrounding area travels into one of the two ephemeral streams bordering the OB/OD site on the east and west based on topographic elevation. These two ephemeral streams join approximately 1,500 feet south of the OB/OD site. This ephemeral stream

intercepts the Threemile Creek approximately 3,700 feet south of the site and eventually enters the Kansas River to the southeast (Figure 1-1).

Surface water in the ephemeral streams generally occurs following precipitation events. During these events, surface water flows in the stream bed while precipitation infiltrates the overlying regolith and migrates into bedrock through fractures, joints, and bedding planes. Where the bedrock outcrops along the stream beds, temporary seeps are developed which allow water to seep from the outcropping bedrock into the streams. Following the precipitation events, the stream flow gradually reduces until flow no longer occurs and ponded areas are formed, which eventually dry up. Additionally, seeps and springs dry up when there is no longer any infiltration to support a continuing flow. Examples of this are the spring located at the base of the Kinney Limestone and the seeps along the western ephemeral stream located within the outcropping Schroyer Limestone.

2.4 Climatology

The average temperature for the area (measured at Station 144972, located at Manhattan, Kansas) is 55 degrees Fahrenheit (ºF). Temperature extremes range from a record low of –31 ºF (January 1947) to a record high of 116 ºF (August 1936). Annual precipitation from 1893 through 2012 ranged from a minimum of 15.42 inches to a maximum of 60.38 inches, with an average of approximately 33 inches per year. The maximum 24-hour rain event during the same period was reported at 6.28 inches. Average annual snowfall is approximately 18 inches, with a maximum annual snowfall during the reporting period of 49.5 inches in 1960. The maximum 24-hour snowfall event during this same period was reported at 18 inches (High Plains Regional Climate Center, 2013). Pan evaporation, measured by the United States Army Corps of Engineers (USACE) at Tuttle Creek Lake north of Manhattan, averaged 47.13 inches/year between 1980 and 1997, with extremes of 37.39 inches/year and 58.66 inches/year. Prevailing wind directions are variable. Winds are predominantly from the south and southwest during March through December, and from the north during the months of January and February. Wind speeds generally range from seven to ten miles per hour (personal communication, First Weather Group, Detachment 8, Fort Riley MAAF, 1998).

2.5 Demography

The lands surrounding the OB/OD site consist of undeveloped wooded and native tall-grass prairie. No residential or commercial structures exist near the site. The only personnel within a 1-mile radius of the OB/OD site are US Army personnel. Access to the Impact Area is severely restricted due to the nature of

the training. Access to the OB/OD site is limited to EOD/Range personnel during detonation of ordnance and maintenance.

In addition to the other cantonment areas of Fort Riley (all of which are within eight miles of the OB/OD site), the following towns are within fifteen miles of the OB/OD site: Junction City and Grandview Plaza (to the south) and Ogden (approximately seven miles to the southeast). The approximate populations of the surrounding major towns are: Junction City (23,353), Grandview Plaza (1,560), and Ogden (2,087) (United States Department of Commerce, 2010) (Figure 1-1).

2.6 Ecology

Fort Riley lies within a transitional zone between deciduous forests of Eastern Kansas and the grass prairies of the Great Plains. The area supports a wide variety of wildlife, adapted to a variety of habitat types. Habitat types found throughout Fort Riley consist of a mosaic of upland and riparian woodland, cropland, tall-grass prairie, pasture/hayfield, revegetated grassland, and lawn based upon previous investigations performed. The Kansas River provides additional wildlife habitat.

The Fort Riley PWE Conservation Branch has identified 28 listed and rare species that have been identified or could potentially exist in the Fort Riley area. A list of these species is provided on Table 2-1. Many of the species have recently been documented at Fort Riley.

Habitat types found at the OB/OD site consist of woodland areas near the banks of the ephemeral streams and grasslands with low lying plants comprising most of the active portion of the site. No known rare or endangered species inhabit the OB/OD site.

2.7 Conceptual Site Model

Figures 2-1 and 2-2 present the human health and ecological Conceptual Site Models (CSMs) for the OB/OD site. Reasonable exposure scenarios were developed for the RI (LBG-BMcD, 2013) based on how the OB/OD site is currently used and assumptions about its future use and physical site features.

2.7.1 Known or Suspected Sources of Contamination

The principal source of contamination at the OB/OD site is the TCE-contaminated soil located in the area of the metal debris pits (source area). The source area is contributing to the groundwater and surface water contamination present at the site. There is no known historical or current use of solvents or knowledge of solvent disposal at the OB/OD site.

2.7.2 Types of Contamination, Affected Media, Location of Contamination, and Known Routes of Migration

Contaminants of concern (COCs) that were identified in subsurface soil, groundwater, and/or surface water at the OB/OD site in the RI Report included VOCs and SVOCs (LBG-BMcD, 2013). Nature and extent of contaminants at the OB/OD site as presented in the RI Report are summarized below:

- **VOCs** – RSK exceedances of TCE were detected in subsurface soil. RSK exceedances of PCA, naphthalene, and MCL exceedances of TCE were detected in groundwater. RKS exceedances of PCA and MCL exceedances of TCE were detected in surface water.
- **SVOCs** – MCL exceedances of bis(2-ethylhexyl)phthalate and benzo(a)pyrene were detected in groundwater. Surface water had one exceedance of benzo(a)pyrene.
- **Explosives** – There were no exceedances of explosives in any of the media sampled.
- **Perchlorate** – There were no exceedances of perchlorate in any of the media sampled.
- **Metals** – There were no exceedances of metals in any of the media sampled.

Soil

The metal debris pits, located in the north central portion of the site, were identified during the RI as the probable contaminant source area. Within this area, soil results are the highest in the eastern portion of the metal debris pits near an area with a metallic signature. VOCs are present within both the surface and subsurface soil in this area. Based on the data from the RI, it is estimated that approximately 7,500 cubic yards of TCE-impacted soil are present at the site above the calculated risk-based RG of 10.72 mg/kg. Due to the presence of a metallic signature, the central portion of the northern metal debris pit was not sampled for chemical analysis. Based upon the pattern of contamination detected, it is probable that the soil within this area also has exceedances, and it is estimated that 460 cubic yards of TCE-contaminated soil will be excavated from the area (LBG-BMcD, 2014a). The PESI will be used to further define the approximate 75 feet long, 50 feet wide, and 15 feet deep limits of the excavation area that is centered over the northern metal debris pit.

Groundwater

Groundwater within this area is primarily recharged through precipitation. Precipitation is transported along the ground surface via overland flow and also migrates downward by infiltration and percolation through micro- and macro-fractures within the regolith. Following infiltration and percolation, precipitation then moves downward by preferential and non-preferential pathways into the weathered bedrock mass through fractures and joints. As the infiltrated precipitation moves through the VOC-

contaminated soil, the water dissolves and transports the VOCs. The VOC-impacted fluids migrate downward into the uppermost groundwater surface located within the regolith and weathered bedrock at the OB/OD site. Results from groundwater samples indicate that the VOCs are migrating down gradient within this aquifer and also downward into the lower aquifer in some locations.

Vertically, groundwater contamination at the OB/OD site extends from the regolith/weathered bedrock aquifer down to the lower aquifer (Threemile Limestone). Horizontally, groundwater contamination at the OB/OD site extends down gradient (southwest) from the metal debris pits toward the western ephemeral stream (Figure 1-2).

Surface Water

During periods of heavier precipitation, wet weather seeps (including the spring) flow as the fracture and joint network within the weathered bedrock mass reach maximum pore volume/fracture aperture capacities. This allows wet weather features like ephemeral streams, springs, and seeps to flow and weep. Samples collected from the seeps, spring, and the western ephemeral stream located during wetter weather conditions down gradient of the soil source contain chlorinated VOCs as found in the soil and groundwater samples. This flow path along the top of more resistant units in the soil/weathered bedrock interface is also the probable source of the VOC detections within the deeper soils near the bedrock interface located down gradient of the metal debris pits.

Water in the spring is only present part time, generally in the spring when groundwater elevations are higher or following large precipitation events, and thus appears linked to fluctuations in the groundwater. It is not possible to estimate the area and volume of surface water exceeding calculated risk-based RGs because of the variable nature of the surface water at the OB/OD site and its apparent link to groundwater, especially at the spring. (LBG-BMcD, 2014a).

2.7.3 Current and Potential Future Site and Resource Uses

2.7.3.1 Land Uses

The OB/OD site is part of the Fort Riley reservation and is not zoned by Riley County. The OB/OD site is currently used for open detonation to destroy UXO. The lands surrounding OB/OD site consist of undeveloped wooded and native tall-grass prairie. No residential or commercial structures exist near the site. Land use at the OB/OD site is classified as "training/ranges" under the Fort Riley RPMP (Black & Veatch, 2007), and it is anticipated that land use activities will remain unchanged into the foreseeable future. The range is anticipated to remain active; however, signage will be installed to designate the area

as an Environmental Treatment Area. Signage location and specific language will be coordinated with Range Control prior to installation.

2.7.3.2 Water Uses

OB/OD site is in an isolated part of Fort Riley. This area is part of the Impact Area for weapons training at Fort Riley and access is restricted by the US Army due to the nature of the training. The only personnel within a 1-mile radius of OB/OD site are US Army personnel. Access to the OB/OD site is limited to EOD/Range personnel during detonation of ordnance and maintenance. The two streams that border the site on the east and west sides are classified as ephemeral streams and are dry except during precipitation events.

A water supply well is located on the military reservation at Range 18, approximately 4,200 feet toward the east, up-gradient of OB/OD site. This well is only used for non-potable purposes. Potable water supply wells are also located on the former Range 19, approximately 5,000 feet to the east and up-gradient of the OB/OD site, and at the Qualification Training Range, approximately 2,000 feet to the east of the OB/OD Site. The nearest potable public water supply well is the City of Ogden well field located approximately three miles away to the southeast and screened in the Kansas River alluvium. Based on the Fort Riley RPMP, the mission for OB/OD site will not change for the foreseeable future and water at Range 16 will not be used for either potable or non-potable purposes. ICs will prohibit the installation of water supply wells at the OB/OD site or affected downgradient, until remediation is complete.

2.7.4 Summary of Site Risks

The BLRA (human health and ecological risk assessments) that was completed for the OB/OD site in 2013, determined that chemicals present at the OB/OD site in soil, groundwater, and surface water could pose risks to human health, but are not thought to pose risk to ecological receptors. The DA's (Fort Riley) remedy decision is based on the presence of site-related contaminants in the soil, groundwater, and surface water that exceed their respective remedial cleanup levels (calculated risk-based RGs and MCLs). The potential risks to human health provide the basis for remedial action at the OB/OD site. The following hazard index (HI) values exceeded the USEPA acceptable risk level of one:

- Future site worker ingestion of groundwater (HI = 10);
- Future site worker inhalation of vapors from groundwater use (HI = 4);
- Current/Future demolition worker inhalation of outdoor vapors (HI = 17); and
- Current/Future demolition worker ingestion of groundwater (HI = 11).

Information regarding the noncancer and cancer risk calculations for each potentially exposed population, and the associated tables that show intake, reference values, slope factors/inhalation unit risks, and hazard indices can be found in Section 6.3 of the RI (LBG-BMcD, 2013).

The following carcinogenic risk values exceeded the USEPA risk management range of 1E-04 to 1E-06:

- Current site worker dermal contact with surface water (6E-04);
- Future site worker dermal contact with surface water (6E-04);
- Future site worker ingestion of groundwater (2E-04); and
- Future site worker dermal contact with groundwater (3E-04).

* * * * *

3.0 REMEDIAL ACTION

3.1 Remedial Action Objectives

As identified in the USEPA guidance *Rules of Thumb for Superfund Remedy Selection* (USEPA, 1997), a remedial action is generally warranted if one or more of the following conditions apply:

- Cumulative excess carcinogenic risk to an individual exceeds 1E-04.
- Non-carcinogenic HI is greater than one.
- Chemical-specific standards (i.e., Applicable or Relevant and Appropriate Requirements [ARARs], MCLs, or other measures [i.e., calculated risk-based RGs]) that define acceptable levels are exceeded and exposure to contaminants above these levels is predicted for the reasonable maximum exposure identified in the risk assessment.
- Site contaminants cause adverse environmental impacts.

For the OB/OD site, the first three listed items above apply, in that the cumulative excess carcinogenic risk for the current and future site worker scenarios exceeds 1E-04, the non-carcinogenic HI for the current and future site worker and current and future demolition worker scenarios are greater than one, chemical-specific ARARs, (MCLs), and calculated risk-based RGs are exceeded in groundwater, and calculated risk-based RGs are exceeded in soil and surface water.

Remedial Action Objectives (RAOs) provide a general description of what remedial action is anticipated to accomplish. RAOs are developed based on protection of human health and the environment including consideration of the goals of the CERCLA program.

Based on the BLRA (human health and ecological risk assessments), the preliminary ARARs, the media of interest, the COCs in soil, groundwater, and surface water at this site, and the anticipated land and beneficial groundwater use, the RAOs for the OB/OD site as defined in the ROD (LBG-BMcD, 2016) are:

Soil

- Prevent/minimize migration of COCs that would result in groundwater with concentrations of chemicals in excess of MCLs or risk-based cleanup goals for the current and future site worker and current and future demolition worker.

- Prevent/minimize inhalation of vapors from soil with COCs that exceed risk-based cleanup goals and/or have a total excess cancer risk greater than the USEPA 1E-04 to 1E-06 risk management

range or a HI greater than one for the current and future site worker and current and future demolition worker.

Groundwater

- Prevent/minimize ingestion of or direct contact with groundwater with COCs that exceed MCLs or risk-based cleanup goals for COCs without MCLs, and/or have a total excess cancer risk greater than the USEPA 1E-04 to 1E-06 risk management range for the current and future site worker and current and future demolition worker.

- Prevent/minimize ingestion of groundwater with COCs that exceed MCLs or risk-based cleanup goals for COCs without MCLs, and/or have a HI greater than one for the future site worker and current and future demolition worker.

- Prevent/minimize inhalation of vapors from groundwater that has COCs that exceed MCLs or risk-based cleanup goals and/or have a total excess cancer risk greater than the USEPA 1E-04 to 1E-06 risk management range or a HI greater than one for current and future site worker and current and future demolition worker.

Surface Water

- Prevent/minimize direct contact with surface water with COCs that exceed the risk-based cleanup goals and/or have a total excess cancer risk greater than the USEPA 1E-04 to 1E-06 risk management range for the current and future site worker and current and future demolition worker.

- Meet the criteria of the Kansas Surface Water Quality Standards (KSWQS) (Kansas Administrative Regulations [K.A.R.] 28-16-28c and 28-16-28e (b)

The RAOs are listed in the general sequence in which they should be addressed (USEPA, 1997).

3.2 Project Data Quality Objectives

Data quality objectives are qualitative and quantitative statements that clarify study objectives, define the type of data needed, and establish error limits for the quality and quantity of data needed to support decisions. Data quality objectives are used to establish performance criteria, or measurement quality objectives, that take into account the purpose of data collection, the types of data needed, and tolerable limits for making decision errors (USEPA, 2006). Data quality objectives for remedial activities are

presented in detail on Worksheet #11 of the Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) (Appendix A).

3.3 Remedial Cleanup Levels

Remedial cleanup levels (calculated risk-based RGs and MCLs) are based upon existing federal and state action levels for groundwater (i.e. ARARs, [MCLs]) or, for those COCs for which there are no existing levels, are calculated as being protective of human health and the environment under a reasonable use scenario (i.e., calculated risk-based RGs) (KDHE, 2010) (EPA, 2017).

During the USEPA review of the Final ROD, a comment was provided that documented the previous version was using screening levels from non-residential KDHE RSK values, where USEPA RSLs produced a more stringent result. A recalculation of screening levels was conducted for the ROD at the OB/OD Site. As a result of the recalculation, PCA was the only additional compound in soil added as a COC, which will be remediated in parallel with TCE by the selected remedy.

During the reassessment of the groundwater dataset utilized during the baseline risk assessment, 1,2,3-trichlorobenzene, cis-1,2-dichloroethene, and tetrachloroethene (PCE) exceeded the lower screening levels, and would have been further evaluated it the risk assessment. These compounds were further evaluated, and it was determined that current risk assessment was still adequate for these three compounds. Additional information regarding the use of RSLs for screening levels and the reevaluation of screening levels are provided as appendices to the ROD (LBG and BMcD, 2016).

The remedial cleanup levels (calculated risk-based RGs and MCLs) for the COCs at the OB/OD site are described in detail in the ROD (LBG and BMcD, 2016), and are as follows:

Soil

Due to the unique nature of the OB/OD site, a risk-based RG for TCE and PCA in soil was calculated for a future demolition worker and current/future site worker. Considerations for the calculation included the type of work that would be done - training and disposal of ordnance, and the total hours per year and number of years that a worker would be expected to be at the OB/OD site. The RG for each constituent represents the most conservative of the calculated individual allowable concentrations in order to remain protective of all exposure. The remedial cleanup levels for soil are:

- TCE – 10.72 mg/kg (calculated risk-based RG) (The remedial cleanup level for TCE in soil is based on non-cancer risk of current/future site worker.)

- PCA – 14.4 mg/kg (calculated risk-based RG) (The remedial cleanup level for PCA in soil is based on a cancer risk of current/future site worker.)

Groundwater

Although groundwater at the OB/OD site is not currently being used as a drinking water source nor is planned to be used as a drinking water source in the future, the groundwater at the site *could* be used as a drinking water source. Therefore, the MCLs are considered ARARs for those COCs in groundwater that have MCLs. For those COCs for which there are no MCLs, risk-based RGs were calculated. The remedial cleanup levels for groundwater COCs are:

- PCA – 2.55 micrograms per Liter (µg/L) (calculated risk-based RG) (The remedial cleanup level for PCA in groundwater is based on cancer risk.)
- TCE – 5 µg/L (USEPA MCL)
- Naphthalene – 2.61 µg/L (calculated risk-based RG) (The remedial cleanup level for naphthalene in groundwater is based on cancer risk.)
- Benzo(a)pyrene – 0.2 µg/L (USEPA MCL)
- bis(2-ethylhexyl)phthalate – 6 µg/L (USEPA MCL)

Surface Water

For surface water, risk-based RG were calculated based on the dermal contact of surface water by a future demolition worker. The remedial cleanup levels for surface water COCs are:

- PCA – 236 µg/L (calculated risk-based RG) (The remedial cleanup level for PCA in surface water is based on cancer risk.)
- TCE – 613 µg/L (calculated risk-based RG) (The remedial cleanup level for TCE in surface water is based on non-cancer risk.)
- Benzo(a)pyrene – 0.0374 µg/L (calculated risk-based RG) (The remedial cleanup level for benzo(a)pyrene in surface water is based on cancer risk.)

3.4 Applicable or Relevant and Appropriate Requirements

ARARs were identified for the OB/OD site by using KDHE's *Potential Applicable or Relevant and Appropriate Requirements, BER Policy # BER-RS-015* (KDHE, 2005) and review of other CERLCA process documents for other OUs at Fort Riley. The list of ARARs identified for the OB/OD site is shown in Table 3-1.

Remedial actions may have to comply with three functional groups of ARARs:

- **Chemical-specific ARARs** are health- or risk-based restrictions on the amount or concentration of a chemical that may be found in or discharged to the environment. The chemical ARARs may be used to set cleanup levels for the chemicals of concern in the designated media, or to set a safe level of discharge (e.g., air emission or wastewater discharge) where a discharge occurs as a part of the remedial action.

- **Action-specific ARARs** generally set performance, design, or other similar operational controls or restrictions on particular activities related to management of hazardous substances or pollutants. These requirements address specific activities that are used to accomplish a remedy. Action-specific requirements do not in themselves determine the remedial action; rather, they indicate how a selected remedial action alternative must be designed, operated, or managed.

- **Location-specific ARARs** are restrictions placed on the types of activities that may occur in particular locations. Location-specific ARARs generally prevent damage to unique or sensitive areas, such as flood plains, historic places, wetlands, and fragile ecosystems, and restrict other activities that are potentially harmful because of where they take place.

3.5 Description of the Remedy

The DA (Fort Riley) shall be responsible for implementing, maintaining, monitoring, reporting and enforcing the remedial actions identified for the duration of the remedy selected in the ROD. It will exercise this responsibility in accordance with CERCLA and the NCP.

Meeting the RAOs shall be the primary and fundamental indicator of performance, the ultimate aim of which is protecting human health and the environment. A detailed description of the RAOs is presented in Section 3.1. The major components of the selected remedy are described below:

Soil Removal with Treatment and Disposal

This component will address the TCE-contaminated soil located in the area of the metal debris pits (source area) which currently serves as a reservoir of contamination that could migrate to the groundwater and surface water and act as a source for direct exposure for potentially exposed populations at the site. The TCE-contaminated soil exceeding its calculated risk-based RG of 10.72 mg/kg will be removed by excavation and treated on site by landfarming to below actionable levels. The area will be restored by backfilling, grading, and reseeding. The LFTC will consist of a lined bermed area with a leachate collection system installed to collect and store contact water collected within the treatment cell limits. In

the treatment cell, excavated soil will be placed in windrows and periodically disked. Solar radiation, wind, and disking of the soil will promote volatilization and biodegradation of the TCE in the soil. After remediation is complete the soil will be transported to the Campbell Hill construction/debris landfill for use as landfill cover. Soil treatment via landfarming has proven to be effective at other Fort Riley sites.

Groundwater and Surface Water Monitoring

The groundwater and surface water monitoring component will be implemented to ensure that contamination present in the groundwater and surface water at the site are continuing to decrease in concentration and the contaminant plumes are continuing to decrease in size. Groundwater and surface water monitoring (sampling, analysis, and contaminant trend analysis) will be conducted at wells in the OB/OD site monitoring well network and at locations where surface water is present (ephemeral streams, seeps and spring) to determine if the contaminant concentrations are continuing to decrease. Trend analysis of the groundwater and surface water results will be used as evidence that the source removal is successfully reducing groundwater and surface water contamination. Additional monitoring wells may be installed at the OB/OD site on an as needed basis based on analytical results from the groundwater monitoring to monitor the plume as it decreases in size.

Groundwater monitoring will be conducted at monitoring wells within the OB/OD site monitoring well network and surface water monitoring will be conducted at surface water sampling points until their respective remedial cleanup levels have not been exceeded for a period of three consecutive monitoring events. Table 17-3 in the UFP-QAPP lists the wells, analytical parameters, and QC requirements for the baseline sampling events. In addition, Table 17-6 in the UFP-QAPP identifies the number of wells and frequency of sampling of the wells proposed for LTM at the site. Following completion of the RA, further information on the 11 wells proposed for LTM will be included in the LTM Plan.

ICs through the Fort Riley RPMP

ICs will be applied through use of the Fort Riley RPMP. The Fort Riley RPMP is the means the post authorities have to control and limit development and other activities on the post. This includes overall controls on restricting changes in land use; limiting access; prohibiting the installation of drinking water wells and groundwater/surface water use; and involving Fort Riley PWE personnel in the proposed future plans. The Fort Riley RPMP ensures compatibility of land uses are considered when planning for locations of functions or facilities. It is the equivalent of a city or county zoning plan. It also serves as a framework for maintenance and repair resource allocation, and development activities. Master planning for US Army installations is required by AR 210-20 which establishes a relationship between environmental planning and real property master planning to ensure that the environmental factors are

included in planning decisions and land use. This is accomplished by the LRC in the Fort Riley RPMP. It consists of a variety of narratives and supporting graphics. One of these graphic representations is the Master Plan Environmental Overlay. This graphic reflects operational and environmental constraints. The OB/OD site is designated as restricted land use in the Fort Riley RPMP as Training/Ranges.

The restricted designation in the Fort Riley RPMP directs users to the Master Plan Environmental Overlay that subsequently identifies the restrictions. Restrictions will limit exposure at the OB/OD site by:

- Restricting change of land use;
- Limiting access;
- Prohibiting the installation of drinking water wells and groundwater/surface water use in the area; and
- Involving Fort Riley PWE personnel in the proposed future plans for the OB/OD site.

The OB/OD site is an active range located within the Impact Area and is currently used for ordnance disposal; therefore, the site is gated with severely restricted access controlled through range controls.

ICs with respect to site-related contamination will continue until the soil, groundwater, and surface water are no longer a threat to human health or the environment. Additionally, as the OB/OD site is an active range located within the Impact Area, the range controls are anticipated to remain in place for the foreseeable future.

* * * * *

4.0 RD/RA SCOPE OF WORK

4.1 Overview of RD/RA Activities

The RD/RA will consist of the following activities, presented in the approximate order that they will be performed.

- Preparation of planning documents
- LFTC Design
- Survey and mark initial excavation footprint and previous soil boring locations
- Pre-Excavation Site Investigation
- Surface Soil Site Investigation
- Site mobilization/Initial UXO clearance
- Survey prominent site features
- Munitions and Explosives of Concern/ General UXO clearance
- Installation of 8 monitoring wells
- Baseline groundwater sampling
- Construct LFTC
- Source area removal
- Soil sifting and transport to LFTC
- Confirmation sampling
- Chemical oxidation application
- Excavation backfill
- LFTC operation
- LFTC confirmation sampling
- Disposal of remediated soil
- Long-term groundwater monitoring (3 years)

The order and timing of field activities may change based on weather, range activity, and analytical data collected during the field activates.

4.2 Planning Documents

Planning documents will be prepared, reviewed, and finalized prior to mobilization to the field.

4.2.1 RD/RA WP

This RD/RA WP is the main planning document for the RD/RA activities to be conducted at the OB/OD. The RD/RA WP will present the assigned personnel, conceptual site model, performance measurement criteria, project action limits, project tasks to include munitions clearance protocols; design specifications and drawings for the Pre-Excavation Soil Investigation (PESI) and surface soil sampling; design, construction and operation of the LFTC; establishment of access/egress and haul routes; site layout including staging, laydown, and decontamination areas; excavation and benching; screening plant operation; in-situ application of permanganate into the excavation; backfilling and compaction; and site restoration; sampling protocols, quality control (QC) summary, analytical protocols, data validation, documentation, and reporting.

4.2.2 Explosive Safety Submission

The Explosive Safety Submission (ESS) will be prepared by the USACE in accordance with DoD 6055.09-M, EM 385-1-97, and Data Item Description MMRP-003 as a stand-alone document and will be approved by the Department of Defense Explosives Safety Board (DDESB). The ESS comprehensively addresses required elements of the scope, including intrusive operations associated with the OB/OD – Range 16 MEC clearances and soil excavation, separation distances, transportation, storage, and disposal operations.

4.2.3 Accident Prevention Plan/Site Health and Safety Plan

The Accident Prevention Plan/Site Health and Safety Plan (APP/SSHP) contains safety protocols for MEC clearance, MEC disposal, construction, excavation, investigation, drilling, site restoration, hauling, emergency detonation by the by the 71st EOD standoff procedures, soil and groundwater sampling, in-situ chemical oxidation placement, and LTM activities. The APP/SSHP is presented as Appendix B to this RD/RA WP.

4.2.4 IDW Management Plan

The Investigation-Derived Waste (IDW) Management Plan outlines regulatory requirements and disposal options for investigative/remediation derived waste generated during RD/RA activities. The IDW Management Plan is included as attachment to the UFP-QAPP (Appendix A).

4.2.5 Environmental Protection Plan

This Environmental Protection Plan (EPP) outlines the operational procedures and methods to be implemented to conduct environmental protection, which is the prevention/control of pollution and

habitat disruption that may occur to the environment during project activities. The EPP is a stand-alone document and will be consistent with the Fort Riley protocols as outlined in the *Fort Riley Environmental Management Plan* (EMP) and *Fort Riley Spill Prevention, Control, and Countermeasures Plan* (SPCCP) and *Installation Spill Contingency Plan* (ISCP).

4.2.6 Stormwater Pollution Prevention Plan/Best Management Practices

Best management practices for soil erosion and sediment controls will be used to prevent the amount of soil particles carried from a land area and deposited in receiving waters. The location and type of best management practices installed to reduce erosion will be based on the field conditions at the time of remedial activities. The Stormwater Pollution Prevention Plan (SWPPP) is prepared in accordance with the applicable permit process. The SWPPP identifies the pollution prevention controls and procedures to be implemented during the removal activities and the inspection and maintenance required to ensure the measures remain protective of water resources. The SWPPP is presented as Appendix C to this RD/RA WP.

4.3 RD/RA Communication

Multiple Fort Riley stakeholders and contractors will be involved with the project. Coordination protocols for this project are stringent and require daily coordination with the Fort Riley Directorate of Plans, Training, Mobilization, and Security (DPTMS)-Range Control for access permission to any portion of the range. The Fort Riley Directorate of Safety-Garrison Safety Office is the primary stakeholder in approval of the ESS and during munitions demolition. The Division G3-Training is the point of contact for scheduling the project field activities to align with the training schedule. Coordination with the 71st EOD will occur if munitions demolition is required. Fort Riley PWE will facilitate coordination among the installation personnel, USACE and Tehama. Stringent coordination requirements will prevent interference with the military training mission and protect personnel. A daily communication flow chart is provided as Figure 4-1, and additional information on the Communication Plan is provided in the Project Management Plan (PMP).

4.4 Schedule Management

Schedule is an important part of the OB/OD Project and provides the project team and stakeholders a picture of the project's status at any given time. The schedule management approach is detailed in the PMP; however, one critical purpose of the schedule management is to align the project schedule with the military training schedule. Tehama will coordinate activities with the installation and Fort Riley DPTMS-Range Control personnel to ensure that the proposed schedule does not conflict with other contractor

activities on site, or interrupt installation mission activities. In the event that Range 16, or adjacent Range 18 are needed for military mission critical activities, military use of firing ranges and disposal of munitions by the 71st EOD takes precedence over contractor work. It is understood that normal working hours during the day could be shortened and that work days could be staggered in between range training activities. The project team will be prepared to demobilize from the site with little notice, during all phases of work. If Tehama is asked to demobilize from the site, the Tehama Project Manager (PM) will work with the installation and DPTMS-Range Control personnel to schedule remobilization and continuation of site work when range training activities are complete.

4.5 Landfarm Treatment Cell Design and Permitting

The LFTC will be located near the entrance to the site to prevent having to use UXO personnel for the bi-weekly tilling events and the three soil sampling events. A general site layout is presented in Figure 4-2 and the LFTC Plan is presented as Figure 4-3. Figure 4.3 details the location of the LFTC, the perimeter soil berm profile, location of the 2,500-gallon leachate collection tank and piping from the LFTC to the collection tank.

Vegetation will be stripped from the LFTC footprint and the area will be graded to a smooth surface. A 6-inches thick, compacted clay base will be placed to cover any surface irregularities or bedrock shards that outcrop in the area. Prior to placing the high density polyethylene (HDPE) liner on the clay base, the compacted clay will be inspected to ensure it is free from any rocks or objects that could damage the HDPE liner. A triangular shaped berm measuring 3.5-foot high with a 1-foot wide rounded top will be constructed from compacted clay will be installed surrounding the cell to contain the contaminated soil and prevent run-on and runoff. The base and berm will be covered with a 30-millimeter (mm) HDPE liner (Poly-Flex) specifically designed for containment of hazardous waste and to be resistant to ultraviolet light. The HDPE liner will be welded at the seams to preclude leakage from the treatment cell. The HDPE liner will be anchored by sandbags or by a berm of soil around the perimeter of the LFTC. Graded sand will be spread across the liner to a uniform depth of 6 inches. The sand will protect the liner from damage during the soil disking. A section of the welded liner will be provided to a project engineer for QC inspection. An access ramp will be constructed for equipment to enter and exit the LFTC. The access ramp will be built such that a layer of sand or soil is maintained to protect the liner from damage. During the tilling events, the LFTC will be inspected and any repairs that may be needed will be conducted immediately.

Excavated soil will be transported to the LFTC and spread to a target depth range of 1.5 feet to 2.5 feet. Maximum LFTC capacity for the LFTC, as designed, is approximately 4,400 cubic yards (cys).

To account for the accumulation of precipitation, the LFTC will have a minimum slope of 1.5% to allow precipitation to travel to a designated sump area where the water will accumulate. The LFTC area will be surveyed before and after placement of the compacted clay to ensure proper sloping and minimum thickness of the clay. The sump area will also be lined. The water that accumulates in the sump will be pumped to a 2,500-gallon collection tank, sampled, and treated off-site in accordance with the IDW Management Plan (Attachment D of the UFP-QAPP). Previous landfarming operations completed at the Fort Riley Drycleaning Facility have included a 2,500-gallon collection tank in LFTC design (ECC-BMcD, 2006).

Typically, a landfarm permit would be required from KDHE for soil treatment. However, the LFTC is 200 x 200 feet (40,000 feet^2) and does not meet the one-acre criteria that would require a permit. Based on Fort Riley's approach for two other LFTCs constructed and operated at other OUs, Fort Riley will meet the substantive requirements as identified in the KDHE Landfarm Application. A memorandum addressing the KDHE LFTC requirements is included as Appendix D to this RD/RA WP.

4.6 Pre-Excavation Soil Investigation

The PESI will be conducted to confirm the extent of the excavation. Twenty direct-push locations will be advanced to bedrock. UXO clearance will be completed along all driving paths and work areas prior to work commencing as per the APP/SSHP. Prior to the start of any intrusive field activities, a utility locate will be performed in accordance with standard operating procedure provided in the UFP-QAPP (Appendix A) and the APP/SSHP (Appendix B). Applicable sample locations from previous investigations will be marked by a surveyor prior to conducting direct-push borings. Direct-push boring locations will be placed in the grid pattern shown in Figure 17-3 of the UFP-QAPP and sampling will start near the center of the proposed excavation area and move outward. Each boring will be logged and field screened using a photoionization detector (PID). One soil sample will be collected from each 5-foot interval. Within each 5-foot interval, a soil sample will be collected from the area which had the highest field screening concentration result. If no PID readings above zero are recorded, a sample will be collected from the approximate middle of the 5-foot interval. If groundwater is encountered in a boring, a groundwater sample will be collected from that boring. Soil and groundwater samples will be sent to an off-site laboratory for analysis of VOCs. Additional details regarding sample standard operating

procedures, sample rationale, sample analysis and quality assurance (QA)/QC samples are provided in the UFP-QAPP (Appendix A).

To help determine real time data and provide step out information, field gas chromatography (GC) will be utilized for TCE and PCA analysis. Select locations for pre-excavation soil sampling may share the same location as surface soil samples. For these locations, the surface soil sample will be collected prior to the pre-excavation samples from the same boring location (Section 4.5). Once these locations have been sampled, a survey will be conducted by a licensed Kansas surveyor.

Data collected for this investigation will be validated and a Quality Control Summary Report (QCSR) will be presented for approval. The data will also be presented in a PESI Summary Memorandum, which will summarize the field data, confirm the primary excavation configuration, and finalize the placement of eight monitoring wells.

4.7 Surface Soil Investigation

A surface soil investigation will be conducted to determine the extent, if any, of TCE and PCA in surface soil adjacent to the proposed primary excavation. Detonation has taken place in the source area, which may have caused contaminated soil to be lifted by the blast and deposited in adjacent areas surrounding the identified source area. If results indicate soil was deposited in adjacent areas due to detonations, then a portion of the surface soil may have to be scraped. UXO sweeps will be completed along all driving paths and work areas prior to work commencing as per the APP/SSHP and Section 4.8.1. Surface soil samples will be collected at twenty-seven locations on 20-foot centers at a depth of 0 to 6 inches. Soil samples will be sent to an off-site laboratory for analysis of VOCs. Additional details regarding sample standard operating procedures, sample rationale, and analysis are provided in the UFP-QAPP (Appendix A).

To help determine real time data and provide step out information, a field GC will be utilized for TCE and PCA analysis. Select locations for pre-excavation soil sampling may share the same location as surface soil samples. For these locations, the surface soil sample will be collected prior to the pre-excavation samples from the same boring location (Section 4.4). Once these locations have been sampled, a survey will be conducted by a licensed Kansas surveyor.

Data collected for Surface Soil Investigation will be validated and included in the PESI QCSR and presented in the PESI Summary Memorandum.

4.8 Site Mobilization / Initial UXO Sweep

4.8.1 General UXO Sweep/Escort Procedures

A general UXO surface sweep will be conducted to prepare the site for the remedial action (office area, excavation area, monitoring well location areas, LFTC area, haul routes and laydown areas, equipment and IDW staging areas, and explosive storage areas), UXO QC checks, and coordination with Fort Riley Range Office. All UXO activities will be conducted in accordance with the Explosive Safety Submission and APP/SSHP (Volume II).

4.8.1.1 Escort Procedures

The areas to be surface swept will be clearly marked by the project team. During this delineation process the person marking the areas will be escorted by a qualified UXO technician.

The UXO team must conduct a surface access sweeps for anomalies before any type of activities commence, including foot and vehicular traffic.

Non-UXO personnel must be escorted by UXO personnel at all times in areas potentially containing MEC until the UXO team has completed the access sweeps and the cleared areas have been marked. Escorted personnel will follow behind the UXO escort. If anomalies or MEC are detected, the UXO escort will halt escorted personnel in place, select a course around the item, and instruct escorted personnel to follow.

The UXO team/escort will conduct an access survey of the footpath and/or vehicular lanes approaching and leaving sampling areas with known or suspected MEC. Typically, the access route will be at least twice as wide as the widest vehicle that will use the route.

The UXO team/escort must also complete an access survey of an area around the proposed investigation site that is large enough to support all planned operations. The size of the surveyed area will be site-specific and will take into account things such as, maneuverability of required equipment (e.g., drill rigs, excavation equipment, etc.), parking of support vehicles, and establishment of decontamination stations. As a minimum, the surveyed area will have a dimension in all directions equal to twice the length of the longest vehicle or piece of equipment to be brought on the OB/OD Site.

A hand-held Schonstedt magnetic locator capable of detecting the smallest known or anticipated military munition will be used to locate anomalies just below the surface that may be encountered through erosion from rain or continual vehicular traffic. The hand-held Schonstedt locator detects the magnetic field of

ferromagnetic objects and provides audio detection signals that peak in frequency when the locator's tip is held directly over the target.

If anomalies or surface MEC are encountered, they will be marked with flagging and the investigation area will be relocated to avoid contact. The UXO team/escort will clearly mark the boundaries of the surveyed area using survey flagging and pin flags. The UXO team will establish a system of flagging colors that will distinguish anomalies, surface MEC, and route boundaries from each other as well as from any utility markings that have been used at the site.

In the event that MEC is encountered that cannot be avoided or, based on its fuzing or current condition, presents an imminent hazard requiring immediate attention, the UXO Escort will notify the SUXOS. Demolition operations will be conducted in accordance with the RD/ RA WP.

4.8.1.2 Surface Sweep Procedures

After the exclusion zone has been established and the technicians have performed instrument function checks, the UXO Tech III and Tech II will begin operations to surface sweep the work areas. Operators will sweep an analog hand-held AGM sensor (schonstedt) in small arcs in front of them as they proceed to focus their sight on the ground in front of them and provide an audible backup signal. This process will be followed until the area is cleared of surface MEC and Material Potentially Presenting an Explosive Hazard (MPPEH). The following actions will take place during the surface clearance:

- All visible targets (or partially visible) will be removed.
- All partially visible targets will be excavated by excavating from the side of the target until they are recognizable. If an item is suspected MEC, a UXO Qualified person must positively identify the item. The Team leader will notify the site manager as soon as possible if a MEC item is located.
- The UXO Tech III will document the location of, photograph, and record all information regarding the MEC.
- MPPEH, MEC, Munitions Debris and non-munitions related debris will be managed in accordance with this RD/RA WP and the APP/SSHP.
- All MEC/MPPEH discovered will stay within the sited munitions response site (MRS) boundary.

4.8.2 Pre-Remedial Action Survey

Following the general UXO sweeps, a survey will be conducted by a licensed Kansas surveyor to tie in prominent site features such as streams, metal debris pits, burn pits, access roads, proposed LFTC area,

and the excavation area into existing surveyed locations such as previously existing monitoring wells. UXO sweeps will be completed along all driving paths and work areas prior to work commencing as per this RD/RA WP and the APP/SSHP.

4.8.3 Utility Locations

Prior to the start of intrusive field activities, a utility locate will be performed in accordance with the Standard Operating Procedure provided in the UFP-QAPP (Appendix A) and the APP/SSHP (Appendix B).

4.8.4 Mobilization

Upon completion of the pre-remedial action survey, the Tehama team and subcontractors, as appropriate, will mobilize to the OB/OD site and set up the work area as shown on the Figure 4-2 OB/OD Site Layout.

4.9 Monitoring Well Installation

Eight monitoring wells will be installed following approval of the PESI. These wells will be installed, developed, and sampled before the remedial action begins to provide a baseline concentration for comparison of post-performance monitoring data. UXO clearance will be completed along all driving paths and work areas prior to work commencing as per the APP/SSHP. Because contaminant concentrations are above the MCL in both overburden and bedrock, four wells will be installed in the overburden and four wells will be installed in the bedrock. The actual location of the wells will be determined based on the results of the PESI and presented in the PESI Summary Memorandum. Additional details regarding sample standard operating procedures, sample rationale, and analysis are provided in the UFP-QAPP (Appendix A).

4.10 Baseline Groundwater Sampling

Twenty-four wells, including the newly installed and existing monitoring wells will be sampled using dedicated bladder pumps and low-flow procedures. This sampling event will provide a concentration baseline for the OB/OD site prior to implementing the remedial action. All wells will be sampled for VOCs; methane, ethane, and ethene; polycyclic aromatic hydrocarbons (PAHs), general groundwater quality parameters (nitrate, sulfate, etc), and stabilization parameters (pH, turbidity, dissolved oxygen, oxidation reduction potential, and temperature). Purge water will be handled as indicated in the IDW Management Plan included in Attachment D to the UFP-QAPP. Two seeps, two surface water, and one spring sample will be collected during the baseline groundwater sampling, if present. UXO clearance will be completed along all driving paths and work areas prior to work commencing as per the APP/SSHP.

Additional details regarding sample standard operating procedures, sample rationale, and analysis are provided in the UFP-QAPP (Appendix A). Table 17-3 in the UFP-QAPP lists the wells, analytical parameters, and QC requirements for the baseline sampling events. In addition, Table 17-6 in the UFP-QAPP identifies the number of wells and frequency of sampling for the wells proposed for LTM at the site. Following completion of the RA, further information on the 11 wells proposed for LTM will be included in the LTM Plan. The LTM Plan will be submitted following the completion of the RA.

Groundwater data collected during the Baseline Sampling Event will be validated and a QCSR will be presented for approval. The data will also be presented in a Baseline Groundwater Summary Report, which will present the field activities and a summary of the groundwater data.

4.11 Landfarm Treatment Cell Construction

The LFTC will be constructed in accordance with the remedial design shown on Figure 4-3 and detailed in Section 4.5. The LFTC will be located near the entrance to the site to prevent having to use UXO personnel for the bi-weekly tilling events and the three soil sampling events (Figure 4-2). Excavated soil will be transported to the LFTC and spread to a target depth range of 1.5 feet to 2.5 feet. Maximum LFTC capacity for the LFTC, as designed, is approximately 4,400 cys.

The PESI will be used to further define the limits of the excavation and the quantity of soil excavated during the source area removal. The general area of excavation is centered on the northern metal debris pit, and has been initially defined as 75 feet long, 50 feet wide, and 15 feet deep (~2,100 cubic yards). As stated above, the LFTC is being designed to hold additional soil volume of up to 4,400 cubic yards; however, the treatment could be expanded to hold additional soil if the PESI indicates that additional source area removal is necessary. The PESI Summary Memo will confirm the primary excavation configuration, volume of soil to be excavated, and the dimensions of the LFTC.

4.12 Source Area Removal

The general area of excavation is centered on the northern metal debris pit (Figure 4-2), and has been initially defined as 75 feet long, 50 feet wide, and 15 feet deep (~2,100 cys). This area has been identified based on the RI and will be refined based on the results of the PESI. Historic TCE concentrations in the general area of excavation ranged from not detected to 2,000,000 micrograms per kilogram (µg/kg) (LBG-BMcD, 2016). Soil above the remedial cleanup levels for TCE (10,720 µg/kg or 10.72 mg/kg) will be removed and transported to the LFTC on the designated haul routes (Figure 4-2). Based on results of the Surface Soil Investigation, there may also be a surface scrape excavation. The proposed final excavation and surface scrape footprint will be presented in the PESI Summary Memorandum.

Before beginning soil excavation activities, the excavation area will be prepared and erosion/storm water control measures will be implemented. Erosion/storm water control measures will be implemented as indicated in the SWPPP (Appendix C). Berming and trenching will be completed around the excavation to prevent overland flow from precipitation events from entering the excavation. A minimal amount of groundwater is anticipated to be encountered at the soil/bedrock interface, and is not expected to interfere with excavation or screening operations. Any accumulations of water in the excavations will be removed and placed in a temporary water collection tank at the site. At the completion of excavation activities, water in the tank will be sampled for VOCs and managed in accordance with the IDW Management Plan (Attachment A to the UFP-QAPP). A working zone will be setup around the perimeter of the proposed excavation. The working zone will be defined as indicated in the APP/SSHP (Appendix B). During excavation activities, readings from a combustible gas indicator will be taken from various monitoring locations during excavation to ensure that the air in the work zone and around the perimeter remains safe. Readings will be recorded in the field log book along with time and location.

The excavation will be conducted by ZAPATA using a robotic JD 350 Excavator with a 4 cy bucket. Material will be excavated and stockpiled near the remote controlled QE440 screen plant as shown on Figure 4-2. Material will be processed through the screen plant as described in Section 4.11. No personnel, including haul truck drivers, will be allowed in the hazardous fragment distance (HFD) boundary while the screen plant is in operation.

Soil that has been MEC cleared and stockpiled, will be transported to the LFTC. A wheeled bucket loader will be stationed at the sifted stockpile to load haul trucks. The haul trucks will transport the sifted material to the LFTC where the soils will be placed into the treatment cell (Figure 4-2). A low ground pressure dozer will be stationed in the cell to evenly distribute the soils within the footprint of the cell.

To confirm that the extent of excavation has satisfied the soil remedial action objective, a field GC will be on site to provide real-time data for soil concentrations along the sidewalls and bottom and for additional stepping out of the excavation if needed. Confirmation soil samples will be collected from the sidewalls of the excavation on 10-foot centers along the sides of the excavation and on 5-foot centers along the depth of the excavation. There will be three rows of confirmation sampling for 250 linear feet of excavation wall (two 75-foot walls and two 50-foot walls). Confirmation samples will be collected from the bottom of the excavation on 10-foot centers over the 75-foot by 50-foot bottom. An estimated 144 confirmation samples will be submitted to an off-site laboratory for analysis of VOCs. Due to the large number of confirmatory samples, sample collection may take up to two days to be completed and may be

collected and analyzed in multiple phases as the excavation advances. Additional details regarding sample standard operating procedures, sample rationale, and analysis are provided in the UFP-QAPP (Appendix A).

Confirmation samples will be collected utilizing the bucket of the excavator to eliminate the need for field personnel to enter the excavation. Shoring of the excavation will not be required if field personnel do not enter the excavation. Excavation confirmation soil data will be validated and presented in a QCSR for approval.

When the excavation is considered completed based on off-site soil confirmation results, a topographic survey to 0.1-foot horizontal and vertical control will be completed to document removed quantities. The survey will extend 10 feet out from the edge of the excavation. The results of the survey will be presented on a drawing that shows the spot elevations, the top perimeter of the excavation at the original ground surface, and 1-foot contour intervals for the entire surveyed area. The drawing will be included in the Remedial Action Completion Report.

4.13 Munitions and Explosives of Concern / Metal Debris Pit UXO Clearance

It has been determined that the potential for large MEC items (155 mm projectiles) exists; therefore, the excavation of impacted soil will be conducted using robotic excavating equipment and remote screening/processing methods to safely achieve the performance objectives at the OB/OD site. Intrusive investigation activities will be conducted in accordance with approved project RD/RA WP, APP/SSHP, UFP-QAPP, and latest version of the DDESB-approved ESS. MEC discovered at the OB/OD site during previous investigation included assorted fuzes, primers, boosters, rockets, mortars, grenades, mines, small-arm rounds, and various other rounds including 155mm projectiles. The larger MEC items and their components that have been found on the OB/OD site included 155mm projectiles. Based on the worst-case scenario, the 155mm M101 projectile is selected as the Munition with the Greatest Fragmentation Distance (MGFD) with maximum horizontal fragmentation distance of 2,894 feet. However, the greater K18 of 55 feet from the 155mm M795 projectile is the required safety distance of an operator in a hardened piece of heavy equipment with hearing protection. The 55 feet safety distance cannot be maintained using conventional manual excavation methods which is why robotic operations have been selected for this removal action.

For the RA at the OB/OD site, soil excavation, screening, and processing of the target excavation area will be conducted. This area covers approximately 75 feet by 50 feet (0.08 acres) by 15 feet in depth, which equates to approximately 2,100 cys of soil to be excavated and sifted. This total does not include

benching or sloping of soil at the excavation, if required. Because historical detonations have created craters up to 10 to 15 feet in depth, all material removed from the excavation will be screened and cleared for MEC.

A robotic JD 210 Excavator with 2.75 cy bucket, a remote-controlled screen plant, robotic PT-100, and an armored JD 744 wheel loader with 4 cy bucket will be utilized for the excavation. The screen and plant will be positioned to ensure sufficient standoff from other operations to facilitate maintenance and repairs. Excavation activities will be completed in compliance with the most recent revision of EM-385-1-1, including sloping of sidewalls or mechanical protection of excavations as appropriate, staging of equipment and personnel in relation to open excavations, and access control.

4.13.1 Screen Plant Operation

Material will be excavated from the source area and placed to one side of the excavation as the material is being removed. Once the material is stock piled, the operators will determine if quicklime should be added to reduce cohesion so that the material will sift more efficiently. If lime is needed, the operators will deposit the lime on top of the stock piles and mix in thoroughly. The lime bags will be staged around the pile. These bags will be tied to the excavator bucket and the dump shoot. All personnel will exit the area and the remote operator will spread the lime on to the pile remotely. The amount of lime used will be determined by the amount of clay in the soil. The maximum amount of lime used would be ratio of 3 tons of lime to 100 yards of clay. Once the material is ready for screening (24 to 48 hours after lime application), the screen plant and magnet will be set up and the remote excavator will start loading the hopper with excavated material. The material will pass over a 4-inch screen and any item 4 inches in size and larger will travel down the conveyor and be deposited off the end of this conveyor. Any material below 4 inches in size will pass across the screen to a ¾-inch screen. Anything ¾- inch or larger in size will travel on a conveyor and will be deposited at the end of this conveyor. Anything below ¾-inch will pass under a cross belt magnet and will be stock piled for final QA/QC. All materials coming off the screen plant will be inspected by qualified UXO personnel for MPPEH. All MEC/MPPEH discovered will not be moved outside the sited MRS.

If an object is stuck in the screen plant and it is determined to be a do not move item, engineering controls will be utilized to remove the object. This may include the use of rope tied to object with the other end tied to the bucket on the excavator, to remotely pull the item from the screen plant and place it in a designated area for further disposal.

If the screen plant becomes disabled with material still on the conveyors, a UXO team will inspect for items of concern. After the repairs are made, a qualified person will start the machine and engage the belts, then move away to a safe distance. All other personnel will be outside the exclusion zone during this process.

Following the sifting of the excavated spoils the team will begin collecting and removing the munitions debris (MD) from the spoils by hand. After the collection and sorting process has been completed, the MD will be transported to an area designated for further sorting and subsequent inspections. All MPPEH will undergo a preliminary inspection to determine its explosive safety status by a UXO Tech II and III to determine final disposition. Any items that contain an explosive hazard and are determined to be acceptable to move will be transported to the designated area for destruction by open detonation. The Senior UXO Supervisor (SUXOS) and UXO Safety Office (UXOSO) and the site explosive safety specialist (OESS) (if available) will determine if an item is acceptable to move. Explosively configured items that are unsafe to be moved will be removed by robotic-controlled machines and placed in the designated area for destruction by open detonation. A guard will secure MEC items until destroyed. All MEC items will be destroyed on a daily basis if possible. Items that contain no explosive hazard will be managed as outlined in Department of Defense Instruction (DoDI) 4140.62 and EM 385-1-97 until they can be confirmed as material documented as safe (MDAS). The SUXOS (certifier) and UXO Quality Control Supervisor (UXOQCS) (verifier) in the absence of the USACE OESS will inspect and sign all MDAS documentation. The items will be segregated, and stored in a lockable container on the project site until they can be processed through a smelter.

After the stockpiled soils are cleared for MEC, the excavated soils will be turned over to be loaded into haul trucks by a wheeled loader and transported to the LFTC. UXO support will be provided during screen plant operation.

4.13.1.1 General Safety Guidelines for Sift Conveyor Operations

Only trained personnel should be allowed to install, set up, operate, maintain and disassemble this equipment. A copy of the Manufacturer's Operation Manual will be available for any persons installing, using, maintaining or repairing this equipment. Emergency Stop (E-STOP) buttons and remote E-STOP are installed on each sifting and screening machine in various locations. All personnel involved in operations must be familiar E-STOP locations and operations for the purpose of stopping all equipment functions instantaneously in the event of an emergency situation.

Make sure that Safety Instructions and Safety Labels are attached to the equipment and that they are clean and visible at all times.

Always Switch Off and Lock Out this equipment prior to making any adjustments or repairs.

Ensure all PPE is worn by personnel, which may include work gloves, eye protection, hard hat, steel toe boots, hearing protection and dust mask while working around this equipment. Site specific PPE requirements will be included in the APP/SSHP.

DO NOT operate this equipment if any safety guards or devices have been removed.

Steps, handrails, tread plates and fixed guards may be present on equipment where personnel are required to climb on these machines. Portable ladders may be used to provide temporary access to the sides of machines, as needed, as specified in the OSHA 3124-12R-2003 and EM 385-1-1.

Always maintain three (3) points of contact whenever climbing on to or off of this or any piece of equipment.

When tracking the equipment, the gradient must never be more than 10 degrees Port to Starboard or 20 degrees Front to Back. The machine must always be on flat, solid ground when operating.

4.13.2 Explosive Maintenance, Storage, and Transportation

This RD/RA WP, consistent with DID WERS-002.01, outlines the procedures that will be used to perform MEC identification and disposal operations at the OB/OD Site. ZAPATA will acquire all required federal and state permits. Licenses or permits issued under this Section or a copy of a license or permit will be posted and available for inspection. The procedures are in accordance with the following:

- FAR 45.5
- ATFP 5400.7
- DOD 6055.9-STD
- AR 190-11
- Department of Transportation (DOT) Regulations

4.13.2.1 Licenses/Permits

ZAPATA has a Bureau of Alcohol, Tobacco, Firearms, and Explosives (BATF) permit and related permit extension to purchase and use explosives. This permit (Figure 4-4) will be posted on site and will be

available for local, state, or federal inspection. Accountability and use of the explosives will remain with ZAPATA unless custody is transferred to the Government or other agency with a current BATF explosive license.

4.13.2.2 Acquisition

4.13.2.2.1 Order Quantity

ZAPATA will order the appropriate amount of demolition explosives from an authorized explosive vendor for disposal operations.

4.13.2.2.2 Acquisition Source and Method of Delivery

The primary method of explosive acquisition will be on call delivery. However, if site conditions change and the need exists, other options of site storage may be considered and arranged. Donor explosives will be delivered on an as needed basis from a vendor. ZAPATA will order the type and quantity of explosives needed for each demolition operation from Tripwire Operations, Omni Supply, or Bonetti Explosives and deliver to the site on an as needed basis. Bringing explosives onto the installation will be coordinated with the Provost Marshall's Office, the Directorate of Emergency Services, and the Garrison and Division Safety Office.

Class 1.4 explosives will be used whenever possible, because they are safer to handle, easier and less expensive to ship and store, and more readily available. The demolition materials anticipated for use on the project are listed in Table 4-1.

4.13.2.3 Initial Receipt

Shipments of explosives will be by the explosives supplier. The explosive supplier is responsible for all permits and documentation required by Federal, state, and local regulations. Only individuals listed on the Explosives Authorization List may sign for explosives from the shipper. Upon initial receipt of a shipment of explosives, each container of material will be inspected and inventoried by two ZAPATA personnel. The contents of the shipment will be verified based on the quantity and type of material ordered, as indicated on the invoice, shipping documents, or bills of lading.

4.13.2.3.1 Receipt of Explosives

The original receipt documents and an inventory will be maintained on file by the SUXOS. Upon receipt of the explosive materials shipment, copies of the supplier's Bill of Lading documentation will be sent to ZAPATA'S Charlotte office within three working days. At the completion of the project, the original

documents will be sent to ZAPATA'S Charlotte office, where they will be maintained for a period of five years. Copies of the documentation will be included in the final report.

4.13.2.3.2 Reconciling Discrepancies

The SUXOS will inventory explosives received by lot number and quantity. The quantity received will be checked against the shipping manifest and any discrepancies will be annotated on the shipping document and immediately reported to ZAPATA'S Charlotte office and to the explosives supplier. It is then the responsibility of the supplier and shipper to rectify the situation. ZAPATA will then notify the supplier, and if necessary BATF, to reconcile any discrepancies. The amount received will be recorded on the Explosives Accountability Record/Magazine Data Card.

4.13.2.4 Storage of Demolition Explosives

ZAPATA is using on call delivery for explosive their needs. If inclement weather or other unforeseen circumstances cancels or delays the demolition activities, ZAPATA will either hire a private security firm or select members of the MEC-removal team to guard the demolition explosives until demolition activities are completed.

4.13.2.5 Transportation

The demolition explosives will be delivered to Range 16 by the explosive vendor. The explosives will be placed in a day box. Blasting caps will be stored separately in an IME container. The day box will be positioned in the safe area but still walking distance to the disposal site. Demolition explosives will be delivered to the OB/OD Site per specific route as indicated on Figure 4-5.

4.13.2.6 Receipt Procedures

The SUXOS will strictly control access to all explosives. All issues, turn-ins, and inventories of explosives will be properly documented and verified, though physical count, by the UXOQCS.

4.13.2.6.1 Records Management

Upon receipt, the type, quantity, and lot number of each explosive item will be checked against the manifest. The original receipt documents will be maintained on file by the SUXOS. All original explosive records will be forwarded to ZAPATA for archiving in accordance with BATF regulations and requirements. BATF requires ZAPATA to maintain explosive records for commercial purchases for a period of five years. Copies of all records will be maintained on site by the SUXOS and be available for inspection by authorized agencies. Explosive items will be tracked using the lot number until the item is expended or transferred to Government control and accountability.

4.13.2.6.2 Authorized Individuals

ZAPATA is required to provide commercial suppliers with documentation of individuals authorized to request and receipt for explosives. The individual authorized to receipt and issue explosives is the SUXOS and if the SUXOS is not available, an identified and authorized UXO technician or manager will be appointed. On site, the SUXOS will designate in writing the UXO personnel who are authorized to transport and use explosives.

4.13.2.6.3 Certification

The SUXOS and UXO Technician III team leader performing demolition will sign and date the Explosives Consumption Certificate certifying that the explosives were used for their intended purpose.

4.13.2.6.4 Procedures for Reconciling Receipt Documents

The SUXOS will reconcile the delivery shipping documentation with the requested amounts ordered and received. Any shortages or overages will be reported to the explosives supplier to reconcile any differences.

4.13.2.7 Inventory

When explosives are received on-site, the SUXOS will perform and document the inventory. The SUXOS will strictly control access to all explosives and will review all requests for explosives for the site. Only sufficient explosives for the day's operations will be removed from storage. A weekly inventory of explosives will be conducted while explosives are stored on site.

4.13.2.8 Reporting Loss or Theft of Explosive Materials

If it is confirmed that ordnance or explosives are missing, the ZAPATA PM and the USACE OESS will be notified, and the SUXOS will immediately notify the Contracting Officer by telephone, followed up by a written report within 24 hours. ZAPATA also will notify BATF (800-800-3855) within 24 hours of discovery, and complete ATF Form 5400.5, "Report of Theft or Loss -Explosive Materials," and mail to the nearest BATF office. Theft or loss of explosives will be reported as required in 27 CFR 55.30. A Report of Theft or Loss – Explosive Materials, ATFP Form 5400.5, will be completed and forwarded within 24 hours to the BATF, with a copy to the ZAPATA PM and the USACE OESS. The following persons will be notified immediately upon discovery of theft or loss of explosive materials:

- BATF at 1-800-800-3855 ATFP 5400.7
- Local law enforcement via 911 (from local landline) AR 190-11
- The USAESCH Contracting Officer

- ZAPATA PM, Mr. Tim Hendrix at 828-421-3794

4.13.2.9 Procedures for Return to Storage of Explosives Not Expended

All explosives will be expended.

4.13.2.10 Procedures for Disposal of Remaining Explosives

All explosives will be destroyed by detonation.

4.13.3 MEC/MPPEH Accountability

The UXO Tech III will document the total weight of cultural debris and Range Related Debris (RRD), MD, and MEC found including item description, condition, and disposition. Additionally, the UXO Tech IIIs will take digital photos of representative MEC found during the source area removal activities.

4.13.4 MEC Security

ZAPATA will either hire a private security firm or select members of the MEC-removal team to guard the MEC until the items are destroyed.

4.13.5 MEC Destruction

ZAPATA will be responsible for the destruction of all MEC encountered during the project utilizing qualified personnel and in accordance with all applicable guidelines and the RD/RA WP and ESS. ZAPATA holds a Federal ATF Explosives License and is able to purchase, store, and use explosives for the destruction of MEC. ZAPATA will have a Senior SUXOS, UXO safety officer UXOSO, and UXO Tech I, II, and III at the OB/OD during RA activities.

ZAPATA will order the type and quantity of explosives needed for each demolition operation from Omni Supply, Bonetti Explosives, Austin Powder or Tripwire Operations. The explosives will be delivered to the site via commercial ground transportation on a “just in time” delivery basis. Transportation of demolition explosives will be conducted in accordance with DOT regulations. ZAPATA will maintain accountability/records for all demolition explosives it receives.

The range is in an area comprised of active ranges in a controlled environment. In most cases, munitions disposal and venting operations can be carried out with minimal security post and no engineering controls. However, in the event a larger than expected suspect live ordnance item is discovered, ZAPATA will use extra security to secure all roads that fall within the exclusion zone. Items that are not acceptable

to move by hand will be moved to the disposal area by remote means. Demolition activities are proposed to take place on a daily basis. Items found will be destroyed the day the donor explosives arrive.

Donor explosives will arrive via ground transportation (FedEx or Conway). The demo truck will be outfitted with an approved day box and separate Institute of Makers of Explosives (IME)/DOT box for the blasting caps. It is possible that all the required materials will not arrive on the same day. Demolition operations will begin as soon as possible following briefings and notifications. ZAPATA will contact the USACE OESS and Range Control as soon as possible when demolition operations are required and will provide the following information:

- Type and quantity of demolition explosives
- Quantity and type of MEC
- Net explosive weight of each demolition shot
- Location of demolition shot

4.13.6 MEC Disposal

All MEC will be disposed of by detonation utilizing standard demolition procedures as outlined in Technical Manual (TM) 60A-1-1-31. The following paragraphs describe in general the procedures ZAPATA will use to detonate MEC items.

If a suspected MEC item is discovered, the item will be left in place while notifying the SUXOS. Notification will include the MEC type, location, associated hazard, condition, and actions required for disposal. If determined to be UXO, the item will be destroyed in place as indicated below. Only qualified personnel who are performing the functions of the SUXOS and UXOSO determine the risk associated with movement is acceptable and movement is necessary for the protection of people, property, or critical assets, or the efficiency of the activities being conducted.

4.13.6.1 Acceptable-to-Move Items

The preferred means of MEC disposal will be blown in place (BIP); however, to reduce the number of times personnel must handle explosive demolition materials, those items identified as being unfuzed and or acceptable to move may be collected and consolidated for disposal at one of the active disposal pits. After determining an item is acceptable to move, the SUXOS will determine the most expeditious route for safe movement of the MEC item to the in-grid consolidation point.

4.13.6.2 Items Unacceptable-to-Move

BIP operations will be conducted for all MEC items that are deemed unacceptable to move. BIP disposal operations will begin at the work site only after all non-essential and non-UXO personnel are out of the minimum separation distance (MSD) of the ordnance being detonated. Demolition safety and operations will be conducted according to the standard practices and procedures outlined in TM 60A-1-1-31, and MEC will only be detonated after positive identification. Electrical demolition procedures will be employed as the method of choice for all detonations. All detonation/access holes will be backfilled. Demolition operations, will take place daily, weather permitting. ZAPATA anticipates using on call explosive delivery for demolition operations. Courtesy storage of explosives in the ASP may be used if necessary and authorized. The SUXOS is responsible for determining whether minimum safe conditions to conduct demolition operations are met. If an event such as inclement weather prevents the destruction of any UXO, a guard will secure MEC items until they can safely be disposed of.. Team personnel will provide perimeter security during demolition operations. Personnel safe separation distance for demolition operations will be DDESB TP 16.

4.13.6.3 MSD Determination

Upon discovery of a larger MEC item, the exclusion zone will be increased from the respective default distance (2,894 feet) to the distance listed for the item in DDESB TP-16 on the DDESB secure website: http://www.ddesb.pentagon.mil. If an item with a greater fragmentation distance is found, the MSD will change in accordance with DDESB TP 16.

4.13.6.4 Site Control, Evacuation, and Establishment of Exclusion Area during Demolition Operations

All roads/trails that provide access to the disposal location will have roadblocks established during demolition operations. The SUXOS and the UXOSO will be on-site at all times during demolition operations. The operation is performed under the direction and supervision of the SUXOS, who is charged with the responsibility to ensure that procedures contained in this Work Plan and referenced documents are followed. The UXOSO monitors compliance with the safety measures contained in the Work Plan and associated documents and, in the event of non-compliance, is vested with the authority to stop or suspend operations. Prior to initiation of demolition operations, all non-essential personnel will be evacuated to a minimum of the MSD from the demolition area, as determined by consultation of DDESB guidance for the MEC item in question. The SUXOS and UXOSO will verify that the exclusion zone is clear of all non-essential personnel and verify that all required notifications have been made. Personnel remaining on-site will be limited to those needed to safely and efficiently prepare the item(s) for

destruction. Prior to priming the demolition charges, all avenues of ingress will be physically blocked by guard personnel. Radio communications are maintained between all involved parties at all times. Avenues of ingress are not opened without the express permission of the UXOSO. A constant state of vigilance is maintained by all personnel to detect any intrusion into the fragmentation zone or over flights of aircraft.

4.13.6.5 Road Closures

Roads entering the exclusion zone will be blocked during explosive disposal operations to ensure that unsuspecting individuals are not placed in jeopardy. The SUXOS will assure the area is clear of unauthorized personnel and equipment prior to permitting MEC disposal activities. An observer will be stationed at a location where there is a good view of the air and surface approaches to the site. It will be the responsibility of the observer to notify the SUXOS to suspend disposal operations if any aircraft, vehicle, or personnel are sighted approaching the site. All vehicular access points will be manned by traffic observers in constant radio contact with the SUXOS and UXOSO.

4.13.6.6 Equipment

Standard electric demolition equipment will be used. Procedures to be used will follow the guidelines dictated by TM 60A-1-1-31. Although use of electrical disposal procedures is anticipated, non-electrical procedures are included to provide procedural guidance should a circumstance arise where non-electrical firing procedures are the most prudent means of initiating a demolition shot.

4.13.6.7 Use of Cell Phones and the Proximity of Cellular Telephone Towers

As noted in EM 385-1-97, Paragraph I.2.K, September 2008, the use of cellular phones and the proximity of blasting operations to a cellular service tower could present an electromagnetic radiation hazard. The cellular telephone is considered a low-power device, but there are concerns about their use in the proximity of blasting caps. The IME Safety Publication No. 20 (July 2001) references the following practices:

- Cell phones with less than one watt must be kept at least eight feet from a blasting circuit.
- Contact should not be made between the blasting circuit and the cellular telephone antenna and charging jack. As an added precaution, the charging jack may be covered with non-conductive tape;
- Restrict the use of cellular phones during blasting operations to only those who have the approval of the person in charge and are operated in accordance with approved procedures; and

- If it is suspected that a blasting circuit is at approximately the same elevation as a nearby cellular telephone service tower's cluster antenna, then the radio frequency field strength measurements should be made at the location of the blasting circuit and competent expert advice sought.

4.13.6.8 Demolition Procedures

The following policies are not all inclusive nor are they applicable in all situations. This section is not a stand-alone document and is to be used together with other parts of the RD/RA WP including the APP and ESS, applicable Federal, State, local regulations and contract restrictions and guidance.

4.13.6.8.1 General Demolition Operations

The following demolition procedures are not all inclusive. Additional safety and procedures information are found in the references cited above. The following is a general guide for disposal operations:

- Analyze explosive operations with a view towards reducing the number of personnel and quantity of explosive material subject to an accident. However, never allow one person to work alone.
- Prohibit tasks not necessary to the explosive operation in the fragmentation zone of such operations.
- Use sufficient warning signals and maintain a restricted/exclusion area when explosive operations are conducted. Cease operations when non-UXO personnel are present.
- Comply with the authorized explosive limits and safe separation distances.
- Discontinue explosive operations when unforeseen hazard conditions develop and do not resume until the condition is corrected.
- Smoke only in designated areas.
- Plan for, provide for, and know the emergency procedures in the event of an accident.
- Use special care in handling and disposal of damaged or deteriorated explosives, munitions items, and other hazardous materials.
- Disperse explosives awaiting destruction, in small quantities at safe distances, and protect them from unintentional initiation.
- Protect explosives and MEC items from the elements and static electricity.
- Provide an emergency vehicle outside the fragmentation zone for response in the event of an accident.
- Perform disposal operations only during daylight hours.
- Carry blasting caps in an approved container and handle them carefully.

- Do not use UXO for donor charges in demolition operations. They may be in an extremely sensitive and hazardous condition.
- Use caution when investigating post demolition shots. Search the area after each shot for any remaining explosives or explosive components.

4.13.6.9 Basic and General Munitions Safety Precautions

UXO personnel will perform demolition operations in a manner consistent with industry standards and safe practices. The following procedures and safety precautions will be adhered to at all times. These basic safety precautions are the minimum munitions and ordnance safety requirements required of all personnel on site.

4.13.6.9.1 Basic Considerations

These basic safety precautions are the minimum munitions and ordnance safety requirements required of all personnel on site.

- SAFETY IS PARAMOUNT.
- The method of disposal for all recovered UXO items that are not acceptable to move will be BIP.
- Do not move or disturb unidentified items.
- All UXO will be identified independently by two UXO technicians.
- Do not collect souvenirs.
- Do not smoke except in designated areas.
- Do not carry fire or spark producing devices into the site.
- All UXO operations will use the "Buddy" system.
- Prohibit unnecessary personnel from visiting the site.
- Demolition operations will be conducted in accordance with TM 60A-1-1-31.

4.13.6.9.2 Basic Safety Precautions

The following safety precautions are applicable to all UXO operations:

- Suspend all operations immediately upon approach of an electrical storm;
- Observe the hazards of electromagnetic radiation (EMR) precautions and grounding procedures when working with, or on, electrically initiated or susceptible MEC;
- Do not dismantle, strip, or handle any UXO unnecessarily;

- Avoid inhalation and skin contact with smoke, fumes, dust, and vapors of detonations and MC residue;
- Do not attempt to extinguish burning explosives or any fire which might involve explosive materials;
- Do not manipulate external features of ordnance items;
- Incorporate appropriate property and personnel protective measures for shock and fragmentation when conducting MEC operations;
- Do not subject MEC to rough handling during transportation - sand bag, chock, and block appropriately;
- Carry explosives in an appropriate container;
- Hand carry no more than two items (one in each hand) at a time and then only as required by the operation being performed;
- Destroy shaped charge munitions by counter charging the cone to prevent formation of the explosive jet;
- The preferred method for disposing of white phosphorous (WP) is to blow the munition in a manner that disperses the WP into the air versus down into the ground;
- Do not transport damaged WP munitions unless fully submerged in water;
- Avoid unnecessary movement of armed or damaged UXO;
- Avoid the forward portions of munitions employing proximity fuzing; and
- Assume unknown fuzes contain cocked strikers or anti-disturbance features.

4.13.6.9.3 General Safety Precautions

The following sub-paragraphs describe safety precautions for various types of munitions/disposal operations:

Projectiles

- Determine if the projectile has been fired and if so consider it armed.
- Check for the presence of unburned tracers.
- Avoid the rear and front of rocket assisted projectiles.
- Handle projectile components such as powder increments, cartridges, and primers with caution.
- Seal the open ends of projectiles or sheared projectile components with tape or other suitable material before transporting.

Grenades

- Do not attempt to re-install safety pins on a dud fired grenade.
- Do not attempt to withdraw impinged firing pins from the fuze of a dud fired grenade.
- Do not dispose of grenades by functioning them as designed.

Rockets

- Approach and work on rockets from the side.
- Do not dismantle or strip dud fired rockets or rocket motors.
- Do not expose electrically fired munitions to radio transmissions within 25 feet.
- Do not transport an unfired rocket motor until having shielded the motor igniter from EMR.
- Dispose of unfired rocket motors, with or without warheads, in such a manner as to prevent them from becoming propulsive. Do not attempt to re-install safety pins on a dud fired grenade;

4.13.6.9.4 Demolition Procedures for Electric and Non-Electric Demolition Operations

The following sub-paragraphs outline the procedures that will be used to perform either electric or non-electric demolition operations:

- The method that provides the most positive control over the specific time of detonation is electric. However, situations may occur, such as an area with a high EMR hazard, where non-electric firing may be the only option.
- Cut the fuse long enough when initiating a non-electric charge to reach a safe distance by walking at a normal pace. Use a minimum of five minutes safe separation time on all shots.
- A minimum of 30 seconds separation time will be observed between multiple non-electric shots initiated simultaneously.
- Wait a mandatory 60 minutes plus the burn time of the fuse in the event of a misfire.
- For all buried charges use a dual priming system and detonating cord, DO NOT BURY CAPS.
- The demolition UXO Technician III will investigate all misfires.
- A "Fire in the hole" warning will be sounded three times, verbally and on the radio prior to firing a shot.

Non-Electric Demolition

The following safety and operating procedures will be used to assemble and detonate explosive charges using non-electric firing trains:

- Do all demolition cap preparation procedures a safe distance (minimum 50 feet downwind) from the item(s) to be destroyed and demolition charges. Observe the following safety considerations.

- Do not strike, roughly handle, tamper with or attempt to remove or investigate the contents of a blasting cap.
- Handle caps only by their open end except during attachment to time fuse or detonating cord;
- Maintain positive control of caps.
- Do not force time fuse or detonating cord into caps.
- Always point explosive end of caps away from your body and other personnel during handling and crimping.
- Handle primed safety fuse and sensitized detonating cord with care. Avoid contact between caps and/or between caps and other hard objects.
- Do not allow time fuse to coil up on itself, other time fuse, or explosives.

Non-Electric Demolition Procedures

- Assemble all equipment and explosives. Keep blasting caps away from explosives until priming the shot.
- Test burn time fuse.
- Cut, and dispose of the first 6 inches of fuse. This will preclude an inaccurate burn rate or misfire due to moisture.
- Cut and test burn an appropriate length of fuse (no less than three feet) to determine the burn rate.
- These procedures will be accomplished at least 25 feet from explosives.
- Compute and cut time fuse to length (minimum 5 minutes) required for safe separation time.
- Inspect cap for foreign matter. Do not blow into cap to clear. Holding cap by the open end, lightly tap wrists together. If the foreign matter remains in the cap dispose of it on the shot and use a new cap.
- Crimp cap on time fuse, crimp 1/8 to 1/4 inch from the base of the cap and attach the fuse lighter.
- Lay out and weight down time fuse.
- Prime explosive charge, sound the warning, initiate the fuse, and return to the safe area.

Non-Electric Misfire Procedures

- WAIT A MINIMUM OF 60 MINUTES, PLUS BURNING TIME OF THE FUSE, AFTER THE MAXIMUM DELAY COMPUTED FOR ANY PART OF THE DISPOSAL SHOT TO ELAPSE BEFORE PROCEEDING DOWN RANGE.
- Up range, prepare a new non-electric firing system to include a new donor charge.

- After the required wait time has elapsed proceed down range. Place a new charge close enough to the original charge to ensure detonation of both charges. When employing a detonating cord firing system use the following procedure: after the wait time, proceed down range, cut the detonating cord between the cap and the charge, and attach a new firing system to the end of the detonating cord going to the original charge. Destroy the cut detonating cord and cap with the newly primed shot.
- Sound the warning, initiate the new firing system and return to the safe area.

Electric Demolition

Personnel performing electrically initiated demolition operations will strictly adhere to the following safety and operating procedures.

Electric Demolition Safety Considerations

Do all demolition preparation procedures a safe distance (minimum 50 feet downwind) from the item(s) to be destroyed. Observe the following safety considerations:

- Never hook up caps to un-shunted wire.
- Never leave caps un-shunted unless actually testing or hooking to firing wire.
- Observe explosive safety (e.g., do not strike, handle roughly, tamper with, or attempt to investigate the contents of the blasting cap.

Electric Demolition Procedures

The following procedures will be used to assemble, test, and function electric firing trains:

- Prior to going down range, gather all equipment and explosives.
- Lay out (from the site to the safe area) the test firing wire.
- Ground yourself prior to breaking out caps. Keep explosive end of cap pointed away from your body and other personnel.
- Grip the cap lead wires 3" to 6" behind the base of the cap, pull an initial arm's length of wire off the wire coil.
- Barricade the cap at least 50 feet downwind from other explosives.
- Un-shunt and test blasting cap(s).
- Splice the cap leads to the firing wire in a parallel circuit and insulate connections;
- Prime the shot.
- Return to the safe area and test the circuit for continuity.

- Hook up the firing machine, sound the warning, and fire the shot.

Electric Misfires

In order to prevent misfires, ensure that:

- All blasting caps are included in the firing circuit.
- All connections between blasting cap wires, connecting wires, and firing wires are properly made.
- Short circuits are avoided.
- Grounds are avoided.
- The number of blasting caps in any circuit does not exceed rated capacity of power source on hand.

Common specific causes of electric misfires include:

- Inoperative or weak blasting machine or power source.
- Improperly operated blasting machine or power source.
- Defective and damaged connections, causing either a short circuit, a break in the circuit, or high resistance with resulting low current.
- Faulty blasting caps.
- The use in the same circuit of blasting caps made by different manufacturers or of different design.
- The use of more blasting caps than power source rating permits.

Clearing Electric Misfires

If charge is electrically primed, proceed as follows:

- Make three successive attempts to fire.
- If unsuccessful, remove firing wires from blasting machine and check continuity of firing circuit.
- If continuity is good, reattach firing wires to blasting machine and make three more successive attempts to fire.
- Check connections of firing wires to blasting machine and make three more successive attempts to fire.
- Change blasting machine after third unsuccessful attempt with original blasting machine.
- If still unsuccessful, disconnect firing wire ends from blasting machine and shunt by twisting firing wire ends together.

- Wait 60 minutes after an electric blasting misfire. A malfunctioned electric cap may have initiated a burning explosive charge.
- Remove and disconnect old blasting caps and shunt wires.
- Connect wires of new blasting caps(s) to firing circuit and re-prime the charge(s).
- Reconnect firing wire ends to blasting machine and fire charge(s).

4.13.6.10 Discarded Military Munitions (DMM)

The preferred means of DMM disposal is BIP; however, to reduce the number of times personnel must handle explosive demolition materials, those items identified as being unfuzed/unfired and acceptable to move may be collected and consolidated for disposal.

4.13.6.11 Munitions Constituents (MC)

If the presence of munitions constituents is suspected in high enough concentration to pose an explosive hazard, the USACE OESS will be immediately consulted. After appropriate notifications, the MC will be destroyed, in coordination with the USACE OESS.

4.13.7 Final Disposition of MPPEH/MD

All material recovered from the range classified as MPPEH will be explosively destroyed and the remains of that material will be re-inspected.

MPPEH consisting of MD and RRD items verified by inspection not to contain an explosive hazard (meeting the inspection requirements in Chapter 1 Section 11 of EM 385-1-97) and subsequently classified as MDAS will be disposed of off-site by Demil Metals Incorporated (DMI).

ZAPATA will use gaylord containers in a lockable tractor trailer to store MDAS. Munitions Debris (shrapnel and vented shapes) and scrap metal such as banding wire, cans, and target debris will be placed in separate and clearly marked containers. MD and RRD will not be comingled. All material leaving the site will be certified and verified as MDAS.

The sealed trailer will be shipped by DMI under chain-of-custody, being accompanied by a fully-executed DD Form 1348-1A and straight bill of lading. Upon receiving the unopened labeled containers, DMI will sign for the material and provide a letter stating that the contents of the sealed containers will not be sold, traded, or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content. DMI will shred the contents of all containers at their facility located in Bedford,

Indiana. All material will be reduced to fist sized pieces no longer identifiable as munitions. The material will then be sent to smelters for melting into new industrial products.

4.13.8 MEC Quality Control

QC for MEC operations will vary to some degree depending on the particular type of MEC activity to be performed. For the purpose of this Work Plan, the QC procedures for each category of MEC operations will be discussed.

4.13.8.1 Quality Control Process

QC processes and procedures are associated with personnel, instruments/sensors and other equipment, data deliverable items, and for measuring the effectiveness of surface sweeps and MEC/MPPEH removal from the metal debris pit. This QC process provides procedures for controlling and measuring quality of all work performed during the conduct of MEC operations. This process provides procedures for:

- Testing and calibrating equipment used to perform work.
- Monitoring/measuring the effectiveness of work performed.
- Inspecting the maintenance and accuracy of site records.
- Determining compliance with site safety, environmental, and operational plans.
- Ensuring the accuracy, timeliness, and completeness of data deliverables.

4.13.8.2 Audit Procedures

ZAPATA has developed detailed procedures for performing MEC operations. These procedures are designed to safely and effectively sample the MEC contamination of the site and to perform effective surface sweeps, MEC/MPPEH removal from the metal debris pit, disposing of all MEC encountered and processing related scrap material. To ensure that these plans are being properly executed/implemented, ZAPATA performs the following QC functions.

4.13.8.2.1 Daily Quality Control Audits

All instruments and equipment that require calibrations will be checked prior to the start of each workday. Batteries will be replaced as needed and the instruments will be checked against a known source. The UXOQCS is responsible for ensuring that personnel accomplish all QC checks and that the appropriate log entries are made. The UXOQCS performs random, unscheduled checks of the various sites to ensure that personnel accomplish all work specified in the Work Plan and submits a report of his findings to the PM.

4.13.8.2.2 Periodic Quality Control Audits

Periodic audits are typically performed by the Quality Manager or a designated representative. The purpose is to determine the effectiveness of QC measures performed at a work site. The Quality Manager reviews logs, records, and files for completeness and accuracy, monitors daily briefs, directs the UXOQCS to conduct checks of selected areas recorded as cleared or completed, and inspects equipment.

4.13.8.3 Equipment Calibration/Maintenance

4.13.8.3.1 Emergency Equipment

Emergency equipment or emergency items will be inspected daily, or as required by the manufacturer, to ensure they are operating as designed and are in good repair

4.13.8.3.2 Magnetometers

Testing

Magnetometers will be field tested each day on a known target to ensure they are operating properly. Magnetometers do not require calibration; they have a simple "Go/No Go" field operational check. This check is achieved by locating a surface target of a similar size and characteristics as an ordnance item. Seed items will be a 1-inch diameter galvanized pipe placed on the surface. Failure to detect the test target is reason to reject the instrument and return it to the manufacturer for repairs.

In addition to the magnetometer being tested to ensure they are operating properly, the test strip also ensures the operator is using the instrument properly. Failure to detect the test targets may result in the operator being retrained on instrument operating procedures.

Validation

During daily operations, random checks of the magnetometers will be performed by the UXOQCS to ensure the equipment is operating and being operated properly. These random checks are made by the UXOQCS by observing the operators use the magnetometer.

Operational Maintenance

Daily maintenance will include cleaning, minor repairs to the equipment, and battery changes when needed. Repairs may include replacing control knobs and tightening connections as stated in the manufacturer's manual, but normally repairs will be accomplished by returning the equipment to the manufacturer. After-operation maintenance (upon project completion) will include removal of the

batteries prior to packing and shipping. Batteries will be removed from magnetometers when stored for more than 24 hours and before shipment.

Documentation

Documentation of the status of the magnetometers will be recorded on copies of the Magnetometer Check Sheet. Each form will be neatly printed in black ink, typed or kept on the on-site computerized formats. Each document will become part of the official site record.

4.13.8.3.3 Radios/Cellular Telephones

Testing

At the beginning of each workday and before departing the headquarters area, each radio and cellular telephone will be checked to ensure it is operating properly. A radio check will be performed by contacting the SUXOS or UXOSO hand held unit. Cellular phones will be checked by making sure that it has been turned on and receiving a signal. A cell phone call to Range Control each morning will serve as the morning communications check and notification that the team is on site.

During Operation

The UXOSO will perform random communication checks with each team to ensure proper communications are maintained. Proper operation of cellular telephones will be verified by reading the built in digital display ensuring that you are in a service area. Magnetometer/electromagnetic instrument operators will not carry radios or phones while using the detectors.

After Operation

Maintenance will include cleaning the equipment and turning it off before inserting into the battery charger.

Documentation

Documentation of the status of communications equipment will be recorded on the Daily QC Journal. Each form will be neatly printed in black ink, typed or kept in the on-site computerized formats. Each document will become part of the official site record. Site personnel will keep a record of all substantive phone conversations related to the performance of the project. Substantive telephone calls are defined as:

- All calls to or from Government personnel requiring action by either the Government or ZAPATA.

- All calls to or from Government personnel directly or indirectly affecting contract terms and conditions.
- All calls to or from federal, state, or local regulatory agency personnel.
- All calls to contractor personnel requiring calling party to be referred to a Government Public Affairs Office.

4.13.8.3.4 Vehicles and Associated Equipment

Daily Vehicle Inspection

Each day, before the vehicle leaves the headquarters area, the operator will perform a check of the vehicle. The check will include under the hood and safety equipment checks. These checks will be documented on the Vehicle Check Sheet.

Under the hood checks will include:

- Fluid levels
- Hoses
- Checks for leak

Safety equipment checks will include:

- Windshield wipers
- Fire extinguishers
- First aid kits
- Vehicle horn and lights
- Tires

4.13.8.3.5 Cleaning and Replenishing Equipment

During operation, checks/maintenance will include cleaning the equipment and replenishing any expended safety equipment. After operation, checks/maintenance will include cleaning the equipment and replenishing any expended safety equipment.

4.13.8.3.6 Hand Tools

UXO tools and demolition kits will be inspected before use, or at least weekly, to ensure they are complete and in good repair.

4.13.8.3.7 Site-Specific Items

Individual sites may require items that are not normally included in the site inventory. These items may include Personal Protective Equipment (PPE) or special tools. Site-specific items will be inspected to ensure they are in good repair. Special tools or equipment acquired after the site is opened will be included in the site inventory.

4.13.8.3.8 Operational Checks

Maintenance checks of equipment will be done in accordance with the manufacturer's manual.

4.13.8.4 Lessons Learned

Any lessons learned will be noted by the SUXOS in his daily report. This information will be given to the PM and included in the daily log. Lessons learned will be included in the project final report. Any lessons learned of an emergency nature will be brought to the immediate attention of the OE Safety Specialist, PM and ZAPATA Program Manager.

4.13.8.5 Deliverable Requirements

Data collection and assemblage for task specific reporting requirements will be conducted by the task SUXOS. This information will be reviewed and finalized by the PM. Final reporting requirements will be prepared by the PM and reviewed by the ZAPATA Program Manager.

Training is conducted by the SUXOS. Attendance records (and student performance when applicable) are maintained. Prior to assignment to a duty position or change in duty position, the UXO Technician assigned QC duties performs a check of the individual's site personnel record to ensure that the employee is qualified to fill the position.

4.13.8.6 Quality Control Training Plan

Employee training is an integral part of producing quality products. ZAPATA will conduct site-specific employee training prior to the start of operations and supplements this initial training, as necessary, throughout the remainder of the project. At a minimum, ZAPATA personnel receive the following types of training:

- OSHA: Current certification in accordance with 29 CFR 1910-120 (e).
- Safety: Review of the Site-Specific Safety and Health Plan with specific emphasis on the hazards known to exist on-site.
- Equipment Operator Training: Tailored to operator experience level and project objectives.

- Daily Safety Training: Tailgate briefings outlining the day's activities, unique hazards and safety precautions, and other operational issues related to the project.

4.13.8.7 Records and Documents

The ZAPATA UXOQCS will perform quality conformance inspections (QCI) as required in the basic contract and this Work Plan. They will include as a minimum:

- Equipment calibration audits
    - Inspection of records
    - Observation of calibration tasks/steps.
- Property accountability audits:
    - Inspection of records
    - Physical inventory of equipment and supplies to include explosives
    - Inspection of physical security for site equipment
    - Inspection of site training records, safety records and reports
- MEC-related tasks audits:
    - Record checks of site journals, grids sheets and team leader QC logs
    - Over the shoulder checks of removal related tasks, such as magnetometer operations, performing intrusive tasks, backfilling, etc
    - Search effectiveness checks will include a magnetometer survey of a minimum of 10 percent of each area swept. These checks will be done as the area is being swept so that the area can be released to the user immediately. Equipment operator maintenance audits.
- PPE audits:
    - Checks of inventory, use and disposal records
    - Observation of use
    - Documentation of proper disposal

The UXOQCS will document in his daily QC journal, or the appropriate form, the results of his inspections of records, audits, QC checks of grids, and the corrective action for quality defects.

QC records of audits/inspections will be maintained on-site and available for Government inspection. These records can be maintained electronically as long as they are backed up on a portable hard drive. The QC inspections are not a substitute for the accountability of ZAPATA's personnel in supervisory

positions. SUXOS are responsible and accountable for accomplishing operator performed maintenance and proper operation of all equipment assigned to the UXO Team.

4.13.8.8 Quality Control Audits during Surface Sweeps

The UXO Tech III and UXO Tech II will be the only technicians on site during this phase. QC for the surface sweeps of work areas will have to be self-performed.

The UXO Tech III and UXO Tech II will perform QC audits during the surface sweeps of specific areas in preparation for remedial action at the site (office area, excavation area, monitoring well location areas, LFTC area, haul routes and laydown areas, equipment and IDW staging areas).

During these QC checks the technicians will backtrack in the opposite direction to double check the area just swept.

When the team is done with surface sweeps in the designated area, QC will also be complete and the area will be available for occupation by all personnel.

4.13.8.9 Quality Control Audits during MEC/Metal Debris Pit UXO Clearance

A qualified UXOQC officer will perform QC checks during this phase. Following the sifting of the excavated spoils the team will begin collecting and removing the MD from the spoils by hand. After the collection and sorting process has been completed, the MD will be transported to an area designated for further sorting and subsequent inspections. QC activities will be performed at several points along the entire operation.

- Each of the 250 cys fines stockpiles will be sampled prior to final disposition/repurpose
- The ferrous and non-ferrous debris stockpiles will be QC checked prior to final disposition
- The separation of MPPEH/MDEH operation will be QC checked
- Ferrous materials exiting the conveyors will be QC checked prior to final disposition

Haul routes will be checked periodically. Visual inspection of haul routes will be checked by drivers during back-and-forth passes.

4.13.8.10 MPPEH Collection

Venting of inert ordnance items will be accomplished, as required, in accordance with Safety Concepts and Basic Considerations for UXO Operations, the RD/RA WP, and the ESS. Munitions debris to be

collected will be no smaller than 4 inches in diameter. Any items contaminated with explosives or explosive residues will be collected and rendered safe. Any item that resembles an ordnance shape, regardless of size, will be collected to prevent the stoppage of Remedial Action activities. RRD equivalent to or greater than diameter or width of 4 inches in diameter will also be removed and processed. If the ordnance item has an internal cavity, the cavity must be vented to ensure it does not contain explosives or explosive residues, and to prevent a mechanical rupture if the item were placed in a melting furnace.

4.13.8.11 MPPEH Classification

MPPEH located in a specified work area will be visually inspected and classified in one or more of the following categories:

- Cultural Debris - not ordnance related and requires no further action.
- Munitions Debris - does not require explosive venting or demilitarization.
- Inert Ordnance – may require explosive venting or demilitarization.
- MEC – military munitions that may pose explosive safety risks.
- UXO - requires disposal by explosive venting or detonation.
- MPPEH - requires inspection by UXO Tech II, UXO Tech III (Team Leader). The SUXOS will certify and the USACE OE Safety Specialist will verify that the debris is free of explosive hazards.
- RRD – requires inspection by SUXOS.
- Existing Targets – requires inspection by SUXOS.

4.13.8.12 MPPEH Inspection

Thorough MPPEH inspection is an important task of all MEC operations and is an essential element of QC. The SUXOS will ensure that all personnel follow the procedures outlined for MPPEH inspection in Chapter 14, EM 1110-1-4009, dated 15 June 2007. The UXO Tech II will meticulously perform an initial inspection of all MPPEH at the location discovered followed by a re-inspection by the UXO Tech III Team Leader. At the end of each workday the inspected material will be brought to a staging area (scrap trailer) and the UXOQCS will perform and document a random sampling of all MPPEH collected from the various teams to ensure no items with explosive hazards, engine fluids, illuminating dials and other visible hazardous liquid materials are identified as MD or RRD. If the UXOQCS feels additional resources are required to satisfactorily perform his daily MPPEH inspections, he will document the facts and submit them to the ZAPATA PM. If no MPPEH is inspected, it shall be documented in the QC daily

report as "No MPPEH Inspected." All MD and RRD will be placed in an obviously marked and locked solid container at the end of each workday.

4.13.8.13 MPPEH Certification

Prior to releasing the MD/RRD to a scrap dealer, a final inspection of the MPPEH will be made by the SUXOS and the USAESCH on-site Safety Specialist after which they will sign a DD Form 1348-1A stating:

"This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of explosive hazards, engine fluids, illuminating dials and other visible hazardous liquid materials."

4.13.8.14 Quality Assurance

In addition to the QC processes performed by ZAPATA, the Government will conduct QA inspections on all phases and types of work performed. Quality failure can also be defined as workmanship not complying with the approved RA/RD WP or other accepted industry practices or defined as not complying with basic safety concepts and other industry safety practices. QA inspections will be accomplished only after the Government has been notified in writing that the Contractor's QC activities have been completed. The Government reserves the right to perform QA inspections at any time. If a selected work area fails Government QA, the Contractor shall provide full documentation detailing what failed the QA process, why it failed, and how the problem was corrected.

4.13.9 After Action Report

The PM and the UXOSO will prepare an After Action Report at the completion of the remedial action field work. The After Action Report will comply with DoD 6055.09-M, EM 385-1-97 and Change 1 with Errata Sheets No. 1-6. The After Action Report will summarize the effectiveness and limitations of technologies used, anticipated use, land use controls, and long-term management. The After Action Report will close out the ESS.

4.14 In-Situ Chemical Oxidation

Following excavation and review of confirmation samples, a one-time application of sodium permanganate will be employed. The sodium permanganate will be a 50% volume concentration and will be applied to the bottom of the excavation, which consists of bedrock composed of weathered shale, weathered limestone, or both. Because bedrock will be the limiting factor and will control the excavation depth, application of sodium permanganate to the bottom of the excavation will promote additional

treatment at the source area. Approximately 14,000 gallons of sodium permanganate treatment solution will be applied, based on a volume of 10% solution needed to fill excavation footprint (50 ft. by 75 ft.) with approximately 6 inches of oxidant. The amount of sodium permanganate for treatment was based on the assumed dimensions of the excavation (50 ft. by 75 ft.), and on recommendations from the product manufacturer. The final volume of sodium permanganate treatment solution will be based on the actual excavation footprint, and may be increased or decreased depending on the results of the PESI. Batches of 500 gallons will be mixed at a time (400 gallons water with 100 gallons of sodium permanganate to create the target solution). The water utilized for the treatment solutions will be collected from the designated non-chlorinated water hydrant at Camp Forsyth. The sodium permanganate will be allowed to soak into the bottom of the excavation before backfilling commences. The permanganate will be located in a controlled access area, therefore; protected fencing will not be required.

4.15 Backfill Excavation

Following confirmation that the remedial objectives for soil have been achieved and that the sodium permanganate oxidant solution has soaked in, the excavation will be backfilled with a clay soil collected from the designated off-site borrow pit (Figure 4-6). Soil samples analyzed for the site COCs, which include TCE and PCA, will have been previously collected from the borrow pits to confirm that the borrow soil does not contain any contaminants. The excavation will be backfilled in 1-foot lifts and compacted after each lift. An excavator will be stationed at the borrow source to load dump trucks. The dump trucks will transport the soils to the site where the soil will be offloaded near the excavation. A dozer and loader will be then utilized to place the soils in the excavation. An excavator with a plate compactor attachment will be utilized to compact the soil in the excavation.

The compaction specification will be 85% of standard maximum density for cohesive soils based on the Unified Facilities Guide Specifications. When the backfill of the excavation has been completed, the site will be restored to its original condition and contoured to prevent accumulation of overland flow on the excavation area. To prevent future detonation within the treatment area, signage will be installed that designates this area as an Environmental Treatment Area. Sign location and language will be coordinated with Range Control prior to installation.

The haul roads will be restored to their original condition once the backfilling and grading are complete.

4.16 Decontamination

A small decontamination pad may be constructed to clean drilling equipment and tooling. The decontamination pad will include a three-sided structure using planks as a frame and plastic sheeting as

the bottom. The pad will be constructed on a slight slope with the open side facing uphill. Pressurized potable water will be used to completely remove visible soil and contamination from surfaces. If necessary, a stiff-bristled brush or other tools will be used to remove soil and contamination. Decontamination water will be containerized, characterized, and properly disposed. Additional information regarding decontamination pad construction and operation can be found in SOP 504 in the UFP-QAPP.

A dry decontamination process will be used to remove soil from excavating and sifting equipment prior to demobilization. Soil removed during the dry decontamination process will be transported to the LFTC.

4.17 Landfarm Treatment Cell Operation

Contaminated soil that has been transported to the LFTC and spread, will be tilled on a bi-weekly basis for nine months. Each tilling event will occur for approximately six hours. Tilling of the soil, in addition to solar radiation and wind, will help to promote the volatilization and degradation of the VOCs in the soil. Soil amendments, such as moisture, nutrients, or any other chemicals, are not anticipated to be necessary. During months two, five, and nine, soil sampling will occur to document the soil concentrations in the cell. Multiple sampling events (months two and five) are being conducted to allow for additional tilling events in the case the soil concentrations remain higher than expected. The soil sampling event for month nine is designated as the confirmation event that indicates that soil within the cell is below the KDHE RSK of 84.2 µg/kg for TCE and 29.4 µg/kg for PCA. During the tilling events, the LFTC will be inspected and any repairs that may be needed will be conducted immediately. If present, a sample of leachate will be collected for characterization and submitted to an off-site laboratory for VOC analysis.

Soil samples will be collected on 25-foot centers in the LFTC and submitted to an off-site laboratory for analysis of VOCs. A total of 64 samples will be collected per sampling event. Sample depth will be representative of the entire depth profile of the soil, which is anticipated to be 1.5 ft. Additional details regarding sample standard operating procedures, sample rationale, and analysis are provided in the UFP-QAPP (Appendix A). Figure 17-6 of the UFP-QAPP details the soil sample locations and Table 17-5 of the UFP-QAPP further details the soil profile depth. Soil data will be validated and presented in a QCSR for approval for each sampling event (months 2, 5 and 9).

4.18 Landfarm Treatment Cell Closure

When the soil concentrations are below the KDHE target levels for TCE (84.2 µg/kg) and PCA (29.4 µg/kg), the LFTC Closure Report will be submitted to KDHE. This report will document the construction, treatment, and sampling results for the LFTC.

Following approval of the LFTC Closure Report, the treated soil and protective sand layer will be loaded into end dump trucks for transport to the Campbell Construction Debris Landfill for use as cover (Figure 4-6). The HDPE liner will be removed and loaded onto trucks and transported off site to an approved Subtitle D landfill. The LFTC clay base will be spread on site and the area will be returned to its original condition. The area where the LFTC was will be returned to original grade and seeded. Erosion measures will remain in place until revegetation occurs.

4.19 Remedial Action Completion Report

Following completion of the RA, a Remedial Action Completion Report will be submitted. The Remedial Action Completion Report will contain the backup for achieving the RA objectives and may include the following components: chronology of events, task completion summaries, boring logs, sample locations and results, survey data, figures, photos, well installation data, and issues and/or RD/RA WP deviations.

4.20 Post Remedial Action Long-term Monitoring

4.20.1 Long-Term Monitoring Plan

The LTM Plan will be submitted following completion of the RA. The LTM Plan will present objectives for monitoring the site following the remedial action. The LTM Plan will include the wells to be sampled, frequency, analytical methods, purging requirements, QC requirements, UXO requirements, IDW disposal requirements, sampling schedule, and a monitoring well maintenance plan.

4.20.2 Groundwater and Surface Water Sampling

Groundwater sampling will occur quarterly for two years and semi-annual for the third year. UXO clearance will be completed along all driving paths and work areas prior to work commencing as per Section 4.8.1 General UXO Sweep/Escort Procedures and the APP/SSHP. For the first event of Year 1, first quarter of Year 2, and first semi-annual event of Year 3, 24 wells will be purged and sampled using low-flow procedures and samples will be collected from locations where surface water is present (two seeps, two surface water bodies, and one spring). For the remaining sampling events, eleven wells will be purged and sampled using low-flow procedures and samples will be collected from two seeps, two surface water bodies, and one spring (if present).

For the first sampling event of Year 1, first quarter of Year 2, and first semi-annual event of Year 3 all monitoring wells will be sampled for VOCs, PAHs, methane, ethane, ethene, and general groundwater quality parameters. PAHs are required based on ROD requirements. For all remaining events; monitoring wells, seeps, springs, and surface water bodies will be sampled for VOCs and PAHs. All monitoring wells will be stabilized using pH, turbidity, dissolved oxygen, oxidation reduction potential, and temperature.

For all groundwater sampling events, purge water will be containerized on site and managed in accordance with the IDW Management Plan (Attachment D to the UFP-QAPP). Additional details regarding groundwater and surface water sample standard operating procedures, sample rationale, and analysis/EPA Methods used for analysis are provided in the UFP-QAPP (Appendix A).

Table 17-3 in the UFP-QAPP lists the wells, analytical parameters, and QC requirements for the baseline sampling events. In addition, Table 17-6 in the UFP-QAPP identifies the number of wells and frequency of sampling on the wells proposed for LTM at the site. Following completion of the RA, further information on the 11 wells proposed for LTM will be included in the LTM Plan. Surface water sample collection is further detailed in Section 17.2.3.6 of the UFP-QAPP, as well as SOP 234 *Collection of Water Samples from A Seep or Spring* in Attachment C of the UFP-QAPP.

Groundwater data from each sampling event will be validated and presented in a QCSR for approval. An Annual Summary Report (ASR) will be prepared for each RA(O)/LTM year. The ASR will contain a brief summary of each sampling event; analytical results presented in a positive hits table that also compares the current results to the baseline analytical results; time series plots for COCs; a water level table; a groundwater gradient map for the overburden and bedrock aquifers; an isoconcentration figure for TCE and PCA; and a summary of any issues or problems that arose and the corrective action implemented.

Contaminant trend analysis will be completed following the collection of a minimum of eight rounds of groundwater monitoring data. Adjustments to the groundwater monitoring program may be made based on the contaminant trend analysis. Additional information on contaminant trend analysis will be included in the LTM Plan.

* * * * *

5.0 PROJECT MANAGEMENT

5.1 Project Task Organization

This section of the RD/RA Work Plan describes project organization and identifies key personnel. A project organization chart is illustrated on Figure 5-1.

5.2 Fort Riley PWE

The United States DA is the lead agency for Fort Riley. The Fort Riley PWE is responsible for implementation of the Installation Restoration Program at Fort Riley. Mr. David Jones will be the Fort Riley PWE PM and will serve as the primary point of contact for OB/OD RD/RA.

5.3 COE

Ms. Amanda Chirpich, Professional Engineer (PE), is the USACE-KCD PM for this project and will be the primary point of contact for contractual and technical matters. The USAEC has contracted with the USACE-KCD to coordinate and provide oversight for the Installation Restoration Program.

Ms. Rhonda Wilkinson is a Project Engineer with COE and is the Contracting Officer's Representative (COR) embedded at Fort Riley. Ms. Wilkinson is responsible for contracting actions, construction oversight, and construction QA for projects at Fort Riley.

5.4 USAEC

Mr. Nick Smith is the USAEC PM and will provide review of project documents. The USAEC focuses on supporting US Army installations in all facets of environmental programs and environmental sustainability. This includes managing environmental restorations at installations, environmental reporting, funding execution, information management, and analyzing environmental legislation and regulations.

5.5 USEPA

Mr. Amer Safadi is the USEPA PM. The USEPA will provide federal regulatory oversight for OB/OD RD/RA activities.

5.6 KDHE BER

Mr. Jorge Jacobs is the KDHE-BER PM. The KDHE-BER will provide regulatory oversight for the State of Kansas for the OB/OD RD/RA activities.

5.7 Tehama

Tehama has a contract with USACE-KCD through which environmental designs and remediation are being performed. Tehama will provide personnel to fill project roles including, but not limited to site supervisor, project safety and health manager, site safety and health officer, field site manager, geologists, and surveyor.

5.7.1 Program Manager

Mr. David Brewer, Professional Geologist (PG) is the Tehama Program Manager. Mr. Brewer will be responsible for the overall performance of the project and the Tehama/BMcD team. He will also perform technical review of project planning documents and report deliverables.

5.7.2 Project Manager

Mr. Jerrett Domling is the Tehama PM. Mr. Domling will be responsible for project direction to staff, review of technical reports, coordination with USACE management, budget control, subcontractor performance, and allocations of resources and staffing to implement the project.

5.7.3 SSHO

Ms. Megan Perez-Utter is the Tehama SSHO. Ms. Perez-Utter will be responsible for the implementation of the approved APP/SSHP. She will verify and oversee equipment inspections, the completion of all required health and safety forms; inspect site activities to identify and correct safety and occupational health deficiencies; coordinate changes/modifications to the SSHP with the SHM, Contracting Officer, PM, and others; and conduct project-specific training for personnel working on the OB/OD Site.

5.7.4 BMcD

BMcD will provide support for RD/RA activities to the Tehama team. BMcD will be involved with work plan preparation including this RD/RA WP, UFP-QAPP, APP/SSHP, and IDW Management Plan; provide senior geologist and experienced staff to assist with PESI and source area removal activities; provide data validation of soil and groundwater and generation of the respective QCSRs; and preparation of the Remedial Action Completion Report and other report deliverables.

5.7.5 Program Manager

Mr. Walter McClendon, PG is the BMcD Program Manager. Mr. McClendon will be responsible for management of the project at the program level to determine time frame, funding needs, procedures for

accomplishing project goals, staffing requirements, and allotment of available resources to various phases of the project.

5.7.6 Project Manager

Mr. Daniel Earhart is the BMcD PM. Mr. Earhart will be responsible for project coordination with Tehama. Mr. Earhart will be responsible for management at the project level to maintain project goals, staffing, and assigning personnel qualified to perform each duty.

5.8 ZAPATA

ZAPATA will be subcontracted to BMcD to provide munition services associated with the OB/OD RD/RA activities. ZAPATA will be responsible for munition clearance, detonation, and disposal activities during the RD/RA activities and the excavation and sifting activities during the RA. ZAPATA will report to the BMcD PM.

5.8.1 Project Manager

Mr. Jeff Schwalm is the ZAPATA PM. Mr. Schwalm will be responsible for project coordination with Tehama and BMcD and will oversee the staff responsible for ZAPATA's activities. Mr. Schwalm will also be responsible for managing the activities assign to the UXO Safety Officer and Senior UXO Supervisor.

5.8.2 UXO Safety Officer

Mr. Terry Farmer of ZAPATA will serve as the UXOSO for the RD/RA activities at OB/OD. Mr. Farmer is a qualified UXO Technician III who meets the requirements in TP-18 and has three (3) years of continuous UXO safety experience in supervising/managing general construction (managing safety programs or processes or conducting hazard analyses and developing controls). As the UXOSO he will be responsible for ensuring that project activities in regard to UXO and explosives safety are executed in accordance with applicable regulations, the APP/SSHP (Appendix B), and the approved ESS.

5.8.3 Senior UXO Supervisor

Mr. Chuck Wentzel of ZAPATA will serve as the SUXOS during on-site RD/RA activities that require munitions clearance and will meet the requirements in TP-18. The SUXOS must ensure site personnel comply with the APP/SSHP, the ESS, and monitor on-site personnel performance, including safety and QC.

5.9 Subcontractors

Tehama will contract with specialty vendors providing services necessary to carry out the scope of work. The required services and selected subcontractors are:

- Direct-push and mobile laboratory services – Environmental Priority Service, Inc. Salina, Kansas
- Well installation and development – Roberts Environmental Drilling, Millstadt, Illinois (Kansas License #903)
- Landfarm construction, operation, maintenance, and closure; transportation of soil; and backfilling of excavation – Remediation Services Inc., Independence, Kansas
- Analytical laboratory – Eurofins Lancaster Laboratories Environmental, LLC, Lancaster, Pennsylvania (KDHE Certified Lab # E-01051)
- Jobsite trailer electrical connection – Kenny's Electrical Company, Inc., Hutchinson, Kansas
- Jobsite trailer – Modular Space Corporation, Kansas City, Missouri

BMcD will contract with vendors providing services necessary to carry out the scope of work for each site. The required services and selected subcontractors are:

- Sodium permanganate - Carus Corporation, Peru, Illinois

5.10 Project Schedule

A project schedule showing the anticipated sequence of task performance and dates for project activities is presented as Appendix E.

* * * * *

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APPENDIX A – UNIFORM FEDERAL POLICY – QUALITY ASSURANCE PROJECT PLAN

APPENDIX B – ACCIDENT PREVENTION PLAN / SITE SAFETY AND HEALTH PLAN

APPENDIX C – STORMWATER POLLUTION PREVENTION PLAN

APPENDIX D – LANDFARM PERMIT MEMORANDUM

APPENDIX E – PROJECT SCHEDULE

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Table 2-1
Listed and Rare Species Occurring and Potentially Occurring in the Fort Riley Area
OB/OD Site, Fort Riley, Kansas

Common Name	Scientific Name	Federal Status	State Status	Known to Occur in Geary County	Known to Occur in Riley County
American Burying Beetle	*Nicrophorus americanus*	E	E	Yes	Yes
Black Rail	*Laterallus jamaicensis*	None	SINC	No	Yes
Black Tern	*Chlidonias niger*	None	SINC	Yes	Yes
Bobolink	*Dolichonyx oryzivorus*	None	SINC	No	Yes
Common Shiner	*Luxilus cornutus*	None	SINC	Yes	No
Eastern Hognose Snake	*Heterodon platirhinos*	None	SINC	Yes	Yes
Eastern Spotted Skunk	*Spilogale putorius*	None	T	Yes	Yes
Eskimo Curlew	*Numenius borealis*	E	E	Yes	Yes
Franklin's Ground Squirrel	*Spermophilus franklinii*	None	SINC	No	Yes
Golden Eagle	*Aquila chrysaetos*	None	SINC	Yes	Yes
Henslow's Sparrow	*Ammodramus henslowii*	None	SINC	Yes	Yes
Highfin Carpsucker	*Carpiodes velifer*	None	SINC	No	Yes
Least Tern	*Sterna antillarum*	E	E	Yes-Critical Habitat Designated[1]	Yes-Critical Habitat Designated[1]
Long-billed Curlew	*Numenius americanus*	None	SINC	No	Yes
Piping Plover	*Charadrius melodus*	T	T	Yes-Critical Habitat Designated[1]	Yes-Critical Habitat Designated[1]
Plains Minnow	*Hybognathus placitus*	None	T	Yes-Temporary Critical Habitat Designated[2]	Yes-Temporary Critical Habitat Designated[2]
Shoal Chub	*Macrhybopsis histoma*	None	T	Yes-Temporary Critical Habitat Designated[3]	No
Short-Eared Owl	*Asio flammeus*	None	SINC	Yes	Yes
Silver Chub	*Macrhybopsis storeriana*	None	E	Yes-Critical Habitat Designated[4]	Yes
Snowy Plover	*Charadrius alexandrinus*	None	T	Yes	Yes
Southern Bog Lemming	*Synaptomys copperi*	None	SINC	No	Yes
Sturgeon Chub	*Macrhybopsis gelida*	None	T	Yes-Critical Habitat Designated[5]	Yes-Critical Habitat Designated[5]
Timber Rattlesnake	*Crotalus horridus*	None	SINC	Yes	Yes
Topeka Shiner	*Notropis topeka*	E	T	Yes-Critical Habitat Designated[6]	Yes-Critical Habitat Designated[6]
Western Hognosed Snake	*Heterodon nasicus*	None	SINC	Yes	Yes
Whip-Poor-Will	*Caprimulgus vociferus*	None	SINC	Yes	Yes
Whooping Crane	*Grus americana*	E	E	No	Yes
Yellow-throated Warbler		None	SINC	No	Yes

Notes:

[1] All the waters within a corridor along the main stem of the Kansas River from the confluence of the Republican River and Smoky Hill River on Fort Riley in Geary County to the confluence of the Missouri River in Kansas City, Wyandotte County.

[2] The Kansas River in Geary and Riley Counties.

[3] The Kansas River in Geary County.

[4] The Kansas River from the confluence of the Republican and Smoky Hill Rivers to the Missouri River (Section 1 & 2, Township 11 South, Range 25 East).

[5] The main stem of the Kansas River from its start at the confluence of the Republican River and Smoky Hill River on Fort Riley in Geary County to the confluence of the Missouri River in Kansas City, Wyandotte County.

[6] Cary Creek and its tributaries in Dickinson County from where it crosses the Dickinson/Geary County line (Sec. 6, T14S, R5E) upstream to its headwaters (Sec. 33, T15S, R3E); Thomas Creek and Dry Creek in Geary County; Little Arkansas Creek and Sevenmile Creek in Riley County; Deep Creek main stem in Riley County from where it crosses the Riley/Wabaunsee County line (Sec. 22, T10S, R9E) upstream to Interstate Highway 70 (Sec. 25, T11S, R9E).

[7] Table provided by the Fort Riley PWE Conservation Branch and was included in the RI.

E = Endangered SINC = Species in Need of Conservation T = Threatened

Table 3-1
Applicable or Relevant and Appropriate Requirements
OB/OD Site, Fort Riley, Kansas

Regulation	Applicable Section	Applicability
Chemical-Specific ARARs		
Federal Water Quality Standards	National Primary Drinking Water Regulations and Standards: 40 CFR §141.61 40 CFR §141.62 40 CFR §141.63	Sets maximum concentrations allowed for organic, inorganic and microbiological contaminants in sources of drinking water. -ARAR if action addresses groundwater.
	National Secondary Drinking Water Standards: 40 CFR §143.3	- Secondary maximum contaminant levels -ARAR if action addresses groundwater.
Clean Air Act	40 CFR §61.01 40 CFR §61.14	Establishes limits on the amounts of pollutants that can be discharged to the air from Hazardous Waste Processes. -An ARAR if emissions trigger a need for air pollution control.
	40 CFR §264; subparts AA, BB, and CC	Establishes limits on the amounts of pollutants that can be discharged to the air from hazardous waste processes. -An ARAR if emissions trigger the need for air pollution control.
Kansas Primary Drinking Water Regulations	K.A.R., 28-15a-23	Contaminants not subject to an MCL but required to be monitored. -An ARAR if the State is more stringent than the Federal requirements.
Kansas Surface Water Quality Standards	K.A.R., 28-16-28c K.A.R., 28-16-28e(b)	SS01Antidegradation – maintaining and protecting existing uses and surface water quality criteria. -An ARAR if surface water quality is affected.
Location-Specific ARARs		
Location Specific	None	NA

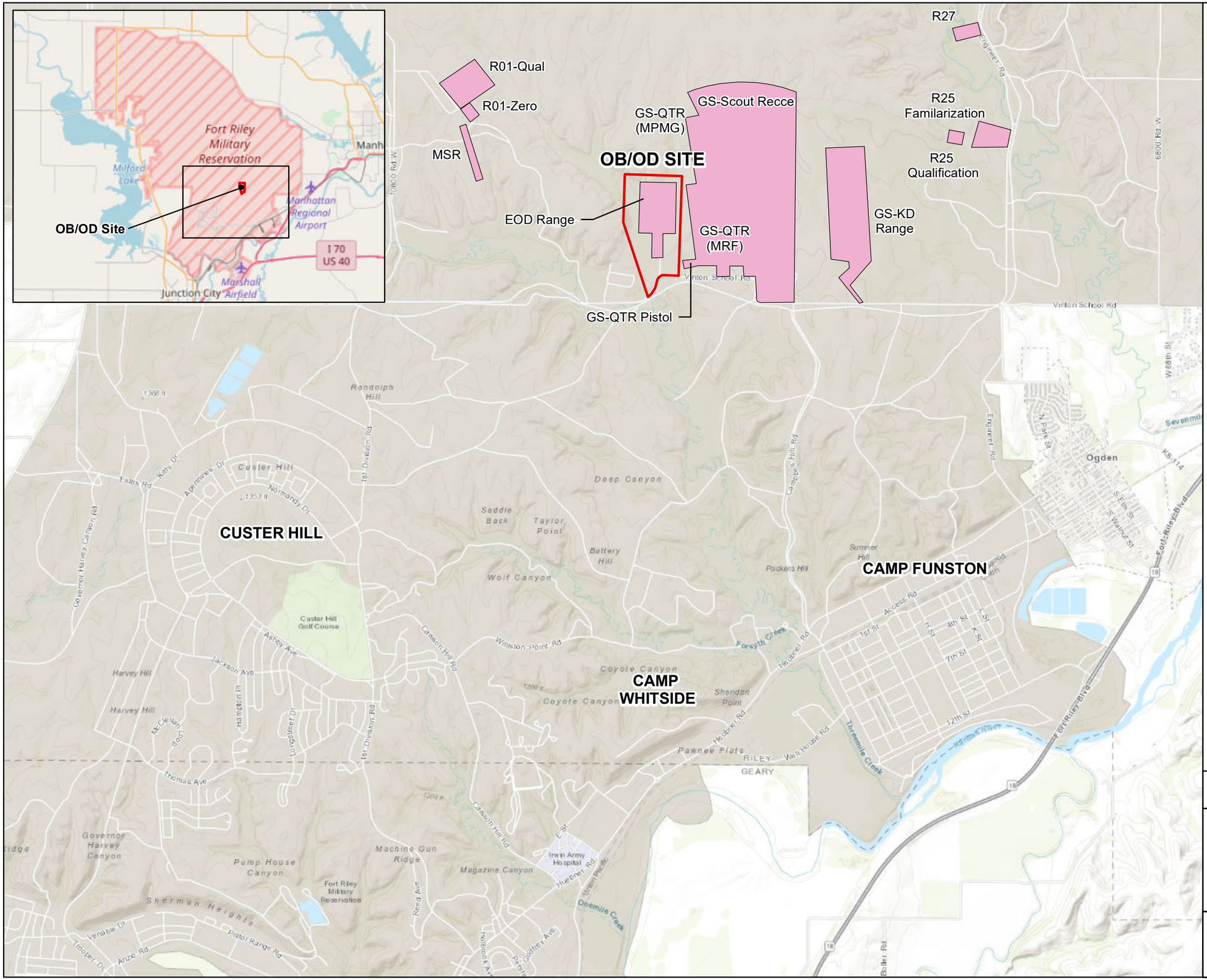
Table 3-1
Applicable or Relevant and Appropriate Requirements
OB/OD Site, Fort Riley, Kansas

Action-Specific ARARs		
Clean Water Act	40 CFR §122.26	Excavation and Runoff and land farm treatment – stormwater storage and runoff. -An ARAR in the event of excavation and runoff from land farm treatment
Safe Drinking Water Act	40 CFR §144, §146, §147, §148	Underground Injection Control Program. Regulates the subsurface emplacement of fluids (including air) with standards for the design and operation of 5 classes of injection wells -ARAR if action uses underground injection control.
Federal Water Quality Standards	40 CFR §131.10 – 131.13; §131.20-131.22	Best Management Practices for stormwater management during soil disturbance -An ARAR water for Stormwater Management.
RCRA	40 CFR §264.171-175 42 USC §6921 - §6939g	Provides standards for the management of hazardous wastes -An ARAR when onsite hazardous waste management is anticipated.
	40 CFR §258	Provides standards for management of nonhazardous wastes. –An ARAR for on-site waste management.
	40 CFR §262	Standards Applicable to Transporters of Hazardous Wastes -An ARAR for transportation of Hazardous Waste
	40 CFR §262.11	Criteria for listing hazardous waste. -An ARAR for transportation of Hazardous Waste
	40 CFR §263	Manifesting, Record Keeping and Reporting Requirements -An ARAR for transportation of Hazardous Waste
	40 CFR §268	Specifies Treatment standards and technologies for specific hazardous wastes. -An ARAR if hazardous wastes will undergo onsite treatment
Kansas Drinking Water Quality Standards —	K.A.R, 28-15a-23	Contaminants not subject to an MCL, but required to be monitored -An ARAR if more stringent than Federal requirements.
Kansas Solid Waste Regulations	K.S.A., 65-3407c(2)	Temporary projects to remediate soils using landfarming requiring a project operating plan and site closure plan. -An ARAR for on-site landfarming.

ARAR - Applicable or relevant appropriate requirements
CFR - Code of Federal Regulations
MCL - maximum contaminant level
NA - not applicable
RCRA - Resource Conservation and Recovery Act

Table 4-1
List of Proposed Explosives
OB/OD Site, Fort Riley, Kansas

Nomenclature	Description	Quantity	Hazard Division	Compatibility Group	NEW (lbs)
Charges, Shaped	19 grams	60 ea.	1.4	S	2.5
Detonating Cord*	80 grain/ft	500 ft	1.4	D	5.7
Electronic Detonators	No. 8	50 ea.	1.4	B	0.11
Binary Explosives Liquid and Solid	Mattanite	50 lbs.	N/A	Flammable 3 Oxidizer 5.1	*0
				Total NEW	**8.31**
*May be shipped as 1.4 under 100 gpf and NEW is under 99 lbs. per vehicle *No NEW until liquid and solid are combined in the field just before use					



Legend

- Range
- OB/OD Site Boundary

N

0 2,500 5,000 10,000

Feet

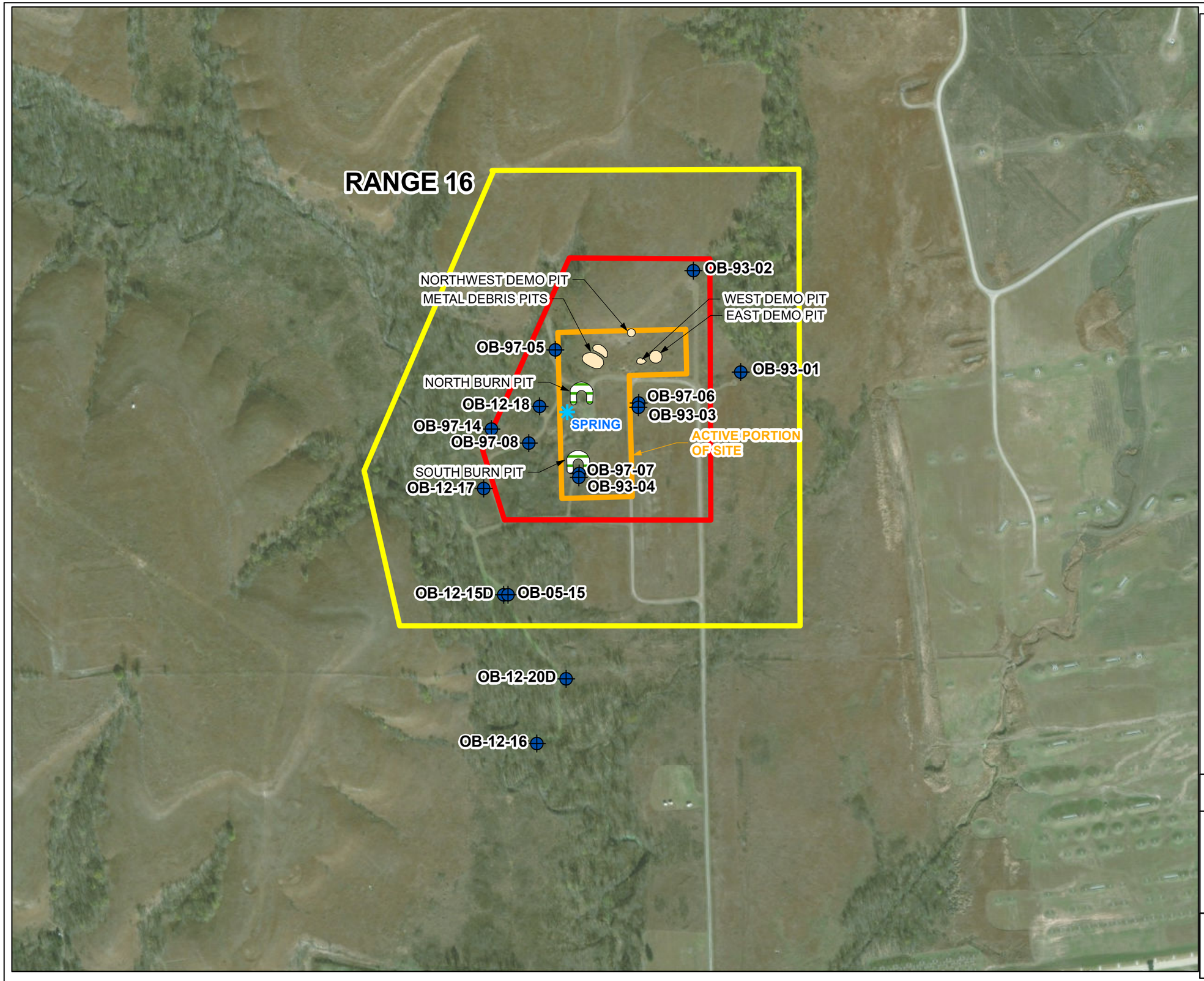
United States Army
Fort Riley, Kansas

OB/OD Site General Location Map

OB/OD Range 16 RD/RA

Tehama

DATE	FIGURE
1/22/2018	1-1



Legend

- Monitoring Well
- Spring
- Burn Pit
- Metal Debris or Demo Pit
- MRS Boundary
- HFD Boundary
- Active Portion of OB/OD

N

0 250 500 1,000

Feet

United States Army
Fort Riley, Kansas

OB/OD Site Location Map

OB/OD Range 16 RD/RA

Tehama

DATE	FIGURE
01/11/2018	1-2

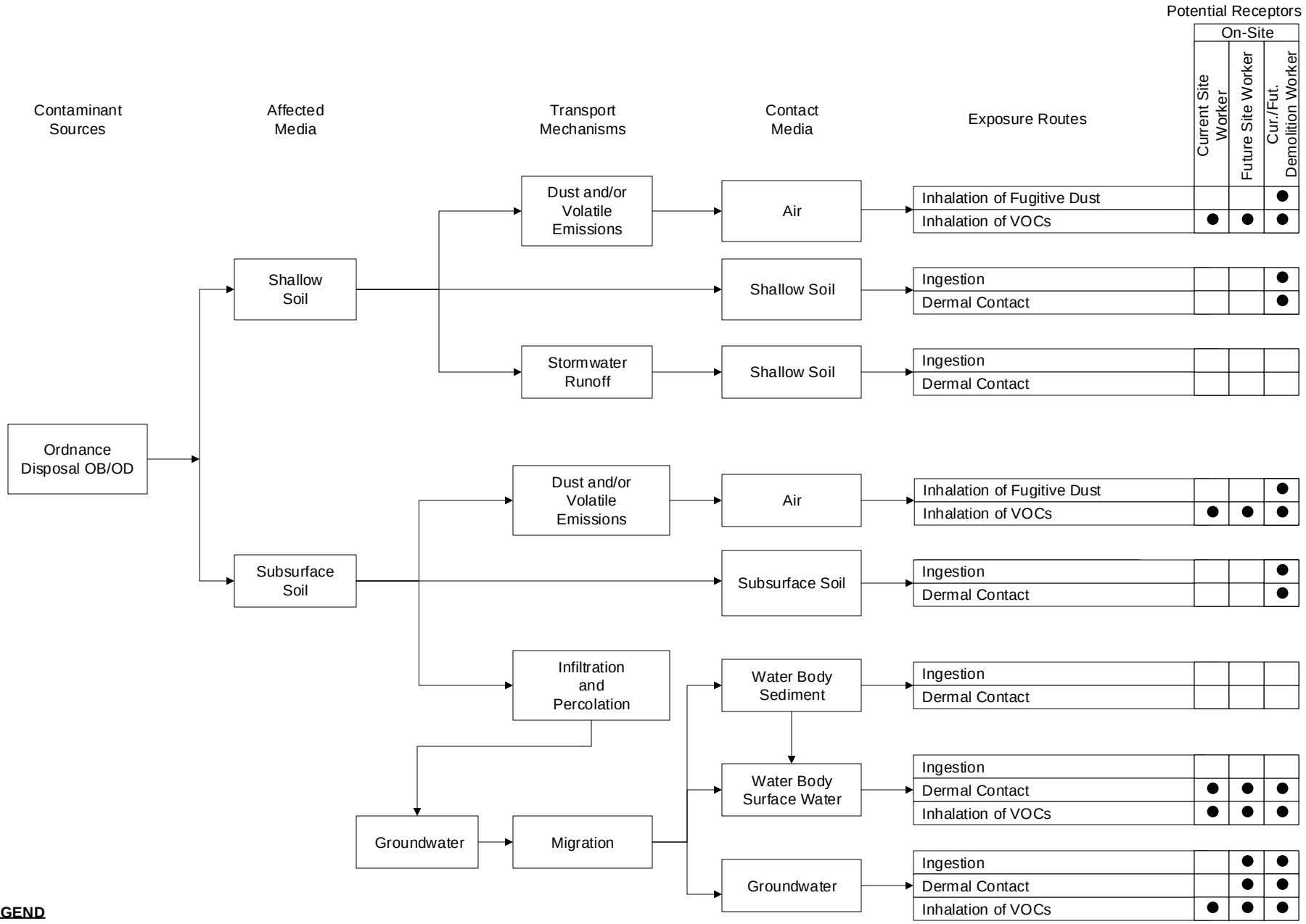


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Figure 2-1
Human Health
Conceptual Site Model
OB/OD
Fort Riley, Kansas

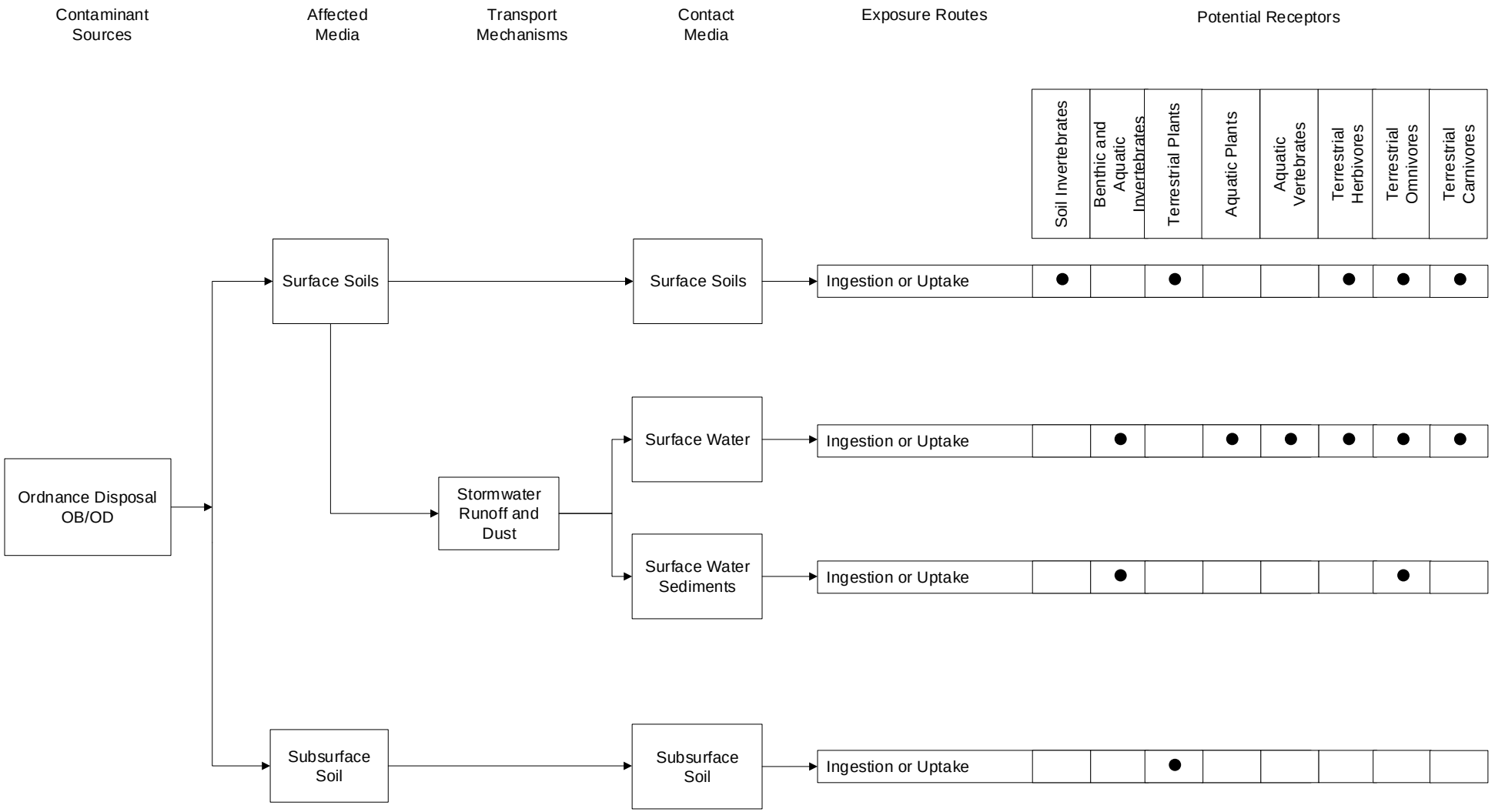

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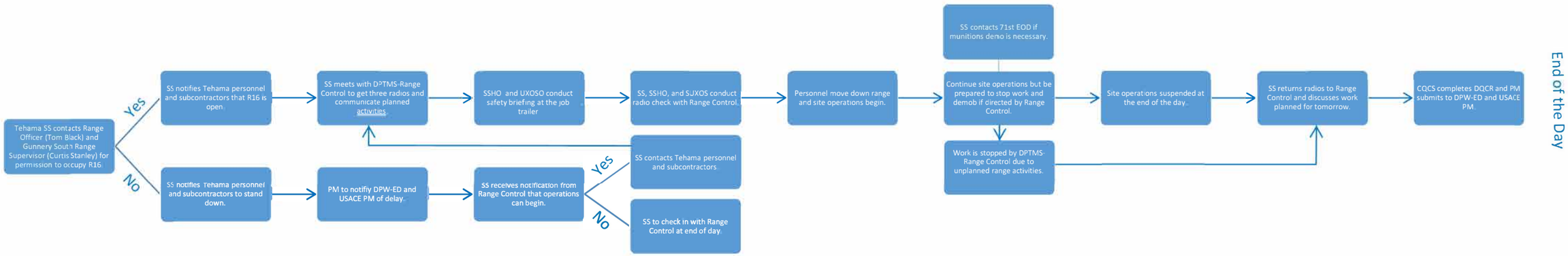
Figure 2-2
ECOLOGICAL CONCEPTUAL SITE MODEL
OB/OD
Fort Riley, Kansas

Daily Communication Flow Chart

Start of the Day



End of the Day

United States Army
Fort Riley, Kansas

DAILY COMMUNICATION FLOW CHART

OB/OD Range 16 RD/RA

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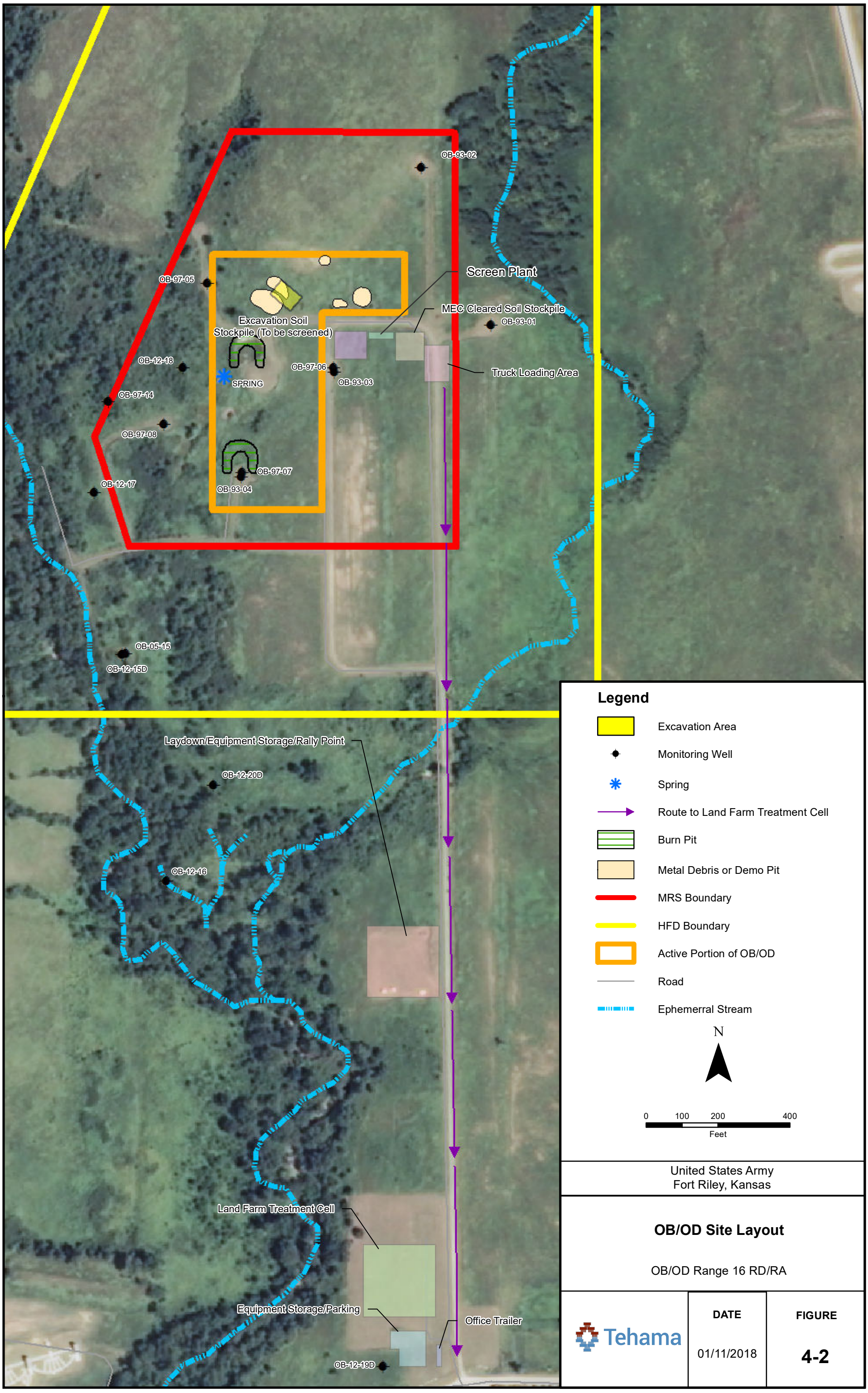
DATE 1/21/18

FIGURE **4-1**



United States Army
Fort Riley, Kansas

OB/OD Site Layout

OB/OD Range 16 RD/RA

Tehama

DATE	FIGURE
01/11/2018	4-2

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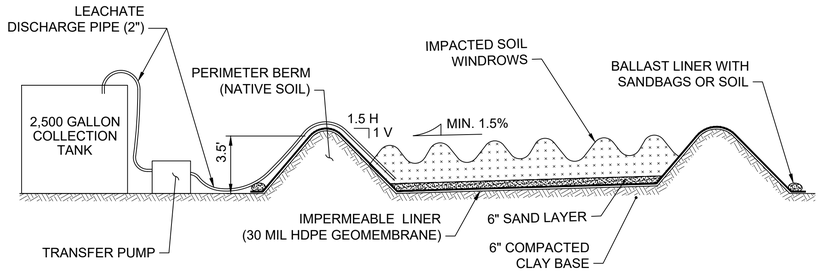
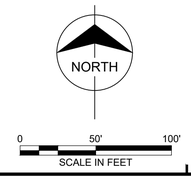
PLAN VIEW
N.T.S.



SECTION VIEW
N.T.S.



NO.	DATE	BY	CKD	DESCRIPTION

NOTES:

1. STRIP SOIL AND GRADE AREA SMOOTH PRIOR TO PLACING HDPE LINER.
2. PLACE AND COMPACT A 6" OF CLAY BASE UNDER THE HDPE LINER TO COVER ANY SURFACE IRREGULARITIES AND BEDROCK SHARDS THAT OUTCROP IN THIS AREA.
3. INSPECT CLAY BASE TO BE FREE FROM ANY ROCKS OR OBJECTS THAT COULD DAMAGE THE HDPE LINER.
4. INSTALL THE HDPE LINER OVER THE CLAY BASE. WELD SEAMS TO PRECLUDE ANY LEAKING.
5. GEOMEMBRANE INSTALLER SHALL BE CERTIFIED BY MANUFACTURER TO INSTALL HDPE LINER.
6. GEOMEMBRANE MATERIALS SHALL MEET GEOSYNTHETICS INSTITUTE SPECIFICATION GM13.
7. INSPECT GEOMEMBRANE WELD SEAL AND TEST SEAMS WITH TRANSPARENT VACUUM BOX. APPLY SOAPY SOLUTION TO SEAMS AND REPAIR ANY AREAS WHERE BUBBLING OCCURS.
8. INSTALL LINED SUMP SUCH THAT INFILTRATED PRECIPITATION WILL FLOW TO THE DESIGNATED SUMP AREA WHERE THE WATER WILL ACCUMULATE.
9. INSTALL LEACHATE DISCHARGE PIPE SUCH THAT LINES COMPLETELY DRAIN AFTER PUMPING INTERVALS
10. PLACE AN UNIFORM 6" LAYER OF GRADED SAND ON TOP OF THE LINER FOR PROTECTION DURING TILLING EVENTS.
11. PROVIDE AND MAINTAIN LAYER OF SAND OR SOIL AT ACCESS RAMP TO PROTECT LINER FROM DAMAGE.

PRELIMINARY - NOT FOR CONSTRUCTION

BURNS McDONNELL
9400 WARD PARKWAY
KANSAS CITY, MO 64114
816-333-9400
LICENSEE NO. 000165

date	detailed
NOVEMBER 2017	B. WEIS
designed	checked
B. WEIS	T. WALLER

RILEY COUNTY, KS

US ARMY CORPS OF ENGINEERS
OBOD LANDFARM PLAN
TREATMENT CELL PLAN

project	contract
102688	-

drawing **Figure 4-3** rev. **0**

sheet 1 of 1 sheets
file Landfarm Drawing.dwg

Scale For Microfilming
Millimeters
Inches

Z:\Clients\ENS\USCOE\102688_OBOD\Support\Data\Landfarm Design\Landfarm Drawing.dwg 4/2/2018 Weis, Brian

U.S. Department of Justice
Bureau of Alcohol, Tobacco, Firearms and Explosives

Federal Explosives License/Permit
(18 U.S.C. Chapter 40)

In accordance with the provisions of Title XI, Organized Crime Control Act of 1970, and the regulations issued thereunder (27 CFR Part 555), you may engage in the activity specified in this license or permit within the limitations of Chapter 40, Title 18, United States Code and the regulations issued thereunder, until the **expiration** date shown. **THIS LICENSE IS NOT TRANSFERABLE UNDER 27 CFR 555.53.** See "WARNINGS" and "NOTICES" on reverse.

Direct ATF Correspondence To: ATF - Chief, FELC
244 Needy Road
Martinsburg, WV 25405-9431

License/Permit Number: **1-NC-119-20-1B-00699**

Chief, Federal **Explosives** Licensing **Center (FELC)**
Christopher R. Reeves

Expiration Date: **February 1, 2021**

Name
ZAPATA

Premises Address (Changes? Notify the FELC at least 10 days before the move.)
6302 FAIRVIEW RD SUITE 600
CHARLOTTE, NC 28210-

Type of License or Permit
20-MANUFACTURER OF EXPLOSIVES

Purchasing Certification Statement

The licensee or permittee named above shall use a copy of this license or permit to assist a transferor of explosives to verify the identity and the licensed status of the licensee or permittee as provided by 27 CFR Part 555. **The signature on each copy must be an original signature.** A faxed, scanned or e-mailed copy of the license or permit with a signature intended to be an original signature is acceptable. The signature must be that of the Federal Explosives Licensee (FEL) or a responsible **person of the** FEL. I certify that this is a true copy of a license or **permit** issued to the **licensee** or permittee named above to engage in the business or **operations specified** above **under** "Type of License or Permit."

Mailing Address (Changes? Notify the FELC of any changes.)

ZAPATA INCORPORATED
ZAPATA
6302 FAIRVIEW RD SUITE 600
CHARLOTTE, NC 28210-

Michael Winningham
Licensee/Permittee Responsible Person Signature

VP MRS/ECRS
Position/Title

Michael Winningham
Printed Name

1/23/18
Date

Previous Edition is Obsolete

ATF Form 5400.14/5400.15 Part I
Revised October 2011

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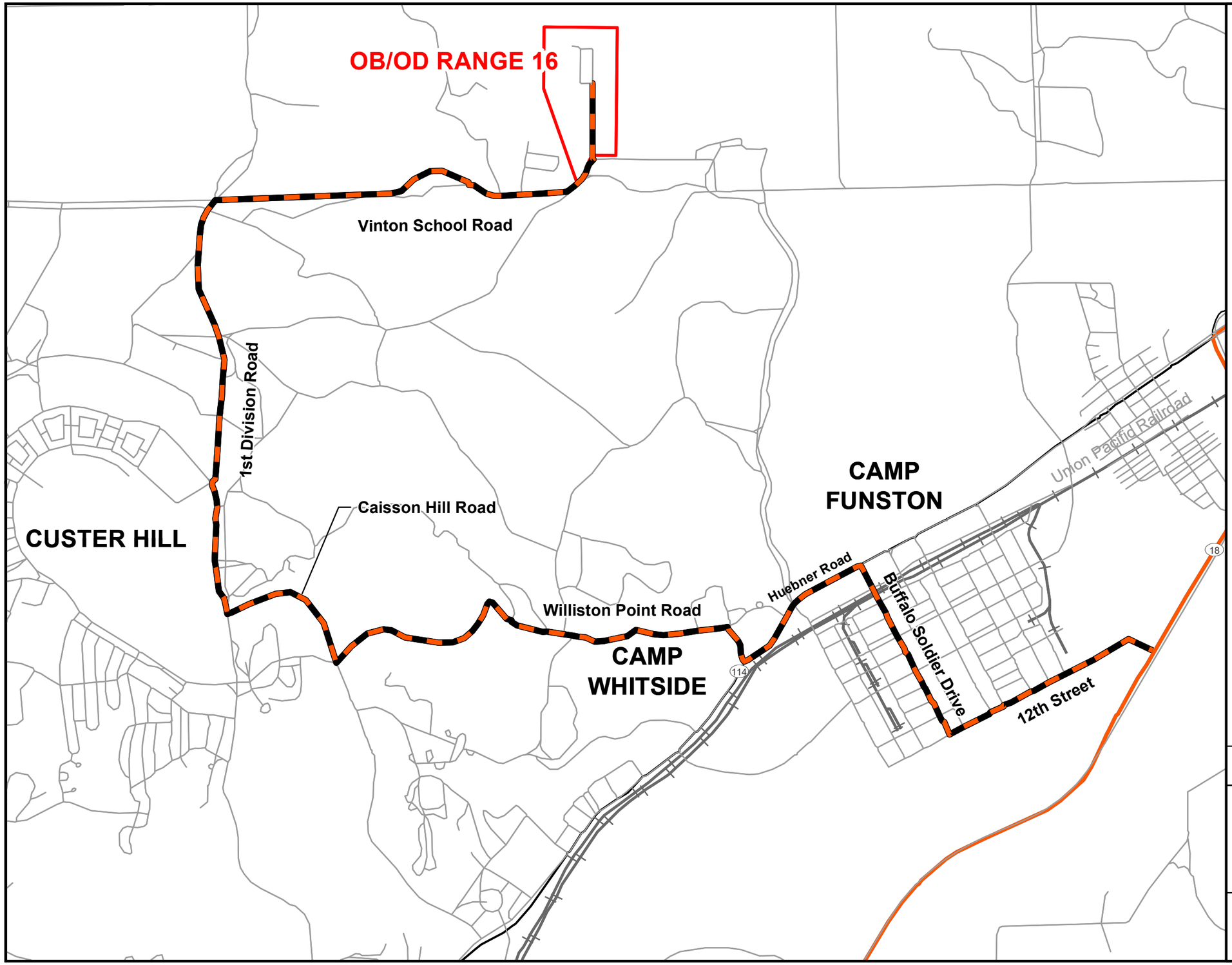
Figure 4-4
OB/OD
Federal Explosives License/Permit
Fort Riley, Kansas



Legend

- Commercial Explosives Route to OB/OD Site
- Site Boundary
- Roads

Driving Directions

Start Location: 12th Street Access Control Point
1 - Continue on 12th Street
2 - Turn right onto Buffalo Soldier Drive
3 - Turn left on Huebuer Road
4 - Enter roundabout and Williston Point Road exit
5 - Continue on Williston Point Road
6 - Turn right onto Caisson Hill Road
7 - Turn right onto 1st Division Road
8 - Turn right onto Vinton School Road
Destination will be on the left
End Location : OB/OD Site

Site GPS Coordinates

Latitude - 39° 08' 3.86" N
Longitude - 96° 45' 39.45" N

N

0 1,800 3,600 7,200
Feet

United States Army
Fort Riley, Kansas

Commercial Explosives Route to OB/OD Site

OB/OD Range 16 RD/RA

Tehama

DATE	FIGURE
1/21/2018	4-5

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Screen Plant
MEC Cleared Soil Stockpile
Truck Loading Area
Excavation Soil Stockpile (To be screened)
Laydown/Equipment Storage/Rally Point
Land Farm Treatment Cell
Tire Cleaning & Inspection Area
Site Access Entry/Exit Point
Equipment Storage/Parking
Office Trailer
Vinton School Road
Tire Cleaning & Inspection Area
Tank Trail
Off-site borrow source
Campbell Hill Road
Campbell Hill Construction & Debris Landfill

Legend

- Location of Warning Signs
- Borrow Source Haul Route
- Remediated Soil Haul Route
- On-Site Exit Route
- On-Site Entrance Route
- Tire Cleaning & Inspection Area
- Active Portion of OB/OD
- Road
- Ephemeral Stream
- Approximate Excavation Area

N

0 450 900 1,800
Feet

United States Army
Fort Riley, Kansas

Borrow Source and Cambell C&D Landfill Location

OB/OD Range 16 RD/RA

Tehama

DATE	FIGURE
1/21/2018	4-6

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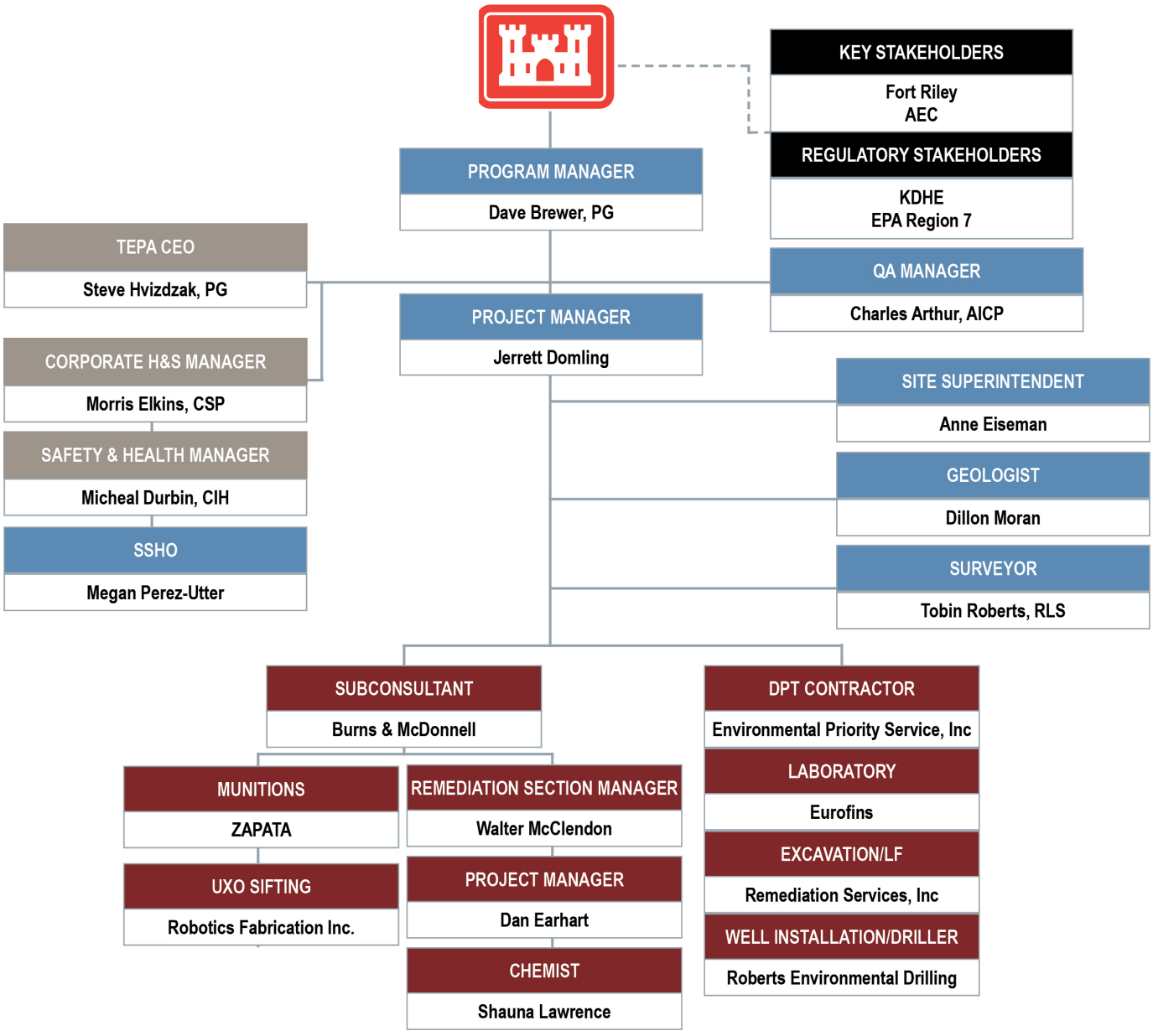

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Figure 5-1

Project Organization Chart
OB/OD Range 16 RD/RA