Received
OCT 17 2023
Land Division

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REPLY TO
ATTENTION OF

Environmental Management Division

October 16, 2023

Mr. Stephen Cobb, P.E
Chief, Land Division
Alabama Department of Environmental Management
Post Office Box 301463
Montgomery, Alabama 36130-1463

SUBJECT: Revision 0, Corrective Measures Implementation Plan (CMIP), RSA-217, Inert Storage Warehouse Facilities, Operable Unit 12, US Army Garrison – Redstone, Madison County, Alabama

Reference:

a. The Installation Restoration Program at Redstone Arsenal, Alabama, AMIM-REP-ER (EPA ID AL7 210 020 742).

b. Resource Conservation and Recovery Act Corrective Action Program at Redstone Arsenal, Alabama (EPA ID AL7 210 020 742).

c. Redstone Arsenal's Alabama Hazardous Wastes Management and Minimization Act Hazardous Waste Storage Facility/Thermal Treatment/Solid Waste Management Unit Corrective Action (AHWMMA) Permit dated July 19, 2021.

Dear Mr. Cobb:

This letter transmits the *Revision 0, Corrective Measures Implementation Plan (CMIP), RSA-217, Inert Storage Warehouse Facilities, Operable Unit 12,* US Army Garrison – Redstone, Madison County, Alabama

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Copies of this correspondence are being furnished to Ms. Samantha Downing with Alabama Department of Environmental Management. Copies are also provided to Mr. Robert Pope, Superfund and Emergency Management Division USEPA Region 4, and Mr. Cesar Zapata, Land, Chemicals and Redevelopment Division USEPA Region 4.

My point of contact for this request is Mr. Clayton Smith, Environmental Management Division, 256-876-6492 or email clayton.b.smith.civ@army.mil.

Sincerely,

Clint Howard

Clint Howard
Chief, Installation Restoration Branch

Enclosure

Revision 0
Corrective Measure Implementation Plan
RSA-217, Inert Storage Warehouse Facilities
Operable Unit 12

U.S. Army Garrison-Redstone
Madison County, Alabama
USEPA ID No. AL7 210 020 742

Prepared for:

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Contract No.: W9124J-18-D-0004
Delivery Order W9124J-22-F-0045

October 2023

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Corrective Measures Implementation Work Plan
RSA-217, Inert Storage Warehouse Facilities
Operable Unit 12

U.S. Army Garrison-Redstone
Madison County, Alabama
EPA ID No. AL7 210 020 742

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



Louis Montgomery, P.E.
Alabama PE No. 20195

10-10-23

Date

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ACRONYMS AND ABBREVIATIONS

AAC	Alabama Administrative Code
ADEM	Alabama Department of Environmental Management
AEIRG	Alabama Environmental Investigation and Remediation Guidance
AHWMMA	Alabama Hazardous Wastes Management and Minimization Act
APTIM	Aptim Federal Services, LLC
ARBCA	Alabama Risk-Based Corrective Action
ASWCC	Alabama Soil and Water Conservation Committee
AST	Aboveground storage tank
bgs	Below ground surface
BMP	Best Management Practice
BSV	Background screening value
CB&I	CB&I Federal Services, LLC
CG	Cleanup Goal
CMA	Corrective Measure Alternative
CMI	Corrective Measure Implementation
CMIP	Corrective Measure Implementation Plan
CMO	Corrective measure objective
COC	Chemical of concern
COPEC	Chemicals of potential ecological concern
CQAP	Construction Quality Assurance Plan
CSM	Conceptual site model
CY	Cubic yards
DAF	Dilution attenuation factor
ECC	Environmental Chemical Corporation
ESV	Ecological screening values
HI	Hazard index
HMW	High molecular weight
HQ	Hazard quotient
ID	Identification
IDW	Investigation-derived waste
IELCR	Individual excess lifetime cancer risk
IROD	Interim Record of Decision
LSA	Limited site assessment
LUC	Land use control
MCL	Maximum contaminant level
MDC	Maximum detected concentration
mg/kg	Milligrams per kilogram
No.	Number
PAH	Polynuclear aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PPE	Personal protective equipment
PSA	Potential source area
PSL	Preliminary Screening Level
PSV	Preliminary Screening Value
RCRA	Resource Conservation and Recovery Act

RDW	Remediation-derived waste
RDX	Research Department eXplosive or cyclotrimethylenetrinitramine
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RM	Risk Management
RSA	Redstone Arsenal
RSL	Regional Screening Level
SAC	Site access control
Shaw	Shaw Environmental, Inc.
SLERA	Screening-level ecological risk assessment
SSHP	Site Safety and Health Plan
SSL	Soil Screening Level
SVOC	Semi-volatile organic compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCLP	Toxicity characteristic leaching procedure
U.S.	United States
USEPA	U.S. Environmental Protection Agency
UST	Underground storage tank
UXO	Unexploded ordnance
VOC	Volatile organic compound
VSI	Visual site inspection
WOE	Weight-of-evidence

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EXECUTIVE SUMMARY

Environmental Chemical Corporation (ECC), on behalf of the United States (U.S.) Army Garrison–Redstone, has prepared this Corrective Measure Implementation Plan (CMIP) for Redstone Arsenal (RSA) site RSA-217, Inert Storage Warehouse Facilities, Operable Unit 12 in Madison County, Alabama, under the management of the U.S. Army Environmental Command. The Mission & Installation Contracting Command has contracted ECC, under Contract Number W9124J-18-D-0004 to perform environmental remediation and restoration and program management services at RSA under the Resource Conservation and Recovery Act (RCRA) Corrective Action program in accordance with RSA's hazardous waste permit (U.S. Environmental Protection Agency [USEPA] Identification [ID] Number [No.]: AL7 210 020 742). This CMIP has been developed to provide technical guidance for implementing the corrective measure selected for surface media at RSA-217. Groundwater at RSA-217 is being addressed under RSA-146, in accordance with Table VI.6 of the RCRA permit.

This work plan incorporates applicable elements of Alabama Department of Environmental Management (ADEM) Hazardous Waste Facility Permit No. AL7 210 020 742 and the most recent edition of the Alabama Environmental Investigation and Remediation Guidance. This work plan is submitted to fulfill in part the requirements listed in Section VI.E.1 of RSA's RCRA permit.

RSA-217 occupies approximately 4.6 acres in the southeastern portion of Redstone Arsenal, between West Line and Warehouse Roads. The site is located within groundwater unit RSA-146, which covers approximately 6,613 acres of the southeastern portion of RSA and adjacent off-post areas.

The purpose of this CMIP is to describe the corrective measure necessary to support no-further-action status and unrestricted use for the surface media at RSA-217. As determined by the RSA-217 RCRA facility investigation (RFI) (Aptim Technical Services, LLC [APTIM], 2021), the situation warranting action at RSA-217 is contaminated surface soil located from 0 to 1-foot below ground surface (bgs) containing arsenic, beryllium, iron, and select polynuclear aromatic hydrocarbons (PAHs) (benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene). Per the Alabama Risk-Based Corrective Action (ARBCA) evaluation conducted as part of the RFI, the soil has been found to pose an unacceptable health risk to hypothetical future residential receptors, however there is no unacceptable health risk to commercial/industrial workers. Per the Screening-Level Ecological Risk Assessment (SLERA) conducted during the RFI, constituents in surface soil are unlikely to pose a threat to ecological receptors.

The Army has elected to perform corrective measure activities to remove and dispose of contaminated soils at RSA-217 to address concerns for residential exposure to surface soils. As presented in the RFI, the residential cleanup goal (CG) for arsenic in soil is 15 milligrams per kilogram (mg/kg), based on two times the mean of the surface soil background concentrations.

The CG for total equivalent benzo(a)pyrene is 0.92 mg/kg, which includes benzo(a)pyrene and dibenz(a,h)anthracene.

The corrective measure involves excavation and off-site disposal of contaminated soils at RSA-217. Based on data from the RFI, approximately 1.85 cubic yards of soil will be excavated for off-site disposal. The corrective measure objectives (CMOs) will be met when confirmation sampling results do not exceed the CGs.

This CMIP presents the specific activities necessary to implement the corrective measure activities. These activities include procurement and subcontracting, mobilization, site preparation, soil excavation, collection of confirmation and waste characterization samples, transportation and disposal of excavated material, and site restoration.

1.0 INTRODUCTION

The Mission and Installation Contracting Command has contracted Environmental Chemical Corporation (ECC) under Contract Number W9124J-18-D-0004, Delivery Order W9124J-22-F-0045, to prepare the Corrective Measure Implementation Plan (CMIP), Army Decision Document/Statement of Basis, Corrective Measure Implementation Construction Report, and Corrective Measure Implementation Report at Redstone Arsenal (RSA) site RSA-217, Inert Storage Warehouse Facilities, Operable Unit 12. Corrective actions at this site are being performed under the Resource Conservation and Recovery Act (RCRA) Corrective Action Program (United States [U.S.] Environmental Protection Agency [USEPA] Identification [ID] Number [No.] AL7 210 020 742) in accordance with the *RSA Alabama Hazardous Wastes Management and Minimization Act Hazardous Waste Storage Facility/Thermal Treatment/Solid Waste Management Unit Corrective Action Permit*, Modification 01 (hereafter referred to as the Permit) (last approved on August 21, 2022) (Alabama Department of Environmental Management [ADEM], 2022).

1.1 Purpose

The purpose of this CMIP is to describe the corrective measure activities planned to achieve unrestricted use of the RSA-217 surface media site. The RSA-217 RCRA facility investigation (RFI) (APTIM Federal Services, LLC [APTIM], 2021) defined the nature and extent of contamination and evaluated potential risks to current and future receptors. The Alabama Risk-Based Corrective Action (ARBCA) Tier 1 Preliminary Screening Level (PSL) evaluation identified the following relevant chemicals of concern (COC) in soil warranting action because they pose an unacceptable health threat to hypothetical future residents:

- Three metals (arsenic, beryllium, and iron), and
- Four polynuclear aromatic hydrocarbons (PAHs) (benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene).

These COCs were further evaluated in an ARBCA Tier 3 Risk Management (RM)-2 evaluation which reduced the COCs to arsenic, benzo(a)pyrene, and dibenz(a,h)anthracene.

Constituents in surface soil pose an unacceptable health threat to hypothetical residential receptors by direct exposure pathways but pose no unacceptable health risk to the commercial worker or construction worker.

Because the majority of the groundwater COCs identified in the RFI (primarily explosives) appear to be part of the footprint of the RSA-146 groundwater unit contamination in this portion of RSA, the groundwater beneath RSA-217 will be addressed during the corrective measure for the RSA-146 groundwater unit. Accordingly, COCs present in groundwater are not addressed in this CMIP and will be addressed by corrective measure activities as part of groundwater unit RSA-146. This CMIP addresses only the corrective measure for RSA-217 soils (and does not include groundwater).

1.2 Document Organization

This CMIP is organized into the following seven chapters:

- *Chapter 1.0, Introduction*, presents the purpose of this CMIP and organization of the document.
- *Chapter 2.0, Site Description,* presents a detailed description of the Site, including topography, geology, and hydrology of the site; the operational history; and regulatory history.
- *Chapter 3.0, Investigation Results,* presents additional background information about the project site, including nature and extent of contamination, fate and transport summary, site risks, and the final conceptual site model (CSM).
- *Chapter 4.0, Decision Summary*, describes the basis for the action, including the corrective measure objective (CMO), cleanup goals (CGs), and corrective measure.
- *Chapter 5.0, Corrective Measure Implementation*, describes the activities necessary to implement the corrective measure for soil.
- *Chapter 6.0, Contingencies*, describes the potential for variances which could arise during execution of the corrective measure described herein.
- *Chapter 7.0, References,* provides the references that contributed to the preparation of this CMIP.

The following plans and supporting documentation are included as appendices to this CMIP:

- Appendix A: Site Safety and Health Plan (SSHP)
- Appendix B: Corrective Measure Implementation Schedule
- Appendix C: Construction Quality Assurance Plan (CQAP)
- Appendix D: Data Quality Collection Plan

2.0 SITE DESCRIPTION

2.1 Physical Setting

RSA is located in the southwestern portion of Madison County in the northern portion of Alabama and is bounded by the city of Huntsville on the north and east and the Tennessee River to the south (Figure 2-1). The city of Madison and the town of Triana are northwest and southwest,

respectively, of RSA. RSA-217, Inert Storage Warehouse Facilities, is in the southeastern portion of RSA between West Line and Warehouse Roads (Figure 2-1). RSA-217 comprises approximately 4.6 acres and is mostly developed with six warehouse buildings and paved areas.

2.1.1 Topography and Surface Water Hydrology

The topography within RSA-217 consists of level and developed land with surrounding wooded and scrub land areas (Figure 2-2). Overall, topographic relief in this area of RSA is subdued due to grading and use of engineered fill to level the building sites, provide drainage, and raise building foundations as necessary to prevent flooding of the buildings and roads. Elevations at RSA-217 range from approximately 590 to 598 feet above mean sea level (Figure 2-2). The entire site lies outside the 100-year floodplain, generally defined by the 565-foot elevation contour.

2.1.2 Geology

The lithological logs from soil and well borings completed at RSA-217 indicate that the native soils consist predominantly of medium- to high-plasticity clay with trace to small amounts of silt and fine-grained sand (APTIM, 2021). The overburden consists of low-permeability, residual red, brown, and gray clay; silty clay; and silt. Intervals of chert and chert fragments increase with depth and represent residual deposits formed by in-situ chemical weathering of chert nodules and layers within the limestone bedrock. The thickness of the overburden soil ranges from approximately 13.3 to 48.5 feet.

Depth to bedrock across this portion of RSA (13.3 to 48.5 feet below ground surface [bgs]) is variable over short distances due to solution weathering of the upper bedrock surface (epikarst). Lithologic data from bedrock wells installed across this portion of RSA indicate that the shallow bedrock first encountered correlates with middle to upper Tuscumbia Limestone and exhibits well-developed karst features. The Tuscumbia Formation beneath this area is characterized by thinly bedded to massive, fine to medium crystalline, stylolitic limestone with numerous chert nodules and chert lenses. The Tuscumbia is underlain by the Fort Payne Chert Formation, which consists of thinly bedded, fossiliferous limestones interbedded with chert. The Fort Payne Formation is underlain by the Chattanooga Shale Formation, a dark gray to black, fissile shale.

2.1.3 Groundwater Hydrogeology

Groundwater beneath RSA-217 occurs in the unconsolidated overburden and the upper portion of the carbonate bedrock (APTIM, 2021). The overburden and upper bedrock comprise a single interconnected, unconfined water table aquifer. At depth, groundwater occurs under semiconfined conditions, flowing along discrete joints and bedding-plane partings. The water table across RSA-217 and the larger RSA-146 groundwater unit is generally flat, mimicking local topography. Depth to groundwater in overburden wells at RSA-217 fluctuates seasonally, based on measurements obtained from the site monitoring well network. Between 2011 and 2019, depth to groundwater was highly variable, ranging from a minimum of 1.04 feet bgs to a maximum of 19.66 feet bgs in 2019. Based on the water level measurements, the overall average depth to groundwater is approximately 6.17 feet bgs.

The overall groundwater flow direction across RSA-217 was toward the west-northwest based on water level measurements taken in May 2013. In June 2019, groundwater generally flowed toward the west beneath the majority of the site; however, in the southern part of the site, the groundwater flow direction was to the southwest.

2.2 Operational History

As described in the RFI (APTIM, 2021) and depicted on **Figure 2-2**, the site consists of six buildings and the surrounding areas distributed within a group of warehouses and administrative buildings. These buildings were historically used for inert munition component storage; security badge photographic development; and general storage, cleaning, and maintenance of inert materials. Some of these buildings were supported by fuel oil underground storage tanks (USTs) and other petroleum separation systems.

Building 7417 – This building was constructed in 1942 and was originally named Building W-417. The ammunition division originally used the building to store inert components and shipping supplies until needed on the assembly lines. Since 1957, the building has been listed in the RSA Building Inventory as a warehouse reclamation shop. During the limited site assessment (LSA) sampling in 2005, evidence was found of a former aboveground storage tank (AST) used to store heating oil with a grouted discharge line. This building was identified as 146-PS-12H (Reclamation Shop) during the potential source area (PSA) investigation.

Building 7421 – Originally identified as Building W-421 and constructed in 1942, the ammunition division used Building 7421 to store inert components and shipping supplies. The 2001 RSA Master Building Inventory listed this building as a general maintenance building. Building 7421 was identified as 146-PS-12Y (Laboratory).

Building 7425 – This building was constructed in 1942 as Building W-425 and used for inert component and shipping supply storage. Building 7425 was later converted to an administrative facility, and a small boiler was installed to provide heat. A 1,500-gallon UST was installed in 1980 on the northern end of the structure to supply No. 2 heating oil. RSA records document the UST's removal in 1996. The building was identified as 146-PS-12AA (Heater Fuel for Offices).

Building 7437 – Constructed in 1942 as Building W-437, the ammunition division originally used this structure to store inert components and supplies. It was converted to a laboratory and listed in the 1957 RSA Inventory as a laboratory and engineering building. Building 7437 housed the engineering management group for the laboratory chief. The building was converted to an administration facility in 1968. In a 2001 inventory, its use was listed as "Boards/Study Groups." This building at one time had an adjacent UST, and a small pit/sump, referred to as the acid pit, is still visible on the southern end. Building 7437 was identified as 146-PS-12I (Laboratory and Inert Engineering Storage).

Buildings 7441 and 7442 – Both structures were constructed in 1942 as Buildings W-441 and W-442. They were originally separated and used for inert munitions component and shipping material storage. The 1954 inventory identifies Building W-441 as the Photo Lab and Civilian Personnel Office and Building W-442 as the Civilian Personnel and Identification Office for the Rocket Development Division. The buildings were essentially used to issue and maintain the

records for access credentials. In 1957, both buildings were listed as having an Office/Lab warehouse use. RSA records show the two buildings were joined while keeping their separate identification numbers in 1959. The 2001 inventory lists only Building 7442 as an administrative general-purpose facility. Both buildings were identified as the "Photographic Laboratory," with Building 7441 assigned as 146-PS-12J and Building 7442 as 146-PS-12K. During the 2003 visual site inspection (VSI), both structures were being used as administrative facilities.

2.3 Regulatory History

RSA currently operates under an Alabama Hazardous Wastes Management and Minimization Act (AHWMMA) Hazardous Waste Storage Facility/Thermal Treatment/Solid Waste Management Unit (SWMU) Corrective Action Permit (ADEM, 2021). The corrective action requirements in the RCRA Permit apply to SWMUs and areas of concern identified at RSA. Prior to implementation of the RCRA Permit, RSA was added to the USEPA National Priorities List on May 31, 1994, effective June 30, 1994.

The Revision 1 RFI Report for RSA-217 was completed in January 2021 (APTIM, 2021). ADEM agreed to move RSA-217 from Table VI.2 (sites requiring investigation) to Table VI.6 (sites requiring corrective measures), whereby corrective measure for soil will be conducted as part of RSA-217 and corrective measure for groundwater at RSA-217 would be performed in conjunction with corrective measure for groundwater unit RSA-146. This CMIP is a requirement of the Permit (Permit Condition VI.E.2).

3.0 INVESTIGATION RESULTS

This section summarizes the historical investigations conducted at the Site to date, the nature and extent of contamination determined from these investigations, a summary of fate and transport of contaminants, assessment of risk evaluations (i.e., ARBCA and Screening-Level Ecological Risk Assessment [SLERA]), and description of the final site CSM.

3.1 Investigation History

Environmental investigations conducted at RSA-217 include the following documents:

- RSA-146 VSI and PSA investigation (Shaw Environmental, Inc. [Shaw], 2005)
- RCRA facility assessment (RFA) (ADEM, 2008)
- Revision 0 RFI for RSA-217 (CB&I Federal Services, LLC [CB&I], 2014)
- Revision 1 RFI for RSA-217 (APTIM, 2021).

These investigations generated usable analytical results from 21 surface soil samples, 61 subsurface soil samples, and 25 groundwater samples. The samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), target analyte list (TAL) metals, explosives, perchlorate, and pesticides. Detailed discussions of these investigations and the associated results are described in the Revision 1 RFI Report for RSA-217 (APTIM, 2021). The investigation results are summarized in Section

3.2. The location of any detected contaminants within RSA-217 is shown on **Figure 3-1** through **Figure 3-3**.

3.2 Nature and Extent of Contamination

The RFI concluded that the nature and extent results indicate the following:

- Arsenic in surface soil and beryllium and iron in subsurface soil were determined to be present at anomalous concentrations that exceeded the applicable preliminary screening values (PSVs) and background screening values (BSVs) and are considered to represent COCs at the site. The anomalously elevated concentrations of these metals have been delineated in soil by samples with concentrations considered naturally occurring or with results less than screening values. All metals detected in groundwater were determined to be background related.
- VOCs were detected in soil, but none are present at concentrations greater than their respective residential soil PSVs. No detections of VOCs in the groundwater samples were at concentrations above the PSVs.
- SVOCs (PAHs) were detected in surface soil at concentrations above PSVs in the vicinity of the acid pit located at the southeast corner of Building 7437. Evaluation of the data shows the concentrations are likely derived from a source and are not considered part of the anthropogenic PAH impacts present throughout the RSA property. The impacted area has been delineated.
- SVOCs in groundwater with detections above screening criteria were limited to PAHs. A one-time exceedance for hexachlorobenzene was observed in an upgradient well in 2017; however, hexachlorobenzene is not in the CSM for the site and was below screening values in 2019. SVOCs in groundwater have been delineated by non-detect results or results below the screening values.
- Explosives are not included in the CSM for RSA-217 based on historical site uses. Explosives were not detected in the surface and subsurface soils within the site. Explosives were intermittently detected in the underlying groundwater sample from one RSA-217 monitoring well, as well as from wells in other SWMUs to the west and south of this site. All detections have been bounded by below PSV data.
- Perchlorate is not included in the CSM for RSA-217 based on historical site uses and was not detected in the surface and subsurface soils within the site.

3.2.1 Soil

Surface and subsurface soil exceedances are presented on **Figure 3-1** through **Figure 3-3** and summarized below:

- All metals detected in surface soil were determined to be naturally occurring except for arsenic, copper, and zinc in one sample location (217-SB002) and calcium in two sample locations (14612H-HP02 and 14612K-HP02). Although these metals have anomalously high concentrations in surface soil, calcium (44,100 and 43,300 mg/kg),

copper (185 mg/kg), and zinc (516 mg/kg) do not exceed their respective PSVs. In subsurface soil samples, iron (110,000 mg/kg) and beryllium (17.3 J and 23.1 mg/kg) concentrations were anomalously high in one (217-SB004) and two (14612H-HP01 and 217-RS1875) sample locations, respectively. The iron and beryllium were above their PSVs.

- All VOCs detected in surface and subsurface soils were detected at concentrations below their PSVs.
- All explosives, perchlorate, PCBs, and pesticides detected in surface soil and subsurface soil were detected at concentrations below their PSVs.
- Benzo(a)pyrene (1.39 mg/kg), benzo(b)fluoranthene (2.48 mg/kg), dibenz(a,h)anthracene (0.43 mg/kg), and indeno(1,2,3-cd)pyrene (1.24 mg/kg) were detected in one surface soil sampling location (217-SB002) at concentrations above their PSVs. None of the SVOC concentrations detected in subsurface soil exceeded their PSVs.

3.2.2 Groundwater

Groundwater sample results associated with RSA-217 are presented in the Revision 1 RFI Report for RSA-217 (APTIM, 2021) and are summarized as:

- All metals concentrations in groundwater were background related.
- VOCs were detected in groundwater samples at concentrations less than their PSVs (see **Figure 3-1**).
- Naphthalene, dibenz(a,h)anthracene, and hexachlorobenzene were detected in groundwater samples at concentrations above their PSVs. However, the hexachlorobenzene exceedance is likely from an upgradient source and not considered to be in the CSM of the site.
- Research Department eXplosive (RDX); nitroglycerin; nitrobenzene; 1,3-dinitrobenzene; and 3-nitrotoluene have been detected at concentrations above their PSVs. However, the detections were intermittent and not supported by soils data, and do not appear to be derived from site releases.
- The pesticides dieldrin and 4,4'-dichlorodiphenyldichloroethane were detected in upgradient wells at concentrations above their PSVs. The wells where pesticides were detected at concentrations above the PSVs are in proximity to ditches, which are accumulation points for pesticides.

3.3 Fate and Transport Summary

Contaminant fate and transport are dictated by the physical and chemical characteristics of site-related contaminants. The effects of physical, chemical, and biological processes on the constituents control the potential fate (degradation) and transport (movement). The fate and transport evaluation provides key input to the human health risk assessment by identifying all

transport mechanisms working at the site and subsequently determining which exposure pathways are relevant to the risk evaluation. This section summarizes the major contaminant migration pathway and route(s) identified in the Revision 1 RFI Report for RSA-217 (APTIM, 2021).

The most significant potential contaminant migration pathway at RSA-217 is the dissolution of site-related chemicals from soil to form leachate and subsequent transport to the groundwater table resulting from the downward percolation of infiltrating rainfall. A contaminant migration assessment was conducted for RSA-217. Non-background-related constituents detected in surface soil exceeding the RSA dilution attenuation factor (DAF) soil screening levels (SSLs) included benzo(a)anthracene. Background-related constituents (i.e., metals) detected in soil greater than both the BSV and DAF SSL were limited to arsenic, beryllium, and copper. Following a weight-of-evidence (WOE) evaluation, it was determined that no chemicals detected in soil are likely to pose a threat to groundwater from the soil-to-groundwater migration pathway.

3.4 Site Risk Summary

An ARBCA evaluation for human health and an SLERA were performed for RSA-217 in accordance with the ARBCA Guidance Manual (ADEM, 2017a) as part of the RFI (APTIM, 2021). Section 3.4.1 and Section 3.4.2 summarize site risk based on the evaluations presented and discussed in the Revision 1 RFI Report for RSA-217 (APTIM, 2021).

3.4.1 Land and Resource Use

RSA-217 is located within the southeastern portion of RSA, and according to the RSA Master Plan, the current land use for this site is classified as supply storage. It is not anticipated that RSA-217 will be developed for residential use in the future. Although risk regulations, policy, and guidance specify the evaluation of those receptors that are at a site or that could reasonably be anticipated to occur, the risk assessment includes a residential use scenario to comply with Alabama Environmental Investigation and Remediation Guidance (ADEM, 2017b) and ARBCA guidance (ADEM, 2017a). RSA is legally mandated to comply with AHWMMA. In RSA's AHWMMA Permit, ADEM requires that these guidance documents, including approved risk assessment work plans (IT Corporation, 2002 and Shaw, 2010), be adhered to during environmental investigations and evaluations. At RSA, the residential scenario is included in the risk assessment only to determine if a site is eligible for unrestricted use as defined in Alabama Administrative Code (AAC) 335-5-1-.03(r) or support the use of land use controls (LUCs) as a component of the selected remedy. Therefore, risks to a residential receptor were assessed in the RFI (APTIM, 2021).

There is no current potable use of groundwater at RSA-217, and development of groundwater as a potable source is precluded by the terms of the Installation-Wide Groundwater Interim Record of Decision (IROD) (Shaw, 2007). Nevertheless, the exposure to groundwater hypothetically developed as a potable source was evaluated in the RFI (APTIM, 2021).

3.4.2 Human Health ARBCA Assessment

The human health risk assessment for RSA-217 was prepared and presented in the RFI for RSA-217 (APTIM, 2021) in accordance with the ARBCA guidance (ADEM, 2017a). It consists of a

three-tiered process: the PSL evaluation (Tier 1), the RM-1 evaluation (Tier 2), and the RM-2 evaluation (Tier 3). In the case of RSA-217, the RM-1 evaluation was not performed; instead, the evaluation proceeded directly from the PSL evaluation to the cumulative risk assessment in the RM-2 evaluation.

The PSL evaluation consists of a simple comparison of site concentrations with PSVs. In the case of soil, the PSVs generally were the USEPA (May 2019) Regional Screening Levels (RSLs), based on the lower of an individual excess lifetime cancer risk (IELCR) of 1E-6 and a noncancer hazard index (HI) of 0.1. In the case of groundwater, maximum contaminant levels (MCLs) were used as the PSVs, if available. Otherwise, tap water RSLs (USEPA, 2019) were used. Residential PSVs were selected for the evaluation of this site to consider alternatives to attain unrestricted land use. The protocol for the PSL evaluation is described in the Revision 1 RFI Report for RSA-217 (APTIM, 2021) and the Installation-Wide Work Plan (Shaw, 2010).

The PSL evaluation was conducted for all chemicals that are determined to be site related. Inorganics with maximum detected concentrations (MDCs) that did not exceed their BSVs or were shown in a site-to-background evaluation to be naturally occurring were judged not to be site related and were not evaluated further. Concentrations of all other detected chemicals were compared to PSVs in the PSL evaluation. A substance was identified as a COC if the MDC was greater than its PSV. Chemicals that may accumulate in homegrown produce from soil were also considered COCs, and chemicals in groundwater that have MCLs, whether concentrations exceed them, were considered COCs in the RM-2 evaluation.

A screening-level vapor intrusion evaluation was conducted for this site. It was concluded that VOCs in soil and groundwater at RSA-217 do not represent a source that would pose an unacceptable health threat to occupants of future buildings at the site.

The soil and groundwater COCs identified in the PSL evaluation were brought forward for evaluation in the cumulative risk assessment (RM-2 evaluation). The protocol for the RM-2 cumulative risk evaluation is presented in the Revision 1 RFI Report for RSA-217 (APTIM, 2021). Receptor scenarios evaluated in the cumulative risk assessment included a commercial worker, a construction worker, and a hypothetical residential receptor.

Groundwater was evaluated as if it were developed as a source of potable water in the future. Risks from exposure to groundwater were assessed even though groundwater use at this site is precluded now and in the future and non-potable uses are managed by RSA's site access control (SAC) program (U.S. Army Garrison-Redstone, 2012) and the terms of the Installation-Wide Groundwater IROD (Shaw, 2007).

The ARBCA guidance (ADEM, 2017a) considers an IELCR of 1E-05 as the target cumulative risk used to guide site management. The target cumulative noncancer hazard is an HI of 1.0. Estimated cumulative risks/hazards at or below these targets do not require additional action.

The cumulative IELCR estimates for exposure to soil alone exceed the ADEM trigger level of 1E-05 for the hypothetical resident. The cumulative HI estimates for all receptors for exposure to soil alone fall below the threshold level of 1.0.

For groundwater, the cumulative IELCR estimate is greater than 1E-05 for the hypothetical resident and the commercial worker but not the construction worker. The cumulative HI for

groundwater exceeded 1.0 for the hypothetical resident only. Groundwater at RSA-217 is being addressed under RSA-146, in accordance with Table VI.6 of the RCRA permit.

The RM-2 evaluation of human health for RSA-217 indicates relevant COCs identified through the ARBCA evaluation that require action. As discussed in Section 1.1, the ARBCA RM-2 evaluation reduced the seven COCs identified in the PSL evaluation, and showed that arsenic, benzo(a)pyrene, and dibenz(a,h)anthracene were the only COCs in soil requiring action.

3.4.3 Screening Level Ecological Risk Assessment

A SLERA was completed for RSA-217 as part of the Revision 1 RFI Report for RSA-217 (APTIM, 2021). The surface soil data for this site were compared to relevant BSVs and ecological screening values (ESVs). A WOE evaluation was completed to further evaluate the constituents identified in the initial screening. The WOE evaluation examined several lines of evidence to draw conclusions as to whether site-related constituents have the potential to pose hazards to ecological receptors. No permanent or semipermanent surface water bodies are at RSA-217; therefore, no surface water or sediment samples were collected from the site.

3.4.3.1 *Surface Soil*

During the initial comparison of the detected constituent concentrations in RSA-217 surface soil to ESVs and BSVs, 15 metals (aluminum, arsenic, cadmium, calcium, chromium, copper, iron, lead, manganese, mercury, potassium, selenium, thallium, vanadium, and zinc), carbon disulfide, and total high molecular weight (HMW) PAHs were identified as preliminary chemicals of potential ecological concern (COPEC) that required further assessment. Results of the COPEC refinement process are summarized below:

- The COPEC refinement process concluded that three metals (arsenic, copper, and zinc) and total HMW PAHs required community-level and food chain assessments. Aside from calcium, the remaining metals preliminary COPECs were determined to be background related.
- Calcium was not evaluated further in the SLERA because concentrations are less than an order of magnitude higher than its BSV and is an essential nutrient that is easily regulated by most organisms.
- Carbon disulfide warranted further evaluation for potential impacts to community-level receptors, but further assessment for food chain effects was not warranted because it is not considered an important bioaccumulative compound.

Following the COPEC refinement process, a terrestrial invertebrate community-level assessment, terrestrial plant community-level assessment, and terrestrial food chain assessment were completed for RSA-217 surface soils. The findings are summarized below:

- ***Terrestrial Invertebrate Assessment Results*** – The assessment concluded that adverse impacts to terrestrial invertebrate communities from exposure to COPECs in surface soil are unlikely. RSA-217 is in a highly industrialized area; therefore, functional communities of terrestrial invertebrates are considered not present onsite.

- ***Terrestrial Plant Assessment Results*** – The assessment concluded that adverse impacts to terrestrial plant communities from exposure to COPECs in surface soil are unlikely.
- ***Food Chain Assessment Results*** – The results indicate that adverse impacts to local populations of food chain receptors from exposure to COPECs in surface soil are not expected because calculated hazard quotients (HQs) for food chain receptors are less than 1.0 for these COPECs.

3.4.3.2 *SLERA Conclusions*

The results of the SLERA indicate that none of the detected constituents in surface soil at RSA-217 are likely to pose hazards to terrestrial ecological receptor communities and/or populations. The small size of the site coupled with its highly industrialized nature and the absence of special status species or habitats results in a lack of ecological resources, which would warrant ecological concerns. Therefore, further evaluation of terrestrial ecological hazards from these COPECs in surface soil at RSA-217 is not warranted. Detailed results of the SLERA are included in Appendix E of the RFI (APTIM, 2021).

3.5 Final Conceptual Site Model

A CSM was developed in the RFI for RSA-217 based on historical operations, available site information, and soil and groundwater data. **Figure 3-4** presents a visual representation of the site listing potential contaminants, their likely sources, possible migration pathways, potential impacted media, and potential receptors. The CSM was developed by considering the primary uses/activities at the site buildings and their potential chemicals for release. It does not consider routine use of chemicals as intended such as the application of pesticides for insect control. Likewise, since the buildings were used to store inert components, there is no site history pointing to contamination by explosives/perchlorate or chemical agent in surface media, and these chemicals are also not considered as part of the CSM.

The most likely potential contaminants from operations associated with the buildings include VOCs and SVOCs (primarily PAHs) present in the petroleum fuels in the heating oil tanks as well as the vehicles and transport equipment used to access the storage buildings, and metals and VOCs potentially present in the photographic chemicals used in the administrative ID facilities. The CSM information is based upon the assumption that potential spills/releases may have occurred from fuel storage tanks and delivery systems (both aboveground and underground), drains and sumps used to collect and discharge floor washings or waste, and heavy equipment and other vehicles used to access the buildings. Note that the following chemicals are not within the CSM of this site: explosives, pesticides, bis(2-chloroethyl)ether, 3,3'-dichlorobenzidene, 4,6-dinitro-2-methylphenol, hexachlorobenzene, hexachloroethane, hexachlorobutadiene, hexachlorocyclopentadiene, n-nitroso-di-n-propylamine, pentachlorophenol, and 2,4,6-trichorophenol.

3.6 Summary of Site Conditions

The results of the RFI indicated that corrective measure activities are warranted for soil at RSA-217 due to the unacceptable risk posed by arsenic and PAHs to a future hypothetical residential receptor. Exposure to groundwater poses an unacceptable risk due to RDX and dibenz(a,h)anthracene concentrations. Potable groundwater use at the site is currently precluded, and non-potable uses of groundwater are managed in accordance with the RSA SAC program (U.S. Army Garrison-Redstone, 2012) and the terms of the IROD (Shaw, 2007). As per ADEM approval, corrective measure activities for groundwater at RSA-217 will be performed in conjunction with corrective measure activities for groundwater unit RSA-146 (ADEM, 2021).

4.0 DECISION SUMMARY

The Revision 1 RFI Report for RSA-217 concluded that the Army's historical operations at this site have resulted in elevated concentrations of arsenic, benzo(a)pyrene, and dibenz(a,h)anthracene in surface soil and RDX and dibenz(a,h)anthracene concentrations in groundwater that pose an unacceptable threat to human health via direct exposure pathways. However, ADEM accepted the Army's recommendation that the groundwater action for the site be performed in conjunction with corrective measure activities for the underlying groundwater unit (ADEM, 2021). This section identifies the CMOs for surface soil based on the results of the Revision 1 RFI and provides CGs that can be used in evaluating alternatives that rely on reduction in concentrations to achieve the CMOs.

4.1 Basis for the Action

The Revision 1 RFI (APTIM, 2021) defined the nature and extent of contamination and evaluated potential risks to current and future receptors. The RFI concluded that exposure to surface soil at RSA-217 contaminated with arsenic, benzo(a)pyrene, and dibenz(a,h)anthracene would pose unacceptable risks to a hypothetical future residential receptor.

4.2 Corrective Measure Objective

Based on the results of the Revision 1 RFI, the CMO for RSA-217 is to reduce or prevent exposure of hypothetical future residents to surface soil contaminated with arsenic, benzo(a)pyrene, and dibenz(a,h)anthracene such that regulatory limits are achieved or no unacceptable hazard or risk is present.

4.3 Applicable Regulations

In considering corrective measure activities, various laws and regulations (state and Federal) may apply. Consideration of applicable laws and regulations may affect the alternative evaluation and selection. **Table 4-1** lists the laws and regulations that may be relevant to RSA-217.

4.4 Corrective Measure Cleanup Goals

In conformance with ADEM guidelines, recommended CGs were developed in accordance with the current version of the ARBCA Guidance Manual (ADEM, 2017a) to achieve a cumulative

IELCR of 1E-05 and an HI of 1.0. The recommended CG for arsenic in surface soil is presented **Table 4-2**, and is based on the RSA BSV (APTIM, 2021) for arsenic, since the BSV exceeds the RSL. The CG for benzo(a)pyrene in soil was developed by determining its risk/hazard target. The target is set such that the total IECLR and HI for the COCs requiring action will meet the ADEM limits. The COCs are shown in **Table 4-2** with their representative concentrations from the Revision 1 RFI (APTIM, 2021), estimated risks and hazards as well as target risks and hazards. The benzo(a)pyrene CG was derived by calculating the concentration associated with the target risk/hazard given the risks associated with the representative concentration. USEPA (March 1993) developed toxicity equivalency factors that relate the toxicity of all carcinogenic PAHs to that of benzo(a)pyrene so that cancer risk and CGs for the PAHs can be expressed as benzo(a)pyrene equivalents. As a result, **Table 4-2** shows the recommended CG for dibenz(a,h)anthracene as the benzo(a)pyrene equivalent.

4.5 Scope and Role of Response Action

The environmental concerns at RSA are complex. Work is underway or complete at over 300 sites in the Installation Restoration Program at RSA. To ensure protection from exposure to potentially contaminated soil at RSA-217, excavation and removal of contaminated soil will be implemented to prevent exposure to a hypothetical future residential receptor.

The corrective measure will also support the Army and the federal government overall in reducing future short-term and long-term financial liabilities associated with managing this site. Upon attainment of the CGs for COCs in soil, the proposed corrective measure will result in a no further action status for soils at RSA-217.

The following information summarizes the analysis of technologies and alternatives and selection of the corrective measure for this site.

4.6 Site Extent Requiring Corrective Measure

The area and volume of soil requiring corrective measure activities to attain unrestricted land use conditions involve surface soil exceedances at sample location 217-SB002 (**Figure 4-1**).

4.7 Corrective Measures

Depending on the nature and extent of contamination and the site setting, the selection of the preferred soil remediation technology for a given location can be a straightforward process. Given the limited extent of surface soil contamination at RSA-217 exceeding residential land use CGs, the technology screen evaluates no action and soil excavation and disposal as potentially feasible technologies.

4.7.1 Summary of the Corrective Measures Alternatives Evaluation

Technologies that could prevent exposure to the COCs were considered during the evaluation. The following technologies were considered and retained during this evaluation as stand-alone technologies or components of the corrective measure:

- Alternative 1: No Action
- Alternative 2: Excavation and Offsite Disposal

4.7.1.1 *No Action Alternative*

The no action alternative is required by the National Oil and Hazardous Substances Pollution Contingency Plan to serve as a baseline for comparison with other remedial alternatives. Under the no action alternative, no active corrective measure activities would be taken to address the COCs in soil at RSA-217, which pose unacceptable risks to potential human receptors under current site conditions. This Corrective Measure Alternative (CMA) is not considered eligible to be selected as the final corrective measure for RSA-217. The no action alternative, however, is included in the evaluation process consistent with state and Federal guidelines. Evaluation of the no action alternative will serve as a baseline for evaluating other CMAs.

No action is often used to either compare against or as a component of corrective measures using multiple technologies. The no action alternative is used as a baseline against which the adequacies of other corrective measures are compared. The no action alternative would not meet the site's CMO and contains no corrective measures, engineering or administrative controls, or monitoring of contaminated media. Contaminants in soil would be left untreated and unmonitored and would be allowed to migrate with time via leaching to groundwater.

The existing site conditions at RSA-217 do not meet the CMO. Therefore, the no action alternative is not considered a viable technology; however, it is retained to establish a baseline for the comparison of the anticipated risk reduction and costs between the other technologies and CMAs.

4.7.1.2 *Excavation and Offsite Disposal Alternative*

Excavation and offsite disposal comprise an effective and proven technology that generally involves using heavy equipment to remove the vertical and horizontal extent of contamination. The excavated soil is stockpiled onsite; sampled for waste characterization; and transported to an appropriate, permitted offsite disposal facility. Confirmation soil sampling is typically required to verify that the material with contaminant concentrations exceeding CGs has been removed.

Complete removal of the contaminated soil by excavation and disposal at an offsite location would eliminate the source in soil of any potential unacceptable risks at RSA-217. A benefit of offsite disposal is the potential for clean closure of the surface media with no future LUCs or long-term monitoring and maintenance, ultimately eliminating the Army's remaining financial liability associated with the surface media at this site. This technology is retained for CMA development for addressing arsenic- and PAH-impacted soil at this site.

Alternative 2 involves excavating arsenic- and PAH-impacted surface soil around 217-SB002, offsite disposal of the excavated soil, backfill with clean fill material, and site restoration. An approximately 5- by 10-foot area would be excavated to a 1-foot depth, as shown on **Figure 4-1**,

for a total of approximately 1.85 cubic yards (CY) of soil. An estimated 1 CY of construction debris from the asphalt-paved surface would be removed in addition to the soil. The excavation would be backfilled with common fill sourced from an appropriate onsite or offsite location approved by RSA, followed by site restoration and grading using asphalt.

4.7.2 Selected Corrective Measure – Excavation and Offsite Disposal

Based on the evaluation criteria, Alternative 2 (Excavation and Offsite Disposal) is the recommended soil corrective measure to prevent unacceptable exposure risk to a hypothetical future resident and allow for unrestricted use of the site.

This alternative involves the following components:

- Planning, procurement, and permitting
- Mobilization/Demobilization
- Construction (site preparation, excavation and offsite disposal, site restoration)
- Reporting

5.0 CORRECTIVE MEASURE IMPLEMENTATION

This chapter provides an overview of the field activities planned to complete corrective measure activities for contaminated soil at RSA-217. Work discussed in this chapter will be completed in accordance with the procedures outlined in this CMIP and other approved documentation as appropriate.

5.1 General Scope

Preliminary activities include review of the existing SSHP (**Appendix A**) and review of the requirements for base access, digging permits, utility marking, surveying, and protection of existing site features. All field personnel will follow this work plan and abide by the health and safety requirements presented in the SSHP.

The general scope of work for RSA-217 activities is expected to include the following:

- Mobilization/demobilization
- Utility clearance and marking
- Site preparation activities, including vegetative clearing
- Site controls
- Survey layout of excavation
- Excavation of contaminated soil
- Confirmation soil sampling from bottom and sidewalls of excavation
- Characterization of waste soil for disposal
- Backfill and compaction of fill material in excavation
- Survey of extent of excavation and confirmatory sample locations

- Laboratory sample analysis of confirmation samples, characterization samples, and borrow fill material
- Site restoration activities, including grading and reseeding

The general schedule for implementation of corrective measure activities at RSA-217 is provided in **Appendix B**. The schedule is approximate; the dates of actual implementation will depend on approval of the CMIP, availability of funding, coordination with other sites, and field conditions encountered during implementation.

Communication and coordination during the Corrective Measure Implementation (CMI) will follow the RSA Program Management Contract program management plan and RSA's community involvement plan. As per the RCRA permitting process, public involvement will occur during permit modification.

5.1.1 Procurement and Subcontracting

The following subcontracted services and imported materials may be required for the completion of the project:

- Vegetation clearing
- Analytical laboratory
- Soil excavation
- Transportation and disposal of contaminated soil
- Surveying
- General fill
- Topsoil
- Erosion controls
- Seed, fertilizer, and mulch
- Heavy-duty plastic sheeting

The following equipment may be utilized to complete field remediation activities by subcontractors:

- Excavator/backhoe/front-end loader to remove debris or asphalt cover
- Excavator/backhoe to excavate contaminated soil
- Front-end loader to consolidate soil and move fill material
- Wheel loader to manage waste and move imported fill material
- Large-capacity water truck (or equivalent) for site dust control and hydration of imported material for compaction, taking care not to oversaturate the ground

Support equipment and materials will be procured through equipment and scientific supply vendors and shipped directly to the site. Support equipment may include portable storage, radios, relief stations, eyewash stations, sampling supplies and equipment, health and safety supplies and equipment (e.g., personal protective equipment [PPE], air monitoring equipment [e.g., dust monitor and photoionization detector]), and other miscellaneous supplies (e.g., wooden stakes, pin flags, and construction fencing materials).

5.1.2 Field Personnel

The following field personnel will likely be utilized to complete field remediation activities:

- One site supervisor
- One site safety officer
- One field construction quality control system manager
- One or two equipment operators
- Two laborers

The number and schedule of personnel will be adjusted during the project as required for completion.

5.1.3 Quality Control Inspections for Field Activities

Inspections will be performed to determine compliance with this CMIP. Inspections may be performed and verified through visual observation, measurement of materials or equipment, examination of documentation/certification, evaluation of performance, or testing.

Inspections will be performed using a three-phase inspection method. Participants in the inspections typically include but are not limited to the task subcontractor, the project quality control manager, the regulatory representative, and the project health and safety representative. The preparatory inspection(s) are performed prior to start-up and will examine training, procedures, equipment and materials, work plans and documents, and overall readiness to perform work. Initial inspection(s) are performed when work begins on a particular feature of work and include an examination of the quality of workmanship and a review of control testing for compliance with work plan requirements. Follow-up inspection(s) are then performed to verify compliance with procedures. Follow-up inspections will ensure a continuation of quality and safety standards established during preparatory and initial inspections until completion of the definable work feature. Final follow-up inspection(s) will be conducted at the completion of the activity. The final follow-up inspection will be performed to ensure that the completed feature of work meets the CMIP requirements. Any deficiencies noted during this inspection will be documented and a determination will be made as to the corrective actions necessary to mitigate the deficiency. All significant deficiencies will be corrected prior to completion of the activity. Records of inspections will be maintained in the project files. At a minimum, inspection files will include inspection reports/checklists, inspection responses, and any supporting documents, as well as applicable comments.

5.1.4 Daily Reports

The requirements for preparation and submittal of daily project documentation are outlined in the CQAP (**Appendix C**). As indicated in the CQAP, the. At a minimum, daily reports (including daily construction logs, etc.) will be provided to the Project Manager or designee for the CMI contractor during CMI activities. The report will include a running inventory of excavated material.

5.2 Preliminary Activities

Preliminary activities include preparation of an SSHP, mobilization, requirements for base access, digging permits, utility marking, surveying, and protection of existing site features. All field personnel will follow this CMIP and abide by the health and safety requirements presented in the SSHP prepared by the contractor responsible for implementing the corrective measure. A placeholder for this SSHP is included in **Appendix A**.

5.2.1 Mobilization

Upon notice to proceed, mobilization activities will begin, including the deployment of personnel, equipment, subcontractors, and materials necessary to commence CMI activities at RSA-217. Initial activities will include the procurement of subcontractors as well as any equipment and supplies needed. After field mobilization, personnel will attend a preconstruction meeting and safety orientation to review the proposed approach and the sequencing of work to ensure that clear lines of communication are established. All necessary site-specific safety training will be conducted at this time.

5.2.2 Access to Redstone Arsenal

Access to RSA requires registering at Gate 9 on Rideout Road. Badge requests for access to RSA should be submitted 2 weeks ahead of the date needed to allow for approval and processing by the RSA host organization. New personnel will register at the RSA Visitor's Center at Gate 9. Personnel with prior approval from a host RSA organization will be issued a personnel badge upon presentation of proper identification. Temporary passes may be required for some vehicles. Upon registration, personnel may access RSA through any of the gates in operation at RSA.

Military and government personnel will present current military (active, retired, or family) or federal government identification cards and do not require a host RSA organization. For further information, contact the RSA Visitors Center located at Gate 9 at (256) 876-1122 or the Vehicle Registration Office at (256) 876-5770.

5.2.3 Monitoring Well Abandonment and Protection

One monitoring well, 217-RS2171, is located along the boundary of the proposed excavation area. As excavation in this area is planned to extend less than 3 feet below grade, the initial excavation activities will take place with this monitoring well remaining in place. The concrete pad and bollards protecting the well will be carefully removed prior to beginning excavation activities. If necessary, excavation around the well will be performed by hand to prevent damage to the monitoring well or the cement grout used to seal the annular space around the well. The concrete pad and bollards will be replaced after the excavation area is backfilled.

Any other wells identified to be within close proximity of the work zone at RSA-217 will be conspicuously marked in the field for protection during construction (i.e., safety fencing will be placed around the monitoring well). Although every attempt will be made to safeguard the existing monitoring well, if it is inadvertently damaged, the well will be closed and replaced.

Wells damaged as part of the corrective measure activities at RSA-217 will be abandoned in accordance with current ADEM Guidelines for Well Abandonment and replaced in kind unless the Army and ADEM agree that the well is no longer needed at RSA. No well closures are planned during this corrective action. If needed, any replacement monitoring wells will be installed following the completion of backfilling operations at RSA-217. This would include any wells damaged or closed as part of excavation activities.

5.2.4 Vegetation Clearing

Brush/vegetation currently covering the excavation area and debris piles at RSA-217 will be cleared as necessary in preparation for the soil removal action. Brush will be cleared using manual and mechanical means (e.g., chainsaw, line trimmer, heavy equipment).

If practical to implement on site, the cleared materials will be mulched and stockpiled for use during site restoration. Materials not used for site restoration will be disposed at the RSA construction and demolition landfill. This does not include material in contact with site soils; such materials (e.g., root wads) will be disposed in the same manner as the surrounding soil.

5.2.5 Locating, Marking, and Surveying of Excavation Extent

A licensed land surveyor will be subcontracted to delineate the project work boundary and mark the excavation area. The surveyor will mark items in the field with highly visible wooden stakes, tape, or pin flags. Surveying methods will follow the procedures specified in the CQAP provided as **Appendix C**. The proposed excavation area is shown on **Figure 4-1**.

5.2.6 Dig Permit and Clearing of Utilities

A digging permit is required prior to beginning any excavation on RSA. This permit is administered by the Directorate of Public Works. As part of this permit, RSA will locate and mark underground utilities in the vicinity of the excavation. The procedure requires notification by telephone ([256] 876-9881) within 14 days of intrusive activities requesting a work order for a digging permit. The digging permit must be renewed every 30 days. To avoid temporary shutdown, a request for permit extension will be made at least 1½ weeks prior to digging permit expiration for the extension to be granted.

5.2.7 Site Control

Existing fencing, temporary construction fencing materials, barricades, and warning tape will be used as necessary to delineate the site exclusion zone, contamination reduction zone, and site support zone in compliance with a site-specific safety and health plan to be prepared by the CMI contractor. Warning signs will be posted at conspicuous locations around the perimeter of the construction area to discourage unauthorized entry. An equipment storage and material laydown area will be designated during mobilization.

5.2.8 Storm Water, Erosion, and Sediment Controls

Storm water management and erosion and sediment control will be provided in accordance with the *Alabama Handbook for Erosion Control, Sediment Control and Stormwater Management on Construction Sites and Urban Areas* (Alabama Soil and Water Conservation Committee [ASWCC], 2022).

Best Management Practices (BMPs) will be used to reduce erosion and sedimentation and prevent pollution of water and land at the sites. Installation of temporary controls will be coordinated to maintain effective and continuous control of erosion and pollution.

If the water does come into contact with contaminated soil, it will be pumped into a tank and sampled for disposal characterization. To prevent this contact, plastic sheeting may be used to cover excavated areas and prevent contact between storm water and potentially contaminated soil. Storm water would then be discharged prior to removing the plastic sheeting.

Erosion control devices will be inspected weekly and within 72 hours of any qualifying precipitation event (any precipitation of 0.75 inch or greater in any 24-hour period). Sediment deposits will be manually removed from the silt fence after each qualifying rainfall event or when sediment reaches one-half of the barrier height.

Removed sediment will be added to the contaminated soil for subsequent disposal. Damaged erosion control devices and damaged areas around and beneath the devices will immediately be repaired. Upon completion of the project, erosion and sedimentation control devices will be removed. The final design of BMPs will be prepared by the CMI contractor.

5.3 Soil Excavation Activities

The excavation will encompass the area identified during the RFI and the sample locations with results exceeding the CGs for arsenic and select PAHs in soil. The excavation area extends approximately 50 square feet in aerial extent and will extend approximately 1 ft bgs. A total estimated volume of 1.85 CY of material is anticipated to be removed from the excavation. The limit of the soil excavation area is depicted on **Figure 4-1**. The limits of the excavation will be surveyed and staked prior to the start of excavation.

Excavation of the delineated area will be performed to remove soil and any commingled debris with concentrations of COCs greater than CGs. The initial confirmation soil samples will be collected from the actual excavation area that may be larger or smaller than the area presented in this CMIP.

Excavation will be accomplished according to the Safety and Health Regulations for Excavations (Occupational Safety and Health Administration 29 Code of Federal Regulations Part 1926 Subpart P). Although not anticipated, excavations over 4 feet deep shall be shored, sloped (1½:1, horizontal:vertical), or benched as required. Spoils must be placed a minimum of 3 feet from the edge of the excavation. Loose soil or rocks shall be removed from the sides of excavation walls. Personnel shall not enter any excavation over 4 feet deep that is not properly sloped or benched.

Although not anticipated, shoring for excavations over 20 feet deep shall be designed by a registered Professional Engineer and any shoring installed shall be approved and signed off by a registered Professional Engineer. The excavated area will be adequately secured from the public and filled as soon as possible.

At least 3 feet of clearance between any underground utility and the cutting edge or point of powered excavation equipment will be maintained until the precise location of the utility is determined. Initial excavation within this 3-foot area will be conducted manually. Powered excavation equipment will be used once the excavation areas have been cleared and the excavation limits have been demarcated.

Soil confirmation samples will be collected from the bottom and sidewalls of the excavation area to verify that the CGs have been achieved. Section 5.4 discusses the collection of confirmation samples. If floor confirmation sample results at the excavation do not achieve the CG, the excavation will be expanded downward. Any downward extension of the excavation area will proceed in 1-foot increments (minimum) from the original depth for remediation. If the sidewall confirmation samples do not achieve the CG, they will be expanded out a minimum of one bucket width and resampled.

If any excavated material is temporarily stockpiled or staged on or near the site prior to waste characterization sampling and off-site disposal, the excavated material will be staged on impervious material such as plastic sheeting and covered with waterproof material (i.e., tarpaulin or 10-mil plastic sheeting). Containment should control volatilization, runoff, leaching, or fugitive dust emissions. Measures shall be taken to prevent any surface runoff from entering into or washing away from the stockpile.

If necessary, dust at the site will be controlled with water using a water truck with hose and sprayers and mulch such as straw or wood chips from vegetation removed from the site. Water will be applied to dry exposed areas until the surface is wet and repeated as needed. Water will be applied at rates that prevent runoff.

5.4 Confirmation Sampling

Following completion of the proposed excavation, confirmation soil samples will be collected within the RSA-217 excavation area to ensure that the soil contaminant concentrations do not exceed the CGs for the applicable site COCs. Composite confirmation samples will be collected from the perimeter sidewalls and the floors of the excavation area. At a minimum, one confirmation sample will be collected from the walls and floor of the excavation, resulting in at least five confirmation samples. Confirmation samples will be sent to an offsite analytical laboratory for analysis. The confirmation soil samples at RSA-217 will be analyzed for the identified COCs (i.e., arsenic, benzo(a)pyrene, and dibenz(a,h)anthracene). Confirmation samples will be collected and analyzed in accordance with the Data Quality Collection Plan (DQCP) provided as **Appendix D**.

Composite samples from the perimeter and the floor of the excavation will be collected by stainless-steel spoon and placed in a stainless-steel bowl. Debris such as grass, roots, or gravel will be removed, and the soil will be thoroughly mixed (homogenized) and placed in the appropriate sample containers. Sample collection logs will be filled out to document the sampling. If floor confirmation sample results do not achieve the CG, the excavation will be expanded downward. Aliquots from deeper excavations (greater than 4 feet in depth) will be collected from an excavator bucket.

Confirmation samples will be collected using routine quality assurance/quality control sample frequencies (i.e., 10 percent field duplicates, 5 percent matrix spike/matrix spike duplicate). All sample containers, preservatives, and holding times will conform to the requirements specified in the DQCP (**Appendix D**).

All analytical data generated from this project will be managed in accordance with the procedures specified in the DQCP, except only the final confirmation sample results will be validated. Sample documentation, custody, packaging, and shipping will follow the procedures specified in the DQCP. Custody will be maintained at all times by the sampling team prior to shipment to the analytical laboratory using typical chain-of-custody forms.

5.5 Remediation-Derived Waste / Investigation-Derived Waste Management

In determining whether to manage remediation- derived waste (RDW) and investigation-derived waste (IDW) as nonhazardous or hazardous, factors such as generator knowledge and real-time field measurements or observations will be considered. AAC 335-14-3-.01(2) allows the use of generator knowledge in the hazardous waste determination process. Generator knowledge consists of an evaluation of the following four factors:

1. ***Process Knowledge*** – The site processes are evaluated to determine if any activity might have generated a listed waste which still persists in soil or groundwater.
2. ***Past Investigation-Derived Waste Management Practices*** – IDW has been managed at RSA for over 20 years. Changes to regulations directing this management have been minor. The Army intends to follow management practices which have been accepted by ADEM during prior investigations.
3. ***Sampling Results from Past Waste Characterization Sampling*** – Historical waste characterization sampling may indicate whether future IDW is likely to be a nonhazardous waste or to have characteristics of a hazardous waste.
4. ***Sampling Results from Past Soil and Groundwater Sampling*** – Historical sampling results from soil and groundwater sampling may indicate whether future IDW is likely to be a nonhazardous waste or to have characteristics of a hazardous waste.

Contaminated soils and debris will either be stockpiled during the excavation at RSA-217, or if approved in advance by an appropriately licensed and permitted landfill, loaded for immediate transport and disposal. Any landfill selected for disposal will be appropriately permitted under RCRA.

Concrete and metal debris that can be easily segregated from the site soils will be stockpiled separately from any stockpiled soil for disposal at the RSA construction and demolition debris landfill. The concrete and metal that is segregated will be visually inspected and cleaned of attached soil prior to stockpiling. The cleaning will remove any clumps of soil from the debris, leaving only incidental attached soil; if necessary, pressure washing will be used to remove any clumps of attached soil.

No known source of contamination involving a process and/or chemical triggering a listed waste code designation has been identified in the waste soils process of generation. Representative composite samples will be collected from stockpiles or in-situ in accordance with the requirements of the landfill selected for disposal of the waste. Stockpile characterization is discussed in Section 5.5, and stabilization is discussed in Section 6.3.

In addition to the excavated soil and debris, other RDW generated during the CMI activities at RSA-217 is expected to include decontamination fluids and disposable PPE. These additional forms of RDW will be containerized, labeled, and stored in compliance with the provisions of AAC 335-14, as applicable, and as discussed in the Alabama Environmental Investigation and Remediation Guidance (AEIRG) (ADEM, 2017b). PPE that is contaminated by site media will be disposed of with the contaminated waste stream (i.e., PPE generated during soil excavation will be disposed of at a Subtitle D landfill). PPE that is uncontaminated will be placed in trash bags and disposed as normal household trash. Other types of RDW, if generated, will be managed in accordance with Table 2 of Appendix G of the AEIRG (ADEM, 2017b).

For RDW considered to be nonhazardous using generator knowledge and field observations, soil cuttings and liquid waste will be containerized and stored on site pending sampling and analysis. Analytical testing and subsequent evaluations will be performed to determine if soil may be disposed of offsite at a Subtitle D landfill. Sampling and analysis of RDW are discussed in **Appendix C**.

If any soil RDW is determined to be hazardous for arsenic, the Army will determine whether offsite disposal as a hazardous waste, or stabilization of this soil (as discussed in Section 6.3) is appropriate. Other RDW believed to be hazardous will be containerized in 55-gallon drums or other suitable containers with tight-fitting lids or other covers. Presumed hazardous RDW will be labeled, moved to a satellite accumulation area or 90-day storage within 72 hours, or managed on site in a 90-day storage area.

An RCRA hazardous waste determination/evaluation is required by AAC 335-14-3-.01(2) and will be made utilizing waste identification criteria outlined in AAC r. 335-14-2-.01 through 335-14-2-.04. Analytical results from soil and groundwater RDW samples will be used to determine whether the waste is hazardous or nonhazardous and, for nonhazardous RDW, to determine the contaminant concentrations for disposal purposes. Types of analyses are site specific but typically include TCLP VOCs, TCLP SVOCs, and TCLP metals. Waste for which TCLP results exceed limits specified in AAC 335-14-2-.03, Table 1, will be managed as hazardous waste and sent offsite for treatment and disposal in accordance with federal and state regulations.

Examples of nonhazardous soil RDW disposal practices for RSA-217 include soil disposal at a Subtitle D landfill. For nonhazardous water RDW, possible management options include processing through RSA's sewage treatment plant or an appropriate RCRA-permitted facility. Examples of disposal practices for hazardous waste include disposal of solid (soil) hazardous waste in a landfill permitted to accept the waste based on the specific contaminants and concentrations in the soil, and treatment of the RDW hazardous liquids will be in accordance with ADEM regulations and the disposal facility permit.

5.6 Waste Soil Transport and Disposal

A licensed transportation subcontractor will be used to transport RDW for disposal at an appropriately permitted landfill. It is anticipated that the excavated soil will be disposed of as a nonhazardous Special Waste at a permitted Subtitle D landfill. Transportation and disposal of the excavated waste will begin after approval by the Alabama Department of Environmental Management (ADEM) pursuant to properly submitted Form 300. Prior to transport, an RSA representative will review and sign the waste manifest.

During loading activities, the CMI contractor will document the quantities of waste loaded into roll-off boxes or into the dump truck and facilitate the bill of lading or shipping paper documentation for the nonhazardous waste shipments. Prior to sending any waste determined to be hazardous waste offsite for disposal, the hazardous waste must be documented on a hazardous waste manifest and have a Land Disposal Restriction notification. Transportation will comply with all U.S. Department of Transportation regulations. The CMI contractor will coordinate with the transporters so that the waste will be shipped to arrive on schedule at the landfill. The landfill will provide written approval prior to the CMI contractor shipping waste to their facility. The landfill will provide a certificate of disposal for each load received and processed.

5.7 Post-Excavation Activities

Activities to be conducted once excavation and confirmatory sampling have been completed include: backfill of the excavation, site restoration, decontamination of equipment, demobilization from the site, and completion of a final corrective measure report. These activities are described below in greater detail.

5.7.1 Backfill and Site Restoration

Upon completion of all soil excavation activities, approximately 2 CY of fill material will be brought in from an approved offsite borrow source. Representative samples of the borrow source material will be collected to confirm it is acceptable for use as backfill at the site if recent sampling of the borrow source material has not occurred. The borrow material sampling, if required, will include one 5-point composite sample analyzed for SVOCs and RCRA-8 metals. Borrow samples will be collected in accordance with the DQCP provided as **Appendix D**.

The analytical results for metals and SVOCs will be screened against RSLs for commercial soils to demonstrate that the material is acceptable for use.

The backfill material will be placed and spread in maximum 12-inch loose lifts and compacted with the excavator prior to placement of the next lift. Any uncontaminated soil removed during excavation activities, such as for sloping or benching, may also be placed in the excavation. Dust at the site will be controlled with water using a water truck with hose and sprayers and mulch such as straw. Water will be applied at rates so that runoff does not occur.

When backfilling and compaction is completed, the surface will be restored to its previous condition. Concrete or asphalt will be placed in previously paved areas. Vegetated areas will be covered with clean topsoil and then be seeded and mulched to stimulate revegetation in the affected area and reduce the potential for soil erosion. Seed and mulch will be applied to all disturbed areas according to the BMP handbook from the ASWCC (ASWCC, 2014).

A site inspection will be conducted 2 to 4 weeks after the seeding to confirm the revegetation is successful. If revegetation is unsuccessful, the site will be reseeded until an adequate stand of vegetation is present.

Upon completion of site restoration activities, temporary erosion and sediment controls will be removed and disposed of offsite at the RSA construction debris landfill or with the RDW from the excavation. The silt fence will remain in place until after the vegetation is established. When the silt fence is removed, the posts will be pulled from the ground and the remaining disturbed area will be reseeded. Excess soils will be removed from the silt fence and disposed of with the RDW from the excavation.

5.7.2 Equipment Decontamination

An area will be designated within the boundary of the work area at RSA-217, adjacent to vehicular ingress and egress areas, for equipment decontamination. A decontamination pad typically consists of a soil-bermed area covered with multiple layers of plastic sheeting where gross contamination can be removed from equipment. The decontamination pad will contain a sump area or low area where wash water from pressure washing will drain to be pumped into a portable holding tank. Decontamination fluids will be sampled for SVOCs and TAL metals. Decontamination fluids will be managed as discussed in Section 5.5. Settled soil within the sump will be disposed of with the excavated materials from RSA-217.

Reusable sampling equipment will be decontaminated prior to beginning work at the site and prior to the collection of individual samples to prevent cross contamination and maintain the integrity of the environmental samples collected. All sampling equipment and heavy equipment will be decontaminated in accordance with procedures specified in the RSA Installation-Wide Quality Assurance Program Plan (Shaw, 2013).

5.7.3 Demobilization

Personnel, equipment, and subcontractors will be demobilized from the project site after completion of remedial activities. A small crew and minimal equipment will be retained as required to remove surplus materials and clean staging areas. Demobilization will primarily consist of disassembly, packing, and return of rented equipment to suppliers and travel for personnel back to their home offices.

5.8 Inspections for Field Activities

Inspections will be performed to determine compliance with this CMIP in accordance with the CQAP in **Appendix C.** Inspections may be performed and verified through visual observation, measurement of materials or equipment, examination of documentation/certification, evaluation of performance, or testing. Inspections will be performed using a three-phase inspection method. Participants in the inspections typically include but are not limited to the task subcontractor, the project quality control manager, the regulatory representative, and the project health and safety representative. The preparatory inspection(s) are performed prior to start-up and will examine training, procedures, equipment and materials, work plans and documents, and overall readiness to perform work. Initial inspection(s) are performed when work begins on a particular feature of work and include an examination of the quality of workmanship and a review of control testing for compliance with work plan requirements.

Follow-up inspection(s) are then performed to verify compliance with procedures. Follow-up inspections will ensure a continuation of quality and safety standards established during preparatory and initial inspections until completion of the definable work feature. Final follow-up inspection(s) will be conducted at the completion of the activity. The final follow-up inspection will be performed to ensure that the completed feature of work meets the CMIP requirements. Any deficiencies noted during this inspection will be documented and a determination of the corrective actions necessary to mitigate the deficiency will be made. All significant deficiencies will be corrected prior to completion of the activity. Records of inspections will be maintained in the project files. At a minimum, inspection files will include inspection reports/checklists, inspection responses, any supporting documents, and applicable comments.

5.9 Corrective Measures Implementation Reporting

The Army will submit CMI progress reports in accordance with Section VIII.D.1 of the Permit. As indicated in the CQAP, the daily reports (including daily construction logs, etc.) will be provided to the Project Manager or designee during CMI activities. The requirements for preparation and submittal of daily project documentation are outlined in the CQAP provided in **Appendix C**.

Upon completion of the approved CMI, a final report will be prepared and submitted to ADEM. The final report of corrective measure activities will be submitted within 90 days of attainment of CGs and the completion of site restoration activities pursuant to Part VIII.D of the Permit. The final report will include the following:

a) A description of activities completed

b) As-built construction drawings presenting the final limits of the soil excavation and the locations of confirmation samples
c) Waste manifests indicating the handling of the excavated material that has been shipped offsite to an ADEM-appropriately permitted and certified landfill
d) Monitoring data (soil, air, dust, and water) collected for any reason during the CMI for the purposes of monitoring potential for human and ecological exposure
e) Certification, prepared in accordance with AAC 335-13-8-02 (2)(d) by RSA and a registered professional engineer (State of Alabama), that the corrective measure required by the Permit is complete
f) Appendices consisting of site photographs, analytical reports, data validation documentation, and waste manifests

6.0 CONTINGENCIES

The implementation of corrective measure activities is based on the best information currently available for RSA-217. It is recognized that variations from this CMIP may be required during the execution phase of the work in order to fully address actual site conditions in a timely manner that is protective of human health and the environment. The Army, ADEM, or other relevant parties may take actions to grant such variances from this CMIP during the corrective measure process. Any variance will be documented and communicated at the time of occurrence and included in the report. Potential site conditions that may be encountered at RSA-217 are discussed in this chapter.

6.1 Contaminated Soil Beyond Proposed Boundaries

The soil excavation at RSA-217 will proceed until the CGs for COCs of arsenic and select PAHs have been achieved. The following procedures will be followed for overexcavating sidewalls and floors:

- If the sidewall confirmation samples do not achieve the CGs, the failing section will be expanded outward a minimum of one bucket width (approximately 3 feet) and resampled. The overexcavation process will continue until the CGs have been achieved or until further expansion of the excavation would threaten the stability of adjacent features such as buildings, roadways, etc.
- If floor confirmation sample results do not achieve CGs, the excavation will be expanded downward. Any downward extension of the excavation area will proceed in 1-foot increments (minimum) from the original depth for remediation. This process will proceed until CGs have been achieved, the average water table has been reached, or groundwater begins to enter the excavation from the sidewalls or floor.

6.2 Sloping of Excavation Sidewalls

If the CMI contractor determines sidewall sloping or benching is necessary, soils removed for these purposes may be stockpiled separately from other site soils for potential use as backfill. These stockpiles will be sampled and analyzed for the site COCs. If the results from this analysis are below site CGs, the soil may be used as backfill.

6.3 Hazardous Waste Determination

As described in Section 5.5, excavated soils will be characterized for hazardous determination using TCLP-metals, TCLP-VOCs and TCLP-SVOCs. If waste characterization sampling determines that the excavated soil is determined to be hazardous, then soil will be appropriately disposed of at a permitted hazardous waste disposal facility.

6.4 Encountering Unknown Utilities

If unknown utilities are discovered or existing utilities are compromised during excavation, work will stop in that portion of the work area until the utilities are identified and either relocated or repaired by the utility company or other appropriate authorities. Continuation of work at the project site will depend on evaluation of potential hazards related to the utility issue. That evaluation will be performed by the project safety officer in consultation with the Health and Safety Manager and the Army as appropriate.

6.5 Dewatering of Excavations

In the event that standing surface water and storm water inhibit excavation activities at the RSA-217 site, the water will be removed from the construction area by pumping. Storm water controls will be implemented to direct potential run-on away from the site. Water that has not come into contact with contaminated soil will be removed and discharged downgradient of the excavation.

If the water does come into contact with contaminated soil, it will be pumped into a tank and sampled for disposal characterization. To prevent this contact, plastic sheeting may be used to cover excavated areas and prevent contact between storm water and potentially contaminated soil. Storm water would then be discharged prior to removing the plastic sheeting.

6.6 Saturated Soils

Although unlikely, in the event contaminated soil becomes saturated in the excavation or stockpile area, the Site Manager will initiate measures to ensure that the soil can be prepared for transport and disposal. Those measures may include one or more of the following:

- Create an area within or adjacent to the affected area where excess water is allowed to drain and can then be collected.
- Mix saturated soil with dry soil (i.e., post waste characterization) ex-situ prior to disposal.
- As a last resort, add absorbent to ensure no free liquids are present during transportation to the disposal facility.

6.7 Discovery of Additional Contaminant Sources

Although no subsurface contaminant sources are expected to be encountered during the RSA-217 excavation activities, subsurface piping, drains, or other undiscovered contaminant sources may

be encountered. If any of these subsurface contaminant sources are encountered during the excavation, the feature will be handled in the following manner:

- If free liquid is found within the feature, it will be addressed as follows:
  - Small amounts will be mixed with dry soil from the excavation or an absorbent until no free liquid is visible.
  - Amounts too large for mixing/absorption will be removed, tested, and disposed of as a separate waste stream.
- Abandoned piping, drains, etc., that are within the excavation area will be excavated and staged along with the surrounding soil and disposed of in like manner with the surrounding soil.
- If a conduit extends outside the excavation and that boundary of the excavation has passed the CG, the conduit will be plugged with at least 2 feet of cement grout.

6.8 Discovery of Munitions and Explosives / Chemical Warfare Materiel

Available information including historical records and recent environmental sampling data was reviewed with respect to munitions and explosives of concern, including chemical warfare materiel, or chemical agent potential at RSA-217. The review indicated that the probability of encountering unexploded ordnance (UXO) or unknown liquid-filled munitions or other items, measurable concentrations of chemical agent, or agent breakdown products is low. Based on this evaluation, it was determined that no chemical agent monitoring or on-site UXO support will be required for the CMI. However, in the event any suspicious item is encountered, all work shall stop and the Project Manager and Health and Safety Manager will be notified. If the suspicious item can be positively identified by qualified UXO personnel as not presenting an explosive or chemical agent hazard or once the hazard has been removed, work will proceed.

6.9 Variances

The Army recognizes that variations from this CMIP in addition to the contingencies included above may be required during the execution phase of the work in order to fully address actual site conditions in a timely manner that is protective of human health and the environment. The Army may grant variances from this CMIP submitted by the CMI contractor during the corrective measure process. As part of their approval process, the Army will discuss applicable field variances with ADEM to determine if the variance process is suitable for documenting the proposed changes, or whether revisions to this CMIP along with a permit modification may be needed. Any variance will be documented and included with the CMI report for the site.

7.0 REFERENCES

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USEPA, May 2019. *Regional Screening Levels for Chemical Contaminants at Superfund Sites*.

TABLES

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Table 4-1
Applicable Regulations
Redstone Arsenal, RSA-217

Standard, Requirement, or Criterion	Requirement	Applicability	Comment
Federal			
Safe Drinking Water Act – 40 CFR Part 149	Sole-source drinking water aquifer designation.	Not applicable	This site is not located over a sole-source aquifer.
Safe Drinking Water Act, 40 U.S.C. §300 – National Primary Drinking Water Standards - 40 CFR Part 141	Applicable to the use of public water systems. Establishes maximum contaminant level, monitoring requirements, and treatment techniques.	Applicable	Federal drinking water standards are used by ADEM to establish cleanup standards.
Safe Drinking Water Act, 40 U.S.C. §300 – Maximum Contaminant Level Goals, 40 CFR Part 143	Establishes drinking water quality goals set at levels of no known or anticipated adverse health effects.	Applicable	Federal drinking water goals are used by ADEM to establish cleanup standards.
Floodplain Management – RCRA; RCRA Location Standards, 42 U.S.C. §6901, 40 CFR §264.18(b)	Requires treatment, storage, or disposal facilities to be designated, constructed, operated, and maintained to avoid washout on a 100-year floodplain.	Not applicable	No new regulated units will be developed as part of the expected remedy.
Protection of Wetlands – 44 CFR Part 9, Executive Order 11990	Federal agencies are directed to avoid construction located in wetlands unless the agency head finds – 1) no practical alternative to such construction, and 2) the proposed action includes all practical measures to minimize harm to wetlands that might result from such use.	Not applicable	No construction will be conducted in wetlands.
Protection of Wetlands – 40 CFR Part 230	Sets forth guidelines for fill material in wetlands.	Not applicable	Filling wetlands is not a component of the expected remedy.
Wetlands Permitting – 24 CFR §55.28	Identifies permitting requirements for excavation activities in wetlands.	Not applicable	Excavation activities will not be conducted in wetlands.
Tennessee Valley Authority Act of 1933 (16 U.S.C. §831), 18 CFR Part 1304	Identifies permit requirements for approval of construction in the Tennessee River system and regulation of structures and other alterations.	Not applicable	Site is not located within the Tennessee River system.
Endangered Species Act, 16 U.S.C. §35, 50 CFR Part 17	Requires Federal agencies to ensure that actions are not likely to threaten the continued existence of endangered/threatened species or adversely modify or destroy the critical habitats of such species.	Not applicable	Actions are not anticipated that will modify or destroy critical habitats as part of the expected remedy.
Fish and Wildlife Coordination Act – 16 U.S.C. §661-666, 33 CFR Parts 320-330	Sets forth procedures for consultation between regulatory agencies to consider wildlife conservation. Requires any Federal agency proposing to modify a body of water to consult with the U.S. Fish and Wildlife Service.	Not applicable	Discharge to surface water is not a component of the expected remedy.
Wild and Scenic Rivers Act, 16 U.S.C. Chapter 28, 36 CFR 297	Restricts activities within areas affecting national wild, scenic, or recreational rivers.	Not applicable	No such areas present.

Table 4-1
Applicable Regulations
Redstone Arsenal, RSA-217

Standard, Requirement, or Criterion	Requirement	Applicability	Comment
Presence of archaeological resources, 43 CFR §7.4(a), 43 CFR §7.5(b)(1), 43 CFR §10.4(c), 43 CFR §10.4(d)	Restricts excavating, removing, damaging, or otherwise altering or defacing such resources unless by permit or exception. Protects any such archaeological resources, if discovered. Restricts activities in area of discovery and requires a reasonable effort be made to protect the objects discovered. Requires consultation with the Indian tribe likely to be affiliated with the objects to determine further disposition per 43 CFR §10.5(b).	Potentially applicable, but unlikely	This regulation would apply if archaeological or historic resources are discovered at the site. This is unlikely since the site is largely developed.
Archeological Resources Protection Act of 1979 (16 U.S.C. §470), 36 CFR Part 296	Requires the protection of archeological resources.	Potentially applicable, but unlikely	This regulation would apply if archaeological or historic resources are discovered at the site. This is unlikely since the site is largely developed.
Native American Graves Protection and Repatriation Act, 25 U.S.C. 3001-3013 and 43 CFR Part 10	Requires protection of Native American graves discovered during excavation activities.	Potentially applicable, but unlikely	This regulation would apply if Native American burial sites or cultural items are discovered at the site. This is unlikely since the site is largely developed.
American Indian Religious Freedom Act, 42 U.S.C. 1996	Requires activities in area of discovery to be stopped and affected work to be suspended until a compliance strategy is approved.	Potentially applicable, but unlikely	This regulation would apply if archaeological or historic resources are discovered at the site. This is unlikely since the site is largely developed.
Standards Applicable to Generators of Hazardous Waste, 40 CFR Part 262	Establishes standards for generators of hazardous waste under RCRA. Specifies requirements for hazardous waste packaging, labeling, manifesting, recordkeeping, and accumulation time.	Not applicable	Generation of hazardous waste not anticipated as part of the expected remedy.
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, 40 CFR §264.13(a)(1)	Must obtain a detailed chemical and physical analysis on a representative sample of the waste(s).	Not applicable	Generation of hazardous waste not anticipated as part of the expected remedy.
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, 40 CFR §264.170-179	Management of hazardous waste in containers.	Not applicable	Generation of hazardous waste not anticipated as part of the expected remedy.
Land Disposal Restrictions, 40 CFR Part 268	Identifies hazardous wastes that are restricted from land disposal.	Not applicable	Generation of hazardous waste not anticipated as part of the expected remedy.
Discharge to Offsite Surface Water, 40 CFR §122.26, 122.41, and 122.48	Requires that the selected remedial action must establish a standard of control to maintain surface water quality.	Not applicable	Discharge to surface water not anticipated as part of the expected remedy.
Clean Water Act, 33 U.S.C. §1342, 40 CFR Part 122	Identifies requirements for discharges under the NPDES.	Not applicable	No discharge to surface water is planned for this site.
Discharge to a POTW, 33 U.S.C. §1317 and 40 CFR Part 403	Establishes list of toxic pollutants and promulgates pretreatment standards for discharge to POTWs.	Not applicable	There is no POTW. Sewer at RSA is private.

Table 4-1
Applicable Regulations
Redstone Arsenal, RSA-217

Standard, Requirement, or Criterion	Requirement	Applicability	Comment
Clean Air Act, codified under 40 CFR Part 60, Part 61, or Part 63; prerequisite for this action – 40 CFR §264.1030(e)	Process vents associated with air or stream stripping operations that manage hazardous wastes with organic concentrations of at least 10 parts per million weight.	Not applicable	No treatment is anticipated for this site.
State			
Alabama Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, ADEM 335-14-5-.01, Hazardous Waste Program	Establishes location standards for facilities located in 100-year floodplains. Forbids placement of any non-containerized or bulk liquid hazardous waste within any salt dome/salt bed, underground mine, or cave.	Not applicable	Generation of hazardous waste not anticipated as part of the expected remedy.
Alabama Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, ADEM 335-14-6, Hazardous Waste Program	Prohibits placement of any hazardous waste in a salt dome, salt bed formation, underground mine, or cave.	Not applicable	Placement of waste is not relevant for this site.
Alabama Identification and Listing of Hazardous Waste, ADEM 335-14-3	Establishes standards for generators of hazardous waste, including identification, accumulation, transport, and reporting.	Not applicable	Generation of hazardous waste not anticipated as part of the expected remedy.
Alabama Drinking Water Standards, ADEM 335-7-2	Applicable to the use of public water systems. Establishes maximum contaminant level, monitoring requirements, and treatment techniques.	Applicable	Drinking water standards established by ADEM based on Federal drinking water goals.
Alabama Water Quality Criteria, ADEM 335-6, Water Quality Program	Requirements for discharges to surface waters, NPDES requirements, BMPs, and UIC.	Not applicable	Discharge to surface water is not included as a component of the expected remedy for this site.
UST Requirements – ADEM 335-6-15	Technical standards, corrective action requirements, and financial responsibility for owners and operators of USTs.	Not applicable	USTs are not present at this site. Corrective action requirements for this site are regulated by ADEM through RSA's RCRA permit.
Wetlands Protection – ADEM 335-8-2.02/2.03	Defines requirements for dredging or filling and mitigation of impacts to wetlands.	Not applicable	Dredging and/or filling are not components of the anticipated remedy for this site.
Alabama Non-Game Species Regulation, AAC 220-2.92	Identifies state-protected species.	Potentially applicable, but unlikely	Applicable if state-protected species are encountered. This is unlikely due to the developed nature of the site.
Phase I Organic Air Emission Standards – ADEM 335-14-5-.27 and 335-15-5-.28	For TSDFs – Emission standards for process vents and emission standards for leaks from specific equipment containing hazardous waste with a total organic concentration of at least 10 percent by weight.	Not applicable	No TSDFs are planned as part of the expected remedy.
Phase II Organic Air Emission Standards – ADEM 335-14-5-.29	For TSDFs – Emission standards tanks, surface impoundments, containers, and miscellaneous units that contact hazardous waste containing an average organic concentration greater than 500 parts per million weight.	Not applicable	No regulated units will be developed as part of the expected remedy.

Table 4-1
Applicable Regulations
Redstone Arsenal, RSA-217

Standard, Requirement, or Criterion	Requirement	Applicability	Comment
Alabama Solid Waste Act, Code of Alabama, Title 22, Chapter 27	Establishes sitewide program to provide for the safe management of nonhazardous wastes.	Applicable	Nonhazardous waste will be generated during excavation activities.
Alabama Solid Waste Management Regulations, ADEM 335-13-1 through 335-13-8	Establishes minimum criteria for the processing, recycling, transportation, and disposal of solid wastes and the design, location, and operation of solid waste disposal facilities.	Applicable	Nonhazardous waste will be generated, transported, and disposed of as part of corrective measure activities.
Alabama Stormwater Discharge Regulations, ADEM 335-6-12	Establishes requirements for a stormwater discharge permit for construction activities that disturb greater than 1 acre of land.	Not applicable	Disturbance of greater than 1 acre of land is not anticipated as part of the remedy.
Alabama Water Quality Criteria and Use Classifications Regulations, ADEM 335-6-10	Establishes water quality criteria and uses for lakes and rivers based on toxicity to aquatic organisms and human health and water use classifications and antidegradation policy	Not applicable	No discharge to surface water is planned as part of the expected remedy for this site.
Indirect Discharge Permits and Pretreatment Rules, ADEM 335-6-5	Establishes list of toxic pollutants and promulgates pretreatment standards for discharge to POTWs and defines the requirements for State Indirect Discharge permits for discharge to POTWs	Not applicable	There is no POTW. Sewer at RSA is private.
Alabama Wellhead Protection Program, ADEM 335-7-12	Establishes requirements for the closure or abandonment of groundwater monitoring or extraction wells.	Potentially applicable	Applicable if any monitoring wells are abandoned or constructed.
Alabama Uniform Environmental Covenants Program, ADEM 335-5	Establishes the requirements for environmental use restrictions on Federal facility property.	Applicable	The use of LUCs is considered likely at least temporarily for this site until facility-wide groundwater cleanup is achieved.

Notes:
§ = Section
AAC = Alabama Administrative Code
ADEM = Alabama Department of Environmental Management
CFR = Code of Federal Regulations
LUC = Land Use Control
NPDES = National Pollutant Discharge Elimination System
POTW = Publicly Owned Treatment Works
RCRA = Resource Conservation and Recovery Act
RSA = Redstone Arsenal
TSDF = Treatment, Storage, and Disposal Facility
UIC = Underground Injection Control
U.S. = United States
U.S.C. = United States Code
USEPA = U.S. Environmental Protection Agency
UST = Underground Storage Tank

Table 4-2
Soil Cleanup Goals
Redstone Arsenal, RSA-217

COC Requiring Action	RC (mg/kg)	Sum of IELCR	Target Cancer Risk [1]	Sum of HI	Residential CG (mg/kg) [2]
Arsenic	1.34E+01	1.32E-05	2.00E-06	2.45E-01	15 [3]
Benzo(a)pyrene[4]	4.26E-01	3.71E-06	8.00E-06	2.38E-02	0.92
Dibenz(a,h)anthracene	5.14E-01	1.91E-06	-	-	included above [5]

Notes:

(1) Cumulative Target Cancer Risk = 1.00E-05.

(2) Residential CG based on achievement of target risk/hazard; the CGs for chemicals with both cancer and non-cancer effects are based on cancer risk.

(3) Based on two times the mean of the surface soil background data set. See Table 3-2 in the Revision 1 RFI Report (Aptim Federal Services, LLC, January 2021). The arsenic CG was selected as the BSV, since the BSV is higher than the value derived on the basis of target cumulative risk/hazard index calculations.

(4) Based on total benzo(a)pyrene equivalent concentration for benzo(a)pyrene and dibenz(a,h)anthracene.

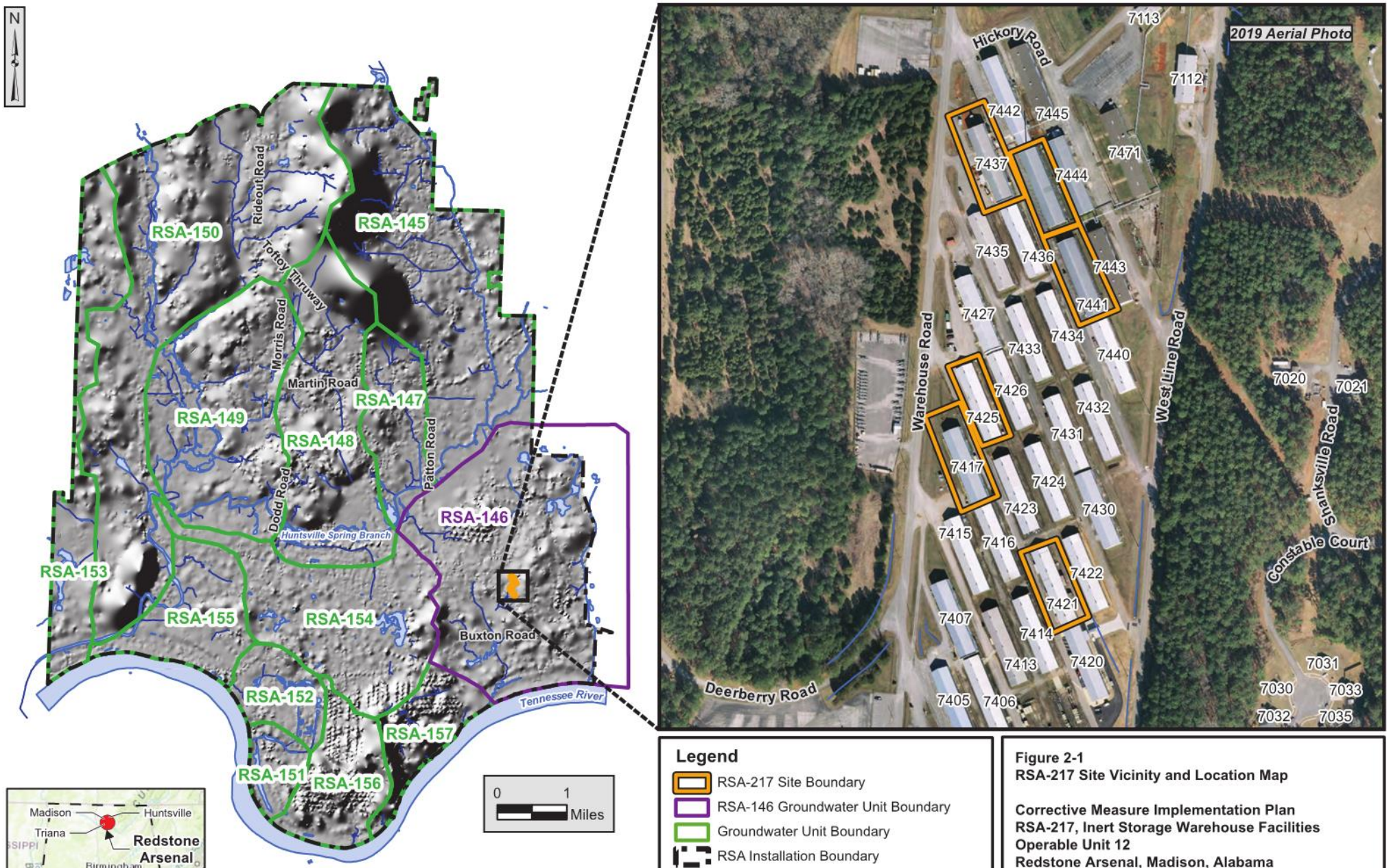
(5) Included in benzo(a)pyrene equivalent residential CG.

BSV = Background Screening Value
CG = Cleanup Goal
COC = Chemical of Concern
IELCR = Individual Excess Lifetime Cancer Risk
mg/kg = Milligrams per kilogram
RC = Representative Concentration
RFI = Resource Conservation and Recovery Act Facility Investigation

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FIGURES

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Legend

- RSA-217 Site Boundary
- RSA-146 Groundwater Unit Boundary
- Groundwater Unit Boundary
- RSA Installation Boundary
- Surface Water Body
- Surface Drainage Features (Some Ephemeral)

NOTES
1. Basemap data from IGI&S Office at Redstone Arsenal
2. Map Size: A-size (11"x8.5")
3. Revision Date: 6/28/2022

Figure 2-1
RSA-217 Site Vicinity and Location Map

Corrective Measure Implementation Plan
RSA-217, Inert Storage Warehouse Facilities
Operable Unit 12
Redstone Arsenal, Madison, Alabama
Project Number: MSC2022.0005.0006

1 inch = 400 feet
0 400 800 Feet
NAD 1983 State Plane Alabama East Feet

bhate
ECC Environmental Chemical Corporation

ECC GIS Server: E:\Projects\Redstone\MapDocument\CMS\RSA217\Fig1-1_RSA217_SiteLoc.mxd


2019 Aerial Photo
RSA-215
RSA-218
RSA-221
RSA-219
RSA-220
RSA-046
Acid Pit
7103
7104
7105
7112
7113
7118DEM
7139DEM
7141DEM
7142DEM
unk392DEM
unk393DEM
unk394DEM
GT74ADEM
GT74BDEM
GT74CDEM
7108DEM
7138DEM
7175DEM
7115DEM
7445
7442
7437
7444
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7411
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7404
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7030
7033
7035
7032
7037
7020
7021
Maple Road
Hickory Road
Dogwood Road
Chestnut Road
White Oak Road
Red Oak Road
Warehouse Road
West Line Road
Shanksville Road
Constable Court
Sweetleaf Road
Deerberry Road
Limeberry Road
Firethorne Road
Ninebark Road
LEGEND
RSA-217 Site Boundary
Other Environmental Site Boundary
Acid Pit
Removed Structure
Wetland
Topographic Contour - 10 ft. Interval
Topographic Contour - 2 ft. Interval
Surface Drainage Features (Some Ephemeral)
Figure 2-2
RSA-217 Site Map
Corrective Measure Implementation Plan
RSA-217, Inert Storage Warehouse Facilities
Operable Unit 12
Redstone Arsenal, Madison, Alabama
Project Number: MSC2022.0005.0006
1 in = 250 ft
0
250
500
Feet
N
NAD 1983 State Plane Alabama East Feet
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ECC
Environmental Chemical Corporation
ECC GIS Server: E:\Projects\Redstone\MapDocument\CMS\RSA217\Fig1-2_RSA217_SiteMap.mxd

2019 Aerial Photo

Location	Date	Depth	Parameter	Result (mg/kg)	VQ	PSV (mg/kg)	BSV (mg/kg)
217-SB002	18-Dec-12	0 - 1	Arsenic	**33.4**		0.68	15
		1 - 2	Arsenic	12.7		0.68	18
		2 - 3	Arsenic	17		0.68	18

Location	Date	Depth	Parameter	Result (mg/kg)	VQ	PSV (mg/kg)	BSV (mg/kg)
217-SB004	26-Mar-19	0 - 1	Iron	**87,700**		5,500	58,199
		1 - 2	Iron	**76,000**		5,500	75,078
		2 - 3	Iron	59,000		5,500	75,078
		3 - 4	Iron	62,100		5,500	75,078
		4 - 5	Iron	**110,000**		5,500	75,078

Location	Date	Depth	Parameter	Result (mg/kg)	VQ	PSV (mg/kg)	BSV (mg/kg)
217-RS1875	5-Jul-11	0 - 1	Beryllium	0.567	J	16	1
		4 - 6	Beryllium	0.747	J	16	1
		8 - 10	Beryllium	**23.1**		16	1

Location	Date	Depth	Parameter	Result (mg/kg)	VQ	PSV (mg/kg)	BSV (mg/kg)
14612H-HP01	5-Apr-04	0 - 1	Beryllium	0.39	J	16	1
		4 - 6	Beryllium	0.71	J	16	1
		8 - 10	Beryllium	**17.3**	J	16	1

RSA-215
RSA-218
RSA-219
RSA-220
Maple Road
Hickory Road
Chestnut Road
White Oak Road
Red Oak Road
Deerberry Road
7105
7113
7112
7471
7445
7442
7444
7437
7436
7435
7434
7433
7440
7426
7425
7432
7431
7424
7423
7430
7417
7416
7415
7422
7421
7407
7414
7413
7420
7406
7405
7404
7403
7408
7411
7443
215-RS2107
217-RS2170
14612K-HP02
14612K-HP01
14612I-HP01
217-RS2172
218-RS1878
217-SB001
14612I-HP02
217-RS2171
217-SB003
217-SB005
217-SB002
217-SB004
217-SB006
217-SB007
14612J-HP02
217-RS2903
14612J-HP01
217-RS2424
217-RS1877
218-RS1879
14612H-HP02
14612H-HP03
217-SB008
217-RS1875
14612H-HP01
217-RS2425
217-RS2904
217-RS1876
217-SB009
14612L-HP01
217-RS2905
219-RS1880

Bolded concentrations are greater than the PSV.
Red highlighting on location indicates a location with concentrations greater than BOTH the BSV and PSV.
Green highlighting on location indicates a location with concentrations less than either the BSV, the PSV, or both.
Green shading in posting block indicates concentrations less than either the BSV, the PSV, or both.
Grayscaled locations determined to be unusable.
mg/kg - milligrams per kilogram
PSV - Preliminary screening value
BSV - Background screening value
VQ - Validation qualifier
J - estimated

LEGEND
- Hydropunch Location
- Soil Sample Location
- Overburden Well
- Interface Well
- RSA-217 Site Boundary
- Nearby Site Boundary
- Wetland
- Surface Drainage Features (Some Ephemeral)

Figure 3-1
RSA-217 Metals in Soil

Corrective Measure Implementation Plan
RSA-217, Inert Storage Warehouse Facilities
Operable Unit 12
Redstone Arsenal, Madison, Alabama
Project Number: MSC2022.0005.0006

1 in = 180 ft
0 180 360 Feet
NAD 1983 State Plane Alabama East Feet

bhate
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ECC GIS Server: E:\Projects\Redstone\MapDocument\CMS\RSA217\Fig2-1_RSA217_Soil_Metals.mxd



Location	Date	Depth	Parameter	Result (mg/kg)	VQ	PSV (mg/kg)
217-SB002	18-Dec-12	0 - 1	Benzo(a)pyrene	**1.39**		0.11
			Benzo(b)fluoranthene	**2.48**		1.1
			Dibenz(a,h)anthracene	**0.43**		0.11
			Indeno(1,2,3-cd)pyrene	**1.24**		1.1
		1 - 2	Benzo(a)pyrene	0.0547	J	0.11
			Benzo(b)fluoranthene	0.146	J	1.1
			Dibenz(a,h)anthracene	ND		0.11
			Indeno(1,2,3-cd)pyrene	0.0508	J	1.1
		2 - 3	Benzo(a)pyrene	0.0775		0.11
			Benzo(b)fluoranthene	0.166		1.1
			Dibenz(a,h)anthracene	ND		0.11
			Indeno(1,2,3-cd)pyrene	0.0739		1.1

LEGEND

Bolded concentrations are greater than the PSV.
Red highlighting on location indicates a location with concentrations greater than PSV.
Green highlighting on location indicates a location with concentrations less than PSV.
Green shading in posting block indicates concentrations less than PSV.
Grayscaled locations determined to be unusable.
mg/kg - milligrams per kilogram
PSV - Preliminary screening value
VQ - Validation qualifier
J - estimated

- Hydropunch Location
- Soil Sample Location
- Acid Pit
- PAH and Arsenic Impacted Area
- Asphalt Vehicle Parking Area
- RSA-217 Site Boundary

Figure 3-2
RSA-217 SVOCs in Soil

Corrective Measure Implementation Plan
RSA-217, Inert Storage Warehouse Facilities
Operable Unit 12
Redstone Arsenal, Madison, Alabama
Project Number: MSC2022.0005.0006

1 in = 10 ft
0 10 20 Feet
NAD 1983 State Plane Alabama East Feet

bhate ECC Environmental Chemical Corporation

ECC GIS Server: E:\Projects\Redstone\MapDocument\CMS\RSA217\Fig2-2_RSA217_Soil_SVOCs.mxd

Soil Results



LEGEND

- Hydropunch Location
- Soil Sample Location
- Overburden Well
- Interface Well
- RSA-217 Site Boundary
- Nearby Site Boundary
- Groundwater Flow Direction
- Wetland
- Surface Drainage Features (Some Ephemeral)

Green highlight indicates all VOC concentrations less than PSVs.
Gray locations did not have VOC analysis.
PSV - Preliminary screening value
VOC - Volatile organic compound

Groundwater Results



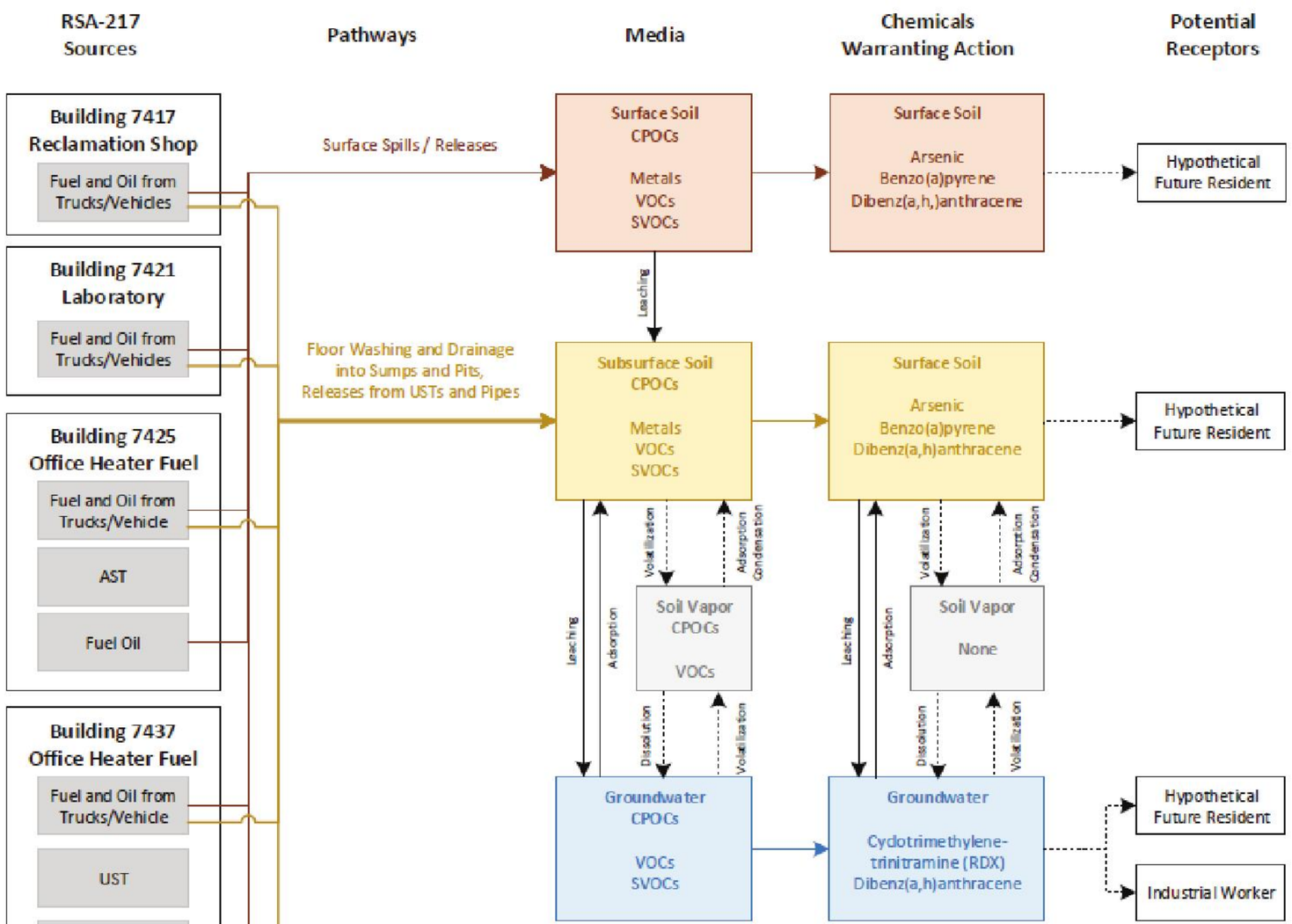
Figure 3-3
RSA-217 VOCs in Soil and Groundwater

Corrective Measure Implementation Plan
RSA-217, Inert Storage Warehouse Facilities
Operable Unit 12
Redstone Arsenal, Madison, Alabama
Project Number: MSC2022.0005.0006

1 in = 300 ft
0 300 600 Feet
NAD 1983 State Plane Alabama East Feet

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ECC GIS Server: E:\Projects\Redstone\MapDocument\CMS\RSA217\Fig2-3_RSA217_Soil_GW_VOCs.mxd



LEGEND

Know/Assumed Transport

Potential Transport

NOTES:

1. Current and future Land Use of this area is designated as Supply/Storage.

2. At Redstone Arsenal, unmanaged exposure to Installation Restoration Program sites is prevented by the Arsenal's Site Access Control Program. Current and potential future receptors include groundskeepers and industrial workers. The residential receptor evaluation will determine if the Site is safe for trespassers. Potential future only receptors include sportsman and hypothetical residential receptors.

3. The hypothetical residential receptor provides the basis for establishing some remedial response including justification for the selecction of Land Use Controls. Sites that do not exceed acceptable risk limits for a residential receptor can be released for any use without restriction.

Acronyms

AST	Above-Ground Storage Tank
COPCs	Chemicals of Potential Concern
PAHs	Polynuclear Aromatic Hydrocarbons
RDX	Research Department Explosive
SVOCs	Semivolatile Organic Compounds
UST	Underground Storage Tank
VOCs	Volatile Organic Compound

Figure 3-4
RSA-217 Conceptual Site Model

Corrective Measure Implementation Plan
RSA-217, Inert Storage Warehouse Facilities
Operable Unit 12
Redstone Arsenal, Madison, Alabama
Project Number: MSC2022.0005.0006

bhate ECC Environmental Chemical Corporation

2019 Aerial Photo

Location	Date	Depth	Parameter	Result (mg/kg)	VQ	PSV (mg/kg)
217-SB002	18-Dec-12	0 - 1	Benzo(a)pyrene	**1.39**		0.11
			Benzo(b)fluoranthene	**2.48**		1.1
			Dibenz(a,h)anthracene	**0.43**		0.11
			Indeno(1,2,3-cd)pyrene	**1.24**		1.1
		1 - 2	Benzo(a)pyrene	0.0547	J	0.11
			Benzo(b)fluoranthene	0.146	J	1.1
			Dibenz(a,h)anthracene	ND		0.11
			Indeno(1,2,3-cd)pyrene	0.0508	J	1.1
		2 - 3	Benzo(a)pyrene	0.0775		0.11
			Benzo(b)fluoranthene	0.166		1.1
			Dibenz(a,h)anthracene	ND		0.11
			Indeno(1,2,3-cd)pyrene	0.0739		1.1

Building 7437

Building 7442

Building 7436

RSA-217

Dogwood Road

217-SB001

14612I-HP02

217-SB003

217-RS2171

217-SB002

217-SB005

217-SB004

Soil Excavation
(5 ft x 10 ft x 1 ft)

LEGEND

Bolded concentrations are greater than the PSV.
Red highlighting on location indicates a location with concentrations greater than PSV.
Green highlighting on location indicates a location with concentrations less than PSV.
Green shading in posting block indicates concentrations less than PSV.
Grayscaled locations determined to be unusable.
mg/kg - milligrams per kilogram
PSV - Preliminary screening value
VQ - Validation qualifier
J - estimated

- Hydropunch Location
- Soil Sample Location
- Soil Excavation (5 ft x 10 ft x 1 ft)
- Acid Pit
- PAH and Arsenic Impacted Area
- Asphalt Vehicle Parking Area
- RSA-217 Site Boundary

Figure 4-1
RSA-217 Remedial Action Extent of Excavation

Corrective Measure Implementation Plan
RSA-217, Inert Storage Warehouse Facilities
Operable Unit 12
Redstone Arsenal, Madison, Alabama
Project Number: MSC2022.0005.0006

1 in = 10 ft
0 10 20 Feet
NAD 1983 State Plane Alabama East Feet

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ECC GIS Server: E:\Projects\Redstone\MapDocument\CMS\RSA217\Fig5-1_RSA217_Alt2.mxd

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APPENDIX A

Site Safety and Health Plan

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SITE SAFETY AND HEALTH PLAN

Environmental Remediation Services
U.S. Army Garrison-Redstone

June 2023

Prepared for:

U.S. ARMY ENVIRONMENTAL COMMAND
Southeast-Environmental Service and Support Division
2450 Connell Road, Building 2264
Fort Sam Houston, TX 782347664

Prepared by:

ECC
9200 Church St.
Suite 305
Manassas, VA 20110

Contract No.: W9124J-18-D-0004, Delivery Order W9124J-22-F-045

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SITE SAFETY AND HEALTH PLAN

Site RSA-217
Redstone Arsenal
Madison County, Alabama

June 2023

I hereby certify that the enclosed Site Safety and Health Plan, shown and marked in this submittal, is that proposed to be incorporated with Contract Number W9124J-18-D-0004, Delivery Order W9124J0F0014. This Site Safety and Health Plan is in compliance with contract specifications and is submitted for Government approval.

Plan Preparer:

Courtney Bigelow	06/09/2023	415-404-5375
Courtney Bigelow, Associate Staff Scientist Assistant Project Manager	Date	Phone Number

Plan Reviewer:

Kym Edelman Digitally signed by Kym Edelman Date: 2023.06.22 13:56:48 -04'00'		757-435-53849
Kym Edelman, Certified Industrial Hygienist, Certified Safety Professional Environment, Safety and Healthy Manager	Date	Phone Number

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Attachment 4B Cold Stress Monitoring Plan
Attachment 5 Excavation and Trenching Plan
Attachment 6 Resumes

<	Less than
>	Greater than
%	percent
°C	degrees Celsius
°F	degrees Fahrenheit
Abs	skin absorption
AED	Automated external defibrillator
AHA	Activity Hazard Analysis
ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
APP	Action Prevention Plan
APTIM	Aptim Federal Services, LLC
ARBCA	Alabama Risk-Based Corrective Action
bpm	beats per minute
BTEX	benzene, toluene, ethylbenzene and xylene
C	Ceiling Limit
Ca	Carcinogen.
CFR	Code of Federal Regulations
CHMM	Certified Hazardous Material Manager
CIH	Certified Industrial Hygienist
CM	Construction Manager
Con	Skin and/or eye contact
COPC	Contaminants of Potential Concern
COR	Contracting Officer's Representative
CP	Competent Person
CRC	Contamination Reduction Corridor
CRZ	Contamination Reduction Zone
CSP	Certified Safety Professional
dBA	decibels (adjusted)
DCE	Dichloroethene
DFW	Definable Features of Work
DIA	Defense Intelligence Agency
DNT	Dinitrotoluene
DOT	U.S. Department of Transportation
ECC	Environmental Chemical Corporation
EGDN	Ethylene glycol dinitrate
ESQ	Environment, Safety and Quality
EZ	Exclusion Zone
HEMSI	Huntsville Emergency Medical Services Inc.
HGL	HydroGeoLogic, Inc.
IDLH	Immediately Dangerous to Life and Health
IDW	Investigation-derived waste
IOC	Installation Operations Center
Ing	Ingestion
Inh	Inhalation
ISEB	in situ Enhanced Bioremediation
LEL	Lower explosive limit
LTM	Long-Term Monitoring/Long-Term Management
LUC	Land Use Controls
MEC	Munitions and Explosives of Concern
mg/m^3	milligrams per cubic meter

MNA	Monitored Natural Attenuation
MTBE	methyl tert-butyl ether
NA	Not applicable
ND	Not determined
NFA	No Further Action
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NT	Nitrotoluene
O&M	Operations and Maintenance
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic aromatic hydrocarbons
PEL	Permissible Exposure Limit
PETN	Pentaerythritol tetranitrate
PG	Professional Geologist
PM	Project Manager
PMP	Project Management Professional
PPE	Personal Protective Equipment
ppm	parts per million
QC	Quality Control
QCP	Quality Control Plan
QP	Qualified Person
RCRA	Resource Conservation and Recovery Act
RDX	1,3,5-trinitro-1,3,5-triazine
REL	NIOSH Reportable Exposure Limit
RFI	RCRA Facility Investigation
RSA	U.S. Army Garrison, Redstone Arsenal
SAP	Sampling and Analysis Plan
Shaw	Shaw Environmental, Inc.
SHM	Safety and Health Manager
SLERA	Screening-Level Ecological Risk Assessment
SOH	Safety and Occupational Health
SOP	Standard Operating Procedure
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SSHS	Site Safety and Health Supervisor
STEL	Short-term Exposure Limit
SVOC	Semivolatile organic compound
SZ	Support Zone
TCE	Trichloroethene
TLV	Threshold Limit Value
TTZ	Targeted Treatment Zone
TWA	Time Weighted Average
UL	Underwriters Laboratories
U.S.	United States
USAEC	United States Army Environmental Command
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
UXO	Unexploded Ordinance
VOC	Volatile Organic Compound

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1.0 INTRODUCTION

This Site Safety and Health Plan (SSHP) has been prepared by Environmental Chemical Corporation (ECC) under contract number W9124J-18-D-0004, Delivery Order W9124J-22-F-045 for U.S. Army Environmental Command (USAEC), Fort Sam Houston, Texas, for environmental fieldwork to be conducted at United States (U.S.) Army Garrison Redstone Arsenal (RSA), Madison County, Alabama. Additional health and safety requirements are presented in the Activity Hazard Analysis (AHA) sheets (**Attachment 1),** and ECC's Corporate Health and Safety Standard Operating Procedures (SOP) as identified in this SSHP.

1.1 Redstone Arsenal History and Description

The RSA occupies approximately 38,300 acres in Madison County, Alabama. The RSA is bounded on the north and east by the city of Huntsville, on the west by the city of Madison, on the west and southwest by Wheeler National Wildlife Refuge, and on the south by the Tennessee River. Huntsville has a population of nearly 165,000; Madison County population is about 320,000. Approximately 330 military families reside in government quarters on RSA and approximately 40,000 government employees and contractors work at the facility. The primary mission of RSA is the development, acquisition, testing, fielding, and sustainment of aviation and missile weapon systems. Most of the installation tenants support this effort; however, RSA is also home to such diverse activities as training for handling explosives and ordnance devices, Defense Intelligence Agency (DIA) activities, and the production of iron carbonyl. The RSA is home to over 70 different tenant organizations.

1.2 Site Description and Scope of Work

RSA-217, Inert Storage Warehouse Facilities, is in the southeastern portion of RSA between West Line and Warehouse Roads. RSA-217 comprises approximately 4.6 acres. The site consists of six buildings and the surrounding areas distributed within a group of warehouses and administrative buildings that were used for inert munition component storage; security badge photographic development; and general storage, cleaning, and maintenance of inert materials. Some of these buildings were supported by fuel oil underground storage tanks (USTs) and other petroleum separation systems. All buildings are still in place and are described below (ADEM, 2021a).

Building 7417 – This building was constructed in 1942 and was originally named Building W-417. The ammunition division originally used the building to store inert components and shipping supplies until needed on the assembly lines. Since 1957, the building has been listed in the RSA Building Inventory as a warehouse reclamation shop. During the limited site assessment (LSA) sampling in 2005, evidence was found of a former aboveground storage tank (AST) used to store heating oil with a grouted discharge line. This building was identified as 146-PS-12H (Reclamation Shop) during the potential source area (PSA) investigation.

Building 7421 – Originally identified as Building W-421 and constructed in 1942, the ammunition division used Building 7421 to store inert components and shipping supplies. The 2001 RSA Master Building Inventory listed this building as a general maintenance building. Building 7421 was identified as 146-PS-12Y (Laboratory).

Building 7425 – This building was constructed in 1942 as Building W-425 and used for inert component and shipping supply storage. Building 7425 was later converted to an administrative facility, and a small boiler was installed to provide heat. A 1,500-gallon UST was installed in 1980 on the northern end of the structure to supply No. 2 heating oil. RSA records document the UST's removal in 1996. The building

continues to be used as a storage and administrative facility. The building was identified as 146-PS-12AA (Heater Fuel for Offices).

Building 7437 – Constructed in 1942 as Building W-437, the ammunition division originally used this structure to store inert components and supplies. It was converted to a laboratory and listed in the 1957 RSA Inventory as a laboratory and engineering building. Building 7437 housed the engineering management group for the laboratory chief. The building was converted to an administration facility in 1968 and continues to be used in that manner. In a 2001 inventory, its use was listed as "Boards/Study Groups." This building at one time had an adjacent UST, and a small pit/sump, referred to as the acid pit, is still visible on the southern end. Building 7437 was identified as 146-PS-12I (Laboratory and Inert Engineering Storage).

Buildings 7441 and 7442 – Both structures were constructed in 1942 as Buildings W-441 and W-442. They were originally separated and used for inert munitions component and shipping material storage. The 1954 inventory identifies Building W-441 as the Photo Lab and Civilian Personnel Office and Building W-442 as the Civilian Personnel and Identification Office for the Rocket Development Division. The buildings were essentially used to issue and maintain the records for access credentials. In 1957, both buildings are listed as having an Office/Lab warehouse use. RSA records show the two buildings were joined while keeping their separate identification numbers in 1959. The 2001 inventory lists only Building 7442 as an administrative general-purpose facility. Both buildings were identified as the "Photographic Laboratory," with Building 7441 assigned as 146-PS-12J and Building 7442 as 146-PS-12K. During the 2003 visual site inspection (VSI), both structures were being used as administrative facilities.

The results of the RFI indicated that corrective measures are warranted for soil at RSA-217 due to the unacceptable risk posed by arsenic, benzo(a)pyrene, and dibenz(a,h)anthracene to a future hypothetical residential receptor. Exposure to groundwater poses an unacceptable risk due to RDX and dibenz(a,h)anthracene concentrations. Potable groundwater use at the site is currently precluded, and non-potable uses of groundwater are managed in accordance with the RSA SAC program (U.S. Army Garrison-Redstone 2012) and the terms of the IROD (Shaw 2007). As per ADEM approval, corrective measures for groundwater at RSA-217 will be performed in conjunction with corrective measures for groundwater unit RSA-146 (ADEM 2021a).

The corrective measures selected involves the following components:

- Excavating arsenic- and PAH-impacted surface soil around 217-SB002
- Offsite disposal of the excavated soil, backfill with clean fill material
- Site restoration

The provisions of this plan are mandatory for all contractor and subcontractor onsite personnel engaged in activities at RSA-217 and Installation-Wide Groundwater Long-Term Management (LTM). The SSHP will be reviewed upon award of these optional sites to ensure that the provisions of this plan address all hazards. Revisions to the SSHP will be made accordingly if needed. The scope of field services includes Long-Term Monitoring (LTM). The Definable Features of Work (DFWs) addressed in this plan include, but are not limited to:

- Mobilization and site preparation
- Excavation, Transportation, and Disposal
- Environmental Sampling

- Investigation-Derived Waste (IDW) Handling and Storage
- Equipment Decontamination, Demobilization and Site Restoration

If hazards or conditions are identified that are not covered by this SSHP, the Contractor's staff must contact the Project Manager (PM) or the Site Safety and Health Officer (SSHO).

Table 1-1 reviews applicable safety, health, and emergency response requirements for this project.

Table 1-1: Site Safety and Health Plan Requirements

	Applicable to this Project?	**If Required, Location or Reference**
Site Layout and Support Facilities		
Haul road plan	No	
Night operations lighting plan	No	
Public safety requirements	No	
Site layout plans	Yes	SAPs
Site sanitation plan	Yes	APP Attachment 5*
Emergency Preparedness		
Emergency phone numbers	**Yes**	SSHP/**Section 5**
Emergency route to the hospital	**Yes**	SSHP/**Section 5/Attachment 3**
Emergency procedures and tests	**Yes**	SSHP/**Section 5**
Fire protection plan	**Yes**	ECC EHS-SOP-02-09/**Attachment 2B**
Spill plans	**Yes**	SSHP/**Section 5.3**
Wild land fire prevention plan	No	
Man overboard/abandon ship	No	
Severe weather contingency plan for floating plant or marine operations	No	
Emergency rescue (tunneling)	No	
Underground construction fire plan	No	
Hazard Assessment and Control	**Required Yes/no**	**If Required, Location or Reference**
Abrasive blasting plan	No	
Activity Hazard Analyses	**Yes**	AHA list SSHP/**Attachment 1**
Drug free workplace	**Yes**	HR-SOP-1.8
Asbestos abatement plan	No	
Blasting plan	No	
Confined space entry	No	
Compressed air plan	No	
Critical lift procedures and plans	No	
Demolition plan	No	
Diving plan	No	
Electrical safety	No	
Excavation/Trenching Plan	**Yes**	**Attachment 5**
Fall protection plan	No	
Formwork and shoring erection and removal plans	No	
Hazard communication program	**Yes**	ECC EHS-SOP-02-10
Hazardous energy control plan	**Yes**	ECC EHS-SOP-04-03
Health hazard control program	**Yes**	SSHP all sections
Lead abatement plan	No	
Jacking and slab plans	No	

	Applicable to this Project?	If Required, Location or Reference
Scaffolding	No	
Machinery and mechanized equipment including drilling	**Yes**	ECC EHS-SOP-02-03
Respiratory protection plan	No	
Steel erection plan	No	

Notes:
*– ECC. 2021. *Accident Prevention Plan, Environmental Remediation Services, U.S. Army Garrison- Redstone Arsenal*, June.
AHA – Activity Hazard Analysis
APP – Accident Prevention Plan
ECC – Environmental Chemical Corporation
SAP – Sampling and Analysis Plan
SSHP – Site Safety and Health Plan
SOP – Standard Operating Procedures

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2.0 HAZARD ASSESSMENT

The following section outlines the AHAs, referenced SOPs, chemical, and physical hazards associated with this project. The AHAs outline personnel risk minimization.

Table 2-1 lists ECC's applicable SOPs for this project. AHAs related to the field activities at the site are presented in **Attachment 1**. The AHAs will be reviewed periodically and revised as applicable.

During daily safety tailgate meetings, applicable AHAs will be reviewed with the work crew prior to commencing work. All site visitors will be required to review the daily tailgate safety issues and sign the visitor log. If necessary, the AHAs will be revised for site-specific activities, and reviewed with work crew before commencing any work.

Table 2-1. Referenced Standard Operating Procedures

SOP Number	SOP Title
1.0	Field Documentation
2.0	Collection And Field Screening of Soil Samples
3.0	Field Equipment Decontamination
4.0	Investigation-Derived Waste
8.0	Standards for Conducting Well Development
11.0	Field Generated Records Management
12.0	Field Measurable Physical Characteristics
13.0	Field Measurable Chemical Characteristics
15.0	Non-Hazardous Sample Handling, Packaging, and Shipping
16.0	Groundwater Level Measurements
18.0	Surface Water Sampling
19.0	Sediments/Sludge Sampling
22.0	Description of Geologic Materials
24.0	Field Equipment Calibration
ECC SOP HS-5.9	Fire Protection Plan
ECC HR-SOP-1.8	Drug Free Workplace
ECC EHS-SOP-02-10	Hazard Communication Program
ECC EHS-SOP-04-03	Hazardous Energy Control Program
ECC EHS-SOP-04-07	Excavation
ECC EHS-SOP-02-03	Machinery and Mechanized equipment including Drilling

[1] – Program Standard Operating Procedures (SOPs) are included in *Revision 4 - Installation-Wide Quality Assurance Program Plan (IW-QAPP)* for the Program Management Contract (HydroGeoLogic, Inc. [HGL], 2019).

2.1 Chemical Hazards

Based on their historical detections in surface soil, and subsurface soil samples collected at RSA-217, specific potential contaminants are listed below:

- The primary Chemical of Potential Concern (COPCs) associated with gasoline and waste oil are:
  - Metal: Arsenic
  - PAHs: Benzo(a)pyrene and Dibenz(a,h)anthracene

Table 2-2 outlines the chemical hazards for sites RSA-217, respectively, including Permissible Exposure Limits (PELs) and Threshold Limit Values (TLVs) for the applicable chemicals.

Table 2-2: Toxicological and Physical Properties of Chemicals, RSA-217

Chemical	TWA[(a)]	STEL/ C (b)	Source (c)	IDLH (NIOSH) (d)	Route	Symptoms of Exposure
RSA-217						
Arsenic	0.01 mg/m³ 0.01 mg/m³ 0.01 mg/m³	Ca 0.002 mg/m³	PEL TLV REL	5 mg/m³	Inh, Ing, Con	Cough, diarrhea, shortness of breath, vomiting, grey skin. Redness.
Dibenz(a,h)anthracene	0.2 mg/m³ 0.1 mg/m³	NA	PEL REL	80 mg/m³	Inh, Con	dermatitis, bronchitis, [potential occupational carcinogen]
Benzo(a)pyrene	0.2 mg/m³ 0.1 mg/m³	NA	PEL REL	80 mg/m³	Inh, Con	dermatitis, bronchitis, [potential occupational carcinogen]

Notes:

(a) The TWA concentration for a normal workday (usually eight or 10 hours) and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day without adverse effect.

(b) STEL. A 15-minute TWA exposure that should not be exceeded at any time during a workday, even if the TWA is not exceeded.

(c) Occupational Safety and Health Administration (OSHA) PEL (29 Code of Federal Regulations [CFR] 1910.1000, Table Z).

(d) IDLH (NIOSH)— Represents the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.

(e) Exposure limits are based on coal tar pitch.

% – percent
Abs – skin absorption
ACGIH - American Conference of Governmental Industrial Hygiene
C – Ceiling limit value which should not be exceeded at any time.
Ca – Carcinogen
Con – skin and/or eye contact
DCE - dichloroethene
DNT – dinitrotoluene
IDLH - Immediately Dangerous to Life and Health
Inh – inhalation
Ing – ingestion
LEL – lower explosive limit
mg/m³ – milligrams per cubic meter
NA – Not applicable
ND – Not determined
NIOSH – National Institute for Occupational Safety and Health
NT – Nitrotoluene
PEL – Permissible Exposure Limit
PETN - pentaerythritol tetranitrate
ppm – parts per million
RDX – 1,3,5-trinitro-1,3,5-triazine
REL – NIOSH Reportable Exposure Limit
STEL – Short Term Exposure Limit
TCE – trichloroethene
TLV – Threshold Limit Value
TNT – Trinitrotoluene
TWA – Time-Weighted Average

2.2 Special Medical Monitoring

Employees on this project whose work involves potential exposure to site contaminants will be included in the medical surveillance program.

Personnel will have a current medical exam clearance (physician's written opinion) in accordance with Occupational Safety and Health Administration (OSHA) standards prior to entering regulated work areas in accordance with 29 Code of Federal Regulations (CFR) 1910.120. ECC uses the services of WorkCare, whose principal is Dr. Peter Greaney, a Board-Certified Occupational Physician to review all exams and provide the clearances, which include an assessment of employee ability to wear respiratory protection and Personal Protective Equipment (PPE) safely. Complete results of everyone's medical examination results are maintained by the medical provider and will not to be kept on-site. The SSHO will ensure appropriate subcontractor's medical screenings are completed, documented, and the physician's written opinions are available at the work site.

3.0 PERSONAL PROTECTIVE EQUIPMENT

Unless otherwise approved by the SSHO, all activities will include at least American National Standards Institute (ANSI)-approved hard hats, safety-toe footwear, safety glasses with side impact protection and high visibility garments. **Table 3-1** summarizes the PPE anticipated during performance field activities.

Table 3-1. Personal Protective Equipment Selection

Activity	Respiratory Protection	Body Protection*	Hand Protection	Eye/Face/Other Protection	Hearing Protection	Fall Protection
Mobilization, Site Inspection and Site Preparation	NA	Level D	Leather palm work gloves; cut resistant gloves if sharp objects, cutting devices, or sharp edges are present	Safety glasses	Plugs or muffs if necessary, based on equipment use, where noise levels exceed 85 dBA	NA
Environmental Sampling		Modified Level D[(a)]	Leather or cut resistant gloves when cutting plastic tubes/ nitrile gloves when sampling	Safety glasses; for splash hazards, face shield with safety glasses or goggles		
Well Installation, Maintenance, and Abandonment			Nitrile or Leather palm work gloves	Safety glasses		
ISEB injection			Nitrile or Leather palm work gloves; adhere to manufacturer requirements for PPE specified in the SDS.			
Equipment Decontamination, Demobilization and Site Restoration[(b)]			Nitrile or Leather palm work gloves	Safety glasses and face shield and apron (if necessary, for equipment decon)		

Notes:

a) A face shield with safety glasses or goggles shall be used during activities where a splash hazard exists. Wear permethrin treated gaiters when in grassy areas.

b) If direct contact with soils, boot covers/ over boots and Tyvek® may be required. Site Safety and Health Officer (SSHO) will determine when boot covers and Tyvek ® are needed

* - Level D body protection includes high visibility Class II garment.

dBA – decibels (adjusted)
NA – Not applicable
ISEB – In-Situ Enhanced Bioremediation
PPE – Personal Protective Equipment
SDS – Safety Data Sheet

3.1 Use and Limitations

Read and follow all manufacturer instructions regarding product use and limitations.

- ***Body protection*** – Wear normal work clothing including high visibility Class II garment. During soil disc and raking and excavation activities, boot covers /over boots and Tyvek ® may be required. The SSHO will determine when these over garments are required.
- ***Hand protection*** – Use gloves described in **Table 3-1**. Chemical protective gloves are meant for incidental contact. Change gloves in the event of immersion unless specifically selected for that purpose. Inspect frequently and change gloves on signs of contamination, and when protection is compromised by wear and tear.
- ***Eye/face protection*** – Wear protection prescribed in **Table 3-1**. Discard when protection is scratched or worn impacting visibility. If face shields are worn for chemical splash, also wear splash goggles underneath. Safety glasses will be worn under face shields for impact protection and under welding helmets. Lens shade will be selected based on hazard, following SOP Environment, Safety and Quality (ESQ)-6.1 (Task Instruction 6.1.02)
- ***Hearing Protection*** – Wear hearing protective devices in accordance with manufacturers' instructions, including fitting and insertion. Use of specific devices will be limited to exposures within the noise reduction ratings.

- ***Fall Protection*** – For the activities covered by this SSHP, fall protection is not anticipated; however, if it becomes necessary, the Safety and Health Manager (SHM) will prepare a site-specific fall protection plan and submit it to the Contracting Officer's Representative (COR) for acceptance before proceeding.

3.2 Work Mission Duration

Work mission durations will be limited to accommodate acceptable service life of the PPE.

Where PPE may cause a hazard, such as heat stress, work mission duration will be determined in the AHA by the SSHO with the assistance of the SHM. Employees must exit the Exclusion Zone (EZ) for rest or monitoring in accordance with the established schedule.

3.3 Personal Protective Equipment Maintenance and Storage

It is important that all PPE be kept clean and properly maintained. Cleaning is particularly important for eye and face protection where dirty or fogged lenses could impair vision. Employees must inspect, clean, and maintain their PPE according to the manufacturers' instructions before and after each use. Supervisors are responsible for ensuring that users properly maintain their PPE in good condition.

Personal protective equipment must not be shared between employees until it has been properly cleaned and sanitized. PPE will be distributed for individual use whenever possible. Where employees provide their own protective equipment, ECC will be responsible for assuring its adequacy, including proper maintenance, and sanitation of such equipment.

3.4 Personal Protective Equipment Decontamination and Disposal

It is anticipated that most of the PPE utilized on the project, beyond the basic PPE elements (hard hat, safety glasses, steel-toed boots, leather gloves), will be of a disposable nature (nitrile or other chemical gloves, ear plugs, boot covers, and Tyvek®). Contaminated PPE will be collected in a dedicated container and disposed of appropriately at a suitable facility. Based on the contaminants present and their concentrations it is anticipated that disposable PPE will be disposed of as non-hazardous waste.

Earmuffs, safety glasses, and other non-disposable forms of PPE will be routinely wiped clean of any visible contamination after each use.

3.5 Personal Protective Equipment Training and Proper Fitting

Users will be trained on the selection, use and limitations of PPE. Each affected employee will demonstrate an understanding of the training specified in this section, and the ability to use PPE properly, before being allowed to perform work requiring the use of PPE.

Should ECC have reason to believe that any affected employee who has already been trained does not have the understanding and skill required of this section, the employer will retrain that employee.

Gloves, head gear, coveralls, and footwear must fit properly to avoid tripping and snagging hazards, or constriction and tearing. Hearing protection will be checked by the user and SSHO for proper fit and must be inserted/worn in accordance with manufacturer instructions.

3.6 Personal Protective Equipment Donning and Doffing Procedures

The SSHO will train on and demonstrate proper donning and doffing procedures for PPE ensembles worn in EZs during site orientation.

3.7 Personal Protective Equipment Inspection Procedures

Each person who is required to wear PPE will inspect their equipment prior to, during, and after each use. Defective or damaged equipment will not be used. Heavily contaminated PPE that cannot be adequately cleaned will be discarded. Stored PPE will be inspected every month to ensure that it has not been damaged and is suitable for use. Workers who wear PPE in the field will take note of the condition of the PPE worn by their co-workers and inform them of any apparent problems, such as missing equipment, tears in protective clothing, excessive contamination, improper use of PPE, inadequate PPE, etc.

3.8 Evaluation of Effectiveness of PPE Program

The SSHO will inspect the jobsite each day and as frequently as necessary to ensure that PPE has been properly selected and is being used as designed. The SSHO will also inspect PPE stored for emergency use every month. Similar PPE inspections will be conducted by ECC's SHM during scheduled visits of the project site.

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4.0 CONTAMINATION CONTROL, SANITATION AND WASTE MANAGEMENT

The following sections describe the contamination control during the field activities.

4.1 Work Zones

Access to the sites are limited to authorized project personnel, approved subcontractors and their employees, and local/State/Federal agency staff escorted by site personnel.

For the purposes of Work Zone Delineation, the site perimeters will encompass an area slightly larger than the portion of the site identified for activities. The perimeter of the sites will be properly delineated (caution tape or high visibility fencing).

4.1.1 Support Zone

The Support Zone (SZ) is located outside the Contamination Reduction Zone (CRZ) and within the site perimeter. The support zone is an uncontaminated (clean) area where personnel will not be exposed to hazardous materials or contaminants.

4.1.2 Contamination Reduction Zone

The CRZ is located in between and serves as a buffer between the SZ and the EZ. The CRZ is intended to prevent the spread of contamination and is utilized for both personnel and equipment decontamination.

4.1.3 Exclusion Zone

The EZ is the work area where, based on planned activities, there is potential for worker exposure to site contaminants. The EZ is bounded by the CRZ and accessed only through the Contamination Reduction Corridor (CRC). The EZ perimeter will be delineated with caution tape or high visibility fencing.

4.2 Access Controls

The SSHO and Site Superintendent will establish the physical boundaries of each zone and instruct all workers and visitors on the limits of the restricted areas. No one will be allowed to enter the restricted area without the required PPE for that area. The Site Superintendent will ensure compliance with all restricted area entry and exit procedures. The Site Superintendent will also designate a decontamination point for personnel to exit the contaminated area and to enter the clean area, which is where personnel may eat and rest.

All site personnel and/or visitors entering and exiting the EZ or the CRZ will be required to log-in/log-out from the site on a daily basis. The log will be maintained at the entrance.

4.3 Hazard Briefing

No person will be allowed on the site during site operations without first participating in a hazard briefing. In general, the briefing will consist of a review of the SSHP and the tailgate safety meeting. All persons on the site, including visitors, must sign the SSHP Acknowledgment Sheet and Daily Safety Meeting Form which is included in **Attachment 1.** Tailgate safety meetings will be held daily before site activities begin.

4.4 Visitor Access

The following section describes how to handle visitors to the site.

4.4.1 Approach

If unannounced visitors arrive at a site, ECC employees should approach them, introduce themselves, and respectfully ask the visitors to identify themselves and state their business. An effort should be made to distinguish between ECC workers and subcontractors and people for whom ECC is not responsible for enforcing health and safety rules on job sites, such as client representatives, agency representatives, and other visitors authorized by the client. For example, hardhats and safety glasses may be a requirement in the SZ or anywhere on the site for workers, but to enforce this requirement on all visitors may not be necessary. A respectful explanation of what areas to avoid may be all that is necessary.

4.4.2 Unauthorized Visitors

If visitors are unauthorized, ECC employees should explain to the visitors that entry to the site is restricted because the site contains hazards. The site boundaries and any other relevant restrictions should be pointed out to the visitors.

4.4.3 Visitors Authorized to View the Site from the Support Zone

If visitors are authorized by the client to see the site from the SZ, ECC employees should do the following:

- Review the tailgate safety meeting form with them and ask them to sign it.
- Provide the visitors with hardhats, safety glasses, and safety vests, if applicable; and,
- Prohibit entry to the EZ.

4.4.4 Visitors Authorized to Enter the Exclusion Zone During Ongoing Work Activities

If the visitors are authorized by the client to enter the EZ, ECC employees should do the following:

- Verify that they have current Hazardous Waste Operations and Emergency Response (HAZWOPER) training.
- Verify that they had a current physical exam authorizing work on hazardous waste sites.
- Review the SSHP and the tailgate safety meeting form and have the visitors sign the acknowledgement forms of all documents.
- Provide the PPE required for the site; and,
- Escort the visitor while in the EZ.

4.4.5 Refusal

If visitors refuse to comply with any one of the requirements listed in the previous sections, and the **client authorizes** the visitor to enter the EZ anyway, ECC will **shut down** any potentially hazardous equipment and take all practicable steps to eliminate other hazards and exposures. The event will be thoroughly documented.

Visitors who refuse to comply and are not authorized by the client should be asked to leave. Contact the local police if problems occur with visitors who refuse to leave.

4.5 Emergency Entry and Exit

People who will enter the site on an emergency basis will be briefed by the Site Superintendent regarding the hazards. All hazardous activities will cease in the event of an emergency. **Attachment 2A** provides more information for emergency procedures.

4.6 Personal Hygiene and Decontamination Procedures

The importance of good hygiene practices will be emphasized with all site workers. Upon exiting the EZ and CRZ, workers and/or site visitors will enter the CRZ and carefully remove all designated PPE, wash their hands, face, and forearms prior to eating, drinking, or smoking. Smoking, eating and drinking will only be allowed in clean work areas (i.e., SZ).

4.7 Equipment Decontamination Procedures

Heavy equipment will be decontaminated using dry methods, a pressure washer, and/or equivalent. Hand tools and smaller equipment will be decontaminated using a non-phosphate detergent scrub, followed by fresh water, and distilled or deionized water rinses. Prior to removal from site, decontaminated equipment and material will be inspected and accepted by the SSHO and the Site Superintendent.

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5.0 EMERGENCY PLANNING

Prior to the commencement of work, the Site Safety and Health Supervisor (SSHS) will contact potential emergency response personnel and will serve as the main point of contact of any on-site emergency. Additionally, field staff will be familiar with emergency condition identification, notification, and response procedures. Emergency response training shall be a part of the initial SSHP pre-work training required of all employees. Additional discussions or refreshers shall take place periodically throughout the project as part of the daily tailgate safety meetings.

The emergency telephone numbers for local emergency response and reporting organizations are provided in **Table 5-1**. Key personnel will have a copy of this table readily available at all times. The Emergency Action Plan and The Fire Protection and Prevention Plan are provided in **Attachments 2A and 2B, respectively)**. Directions to the nearest hospital from the site are provided below and a map is provided in **Attachment 3.** The SSHS will review emergency procedures and/or applicable site contingencies during the initial tailgate safety meeting with site personnel. Off-site emergency personnel will ultimately handle on-site emergencies. Initial response and first aid treatment, however, will be provided on-site. First aid kits, portable eyewash units, and fire extinguishers will be maintained on-site in accordance with ANSI.

The following lists the emergency call list and the project organization. This table must be available to the crew at all time. In case of an emergency, the crew must be transported to the designated medical center.

Table 5-1. Emergency Call List

Name/Organization	Phone Number
Fire Department (ask for Redstone Arsenal [RSA] Fire Department)	911
Fire Department (from cellular phone)	256-876-2117
Ambulance (Huntsville Emergency Medical Services Inc.[HEMSI])	911
Installation Emergency Operations Center (non-911 emergencies)	256-313-1043
Military Police	256-876-2222
Huntsville Hospital (Emergency Room)	256-265-8144
Huntsville Hospital (Trauma Center)	256-265-8137
Chemical Agent Emergencies (state that you are at Redstone)	911
Unexploded Ordnance (UXO) Emergencies (state that you are at Redstone)	911
Installation Operations Center (IOC)	256-313-1043
Garrison Safety Office • Michael Moore, Safety Manger • Michael Moore, Safety Manager (DSN) • Keith Coates, Safety & Occupational Health Specialist • Bobby Taylor, Safety & Occupational Health Specialist • Jonathan Niedergeses (Munitions and Explosives of Concern [MEC] Support)	256-876-2944 256-313-3297 256-897-3297 256-876-3383 256-313-3294 256-876-6027
Primary Site Emergency Contact, Matt Berry, Site Manager, RSA	601-278-4390
Clint Howard, U.S. Army Garrison, Chief Installation Restoration Branch	256-758-7084 (cellular) 256-842-3702 (office)
National Response Center	80-424-8802
Poison Control Center	800-222-1222
United States Environmental Protection Agency (USEPA) Region IV	404-347-3931
Pam Foti, ECC Project Manager	508-274-3084 (cellular) 865-288-0357 (office)
Kym Edelmen, ECC Corporate Safety Director	757-435-5384 (cellular)
Aaron Glad, Site Manager and ECC Site Safety and Health Officer (SSHO)	256-452-986
ECC Hot Line (ECC incident reporting)	650-347-7512 Ext 111

Note: KEY PROJECT/FIELD PERSONNEL ARE TO HAVE A COPY OF THIS LIST READILY AVAILABLE AT ALL TIMES.

5.1 Emergency Conditions

Fire, a medical emergency, a spill, severe weather, criminal or terrorist activity, incidents, accidents, injuries, and mishaps are the conditions that may lead to an emergency situation.

5.2 Evacuation and Rally Points

The SSHS will review procedures during the first tailgate safety meeting. Topics will include conditions leading to an emergency, location of rally point, contact numbers, and head counts. At least two of the Contractor's employees on-site will be trained/certified in First Aid/Cardio-Pulmonary Resuscitation/Bloodborne Pathogen Program.

5.3 Spill or Release Potential

In case of release or spill (i.e., fuel from associated with motorized equipment, the following is needed to prevent the release or spill of spreading:

- Non-combustible absorbent pillows or pads or speedi-dri;
- U.S. Department of Transportation (DOT)-approved 55-gallon drums
- Shovels; and
- Appropriate Personal Protective Equipment (PPE).

Water and/or sludge generated from spills will be transferred to DOT-approved 55-gallon drums.

5.4 Directions to Hospital

In case of a medical emergency, the closet hospital is Huntsville Hospital located at 101 Sivley Road SW, Huntsville, Alabama 35801 Driving directions from Main Gate No. 9 – Visitors Center, are given below:

Leaving from Main Gate N0. 9 – Visitors Center – Redstone Arsenal

Instructions: 6.2 miles – 11 minutes

1. Take Redstone Gateway SW to Rideout Road 2 min (0.2 miles)
2. Use the left 3 lanes to turn left onto Rideout Road (0.3 miles)
3. Use the right lane to take the ramp onto I-565 E (2.8 miles)
4. Use the right 2 lanes to take exit 17B for AL-53 S toward Governors Dr (0.5 miles)
5. Continue onto AL-53 S/Governors Dr SW - *Continue to follow Governors Dr SW, pass by AutoZone Auto Parts (on the right in 0.2 miles)* (2.2 miles)
6. Turn left 85 feet
7. Turn right 315 feet
8. 11. Turn left 420 feet
9. Huntsville Hospital will be on the left.

A hospital map with directions from each site is included in **Attachment 3**.

5.5 Heat Stress/Cold Stress

See **Attachments 4A** and **4B**.

5.6 Rescue Plan(s)

The SSHS will prepare a Rescue Plan(s) and present the Rescue Plan(s) to the crew, if the field crew will be working under any of the following situations:

- Geographically remote sites;
- Elevated positions;
- Using personal fall arrest systems;
- Confined spaces; and/or
- Atmospheres considered potentially Immediately Dangerous to Life and Health (IDLH).

None of these conditions are anticipated for the field activities at the site.

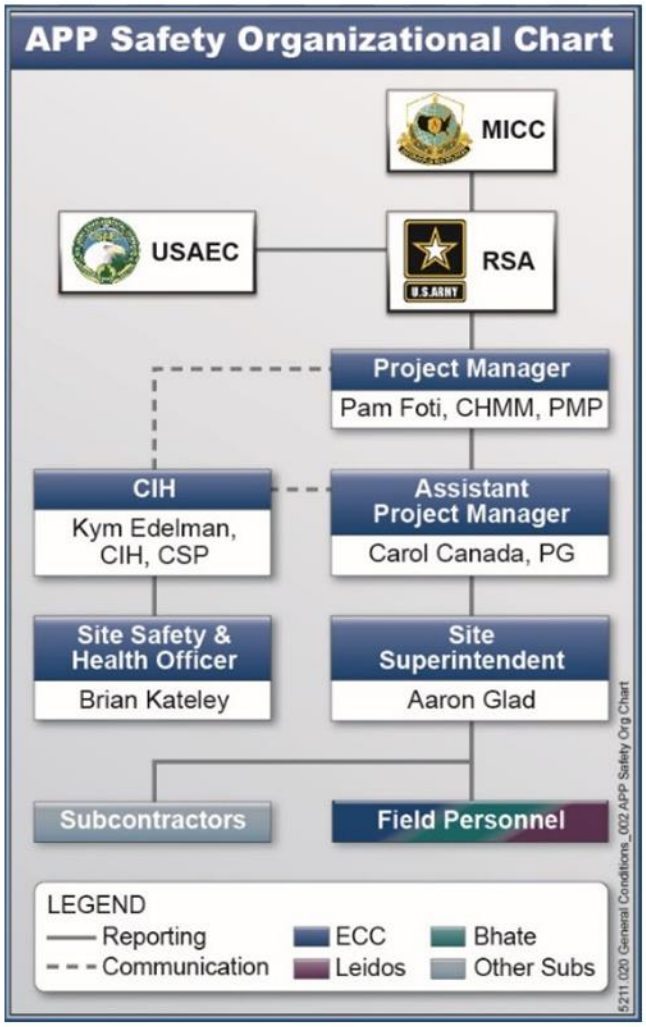
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6.0 ORGANIZATION, RESPONSIBILITIES, AND LINES OF AUTHORITY

ECC and its subcontractors are responsible for implementing this SSHP. Personnel responsibilities for project safety and the lines of authority of these safety personnel are described below. Refer to **Figure 6-1** for the project safety organization. Resumes of the SHM and SSHO are provided in **Attachment 5.**

ECC, as the prime contractor, is the "controlling authority" for all work site safety and health of the subcontractors. ECC is responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out.

Figure 6-1: Safety Organization



6.1 Health and Safety Responsibilities

The following sections describe the key personnel involved in this project and their responsibilities. To achieve the goals of the SSHP, each individual must fulfill their responsibilities and comply with the health and safety requirements. Failure to do so could result in removal from the site.

No work will be conducted on the site without the presence of the Site Safety and Health Officer (SSHO) or designated CP. Pre-task analysis (AHA, daily tailgate, Job Safety Analysis) will be conducted prior to doing work.

6.1.1 ECC Project Manager

Reports through Program Director to the Chief Operating Officer.

The PM, Ms. Pam Foti, Certified Hazardous Material Manager (CHMM), Project Management Professional (PMP), represents ECC in all aspects of work under the contract and is responsible for the following:

- Providing leadership by setting an example for all site personnel through actions and words regarding the importance of proper health and safety practices and holding project staff accountable for safety performance.
- Ensuring adequate resources are available to implement the SSHP.
- Ensuring that subcontractor Statements of Work include appropriate safety provisions and expectations.
- Ensuring that mishaps are properly reported to the Army and ECC's ESQ reporting network.
- Notifying the SHM of any changes in the SOW or site conditions.
- Ensuring that the SSHP is updated to address new hazards.

6.1.2 ECC Safety and Health manager

Reports to the Vice President of Operations.

The SHM, Ms. Kym Edelman, Certified Industrial Hygienist (CIH), Certified Safety Professional (CSP) will oversee the overall project health and safety structure and implementation and is responsible for the following:

- Reviewing and signing the SSHP prior to submittal and approving any modifications.
- Developing and/or reviewing AHAs prepared for the project.
- Approving the appointment of the SSHO and ensuring that the SSHO has the appropriate training and competencies to perform all expected duties.
- Being available on a 24-hour basis for consultation with the SSHO during on-site emergencies or as needed.
- Providing on-site consultation as needed to ensure the SSHP is fully implemented.
- Conducting general safety inspections during site visits and at least once per quarter.
- Participating in the investigation of mishaps.
- Evaluating air monitoring data and recommending changes to engineering controls, work practices, and PPE.
- Assisting in development of on-site training, which will be provided by the SSHO.

6.1.3 Site Safety and Health Officer

Reports to the PM and SHM.

The SSHO, Mr. Brian Kateley, implements the task-specific SSHP. In accordance with United States Armh Corps of Engineers (USACE) EM 385-1-1, the SSHO must have completed the 30-hour OSHA Construction Safety course, the 30-hour General Industry Safety course, or an equivalent course meeting

the 30-hour training objectives; eight hours of safety and health coursework every year; and at least five years of experience in construction or general industry safety or four years of experience plus a third party, nationally accredited Safety and Occupational Health (SOH) certification.

The SSHO will be responsible for:

- Serving as the general site Competent Person (CP) for safety and health (EM 385-1-1 01.A.17 and 29 CFR 1926.20(b) (2)). No work will be done unless the SSHO or a suitable CP is on site.
- Overseeing compliance with the SSHP procedures and OSHA regulations through informal daily inspections.
- Developing (or assisting subcontractors with the development of) project-specific AHAs before work begins.
- Reporting to the site on a full-time basis for the duration of field activities.
- Serving as a member of the Quality Control (QC) staff on matters relating to safety and health.
- Stopping work if unacceptable safety and health conditions exist and taking necessary action to re-establish and maintain safe working conditions.
- Consulting and coordinating modifications to the SSHP with the SHM, ECC PM, and designated U.S. Army representative.
- Ensuring all site personnel and visitors are properly trained in site hazards.
- Ensuring all employees and subcontractors are properly trained on the SSHP /AHAs and implement the SSHP.
- Conducting air monitoring and preparing air monitoring reports.
- Conducting site safety surveys and maintaining deficiency logs.
- Ensuring accidents are reported, investigated, and corrective actions are implemented.
- Monitoring decontamination methods to determine effectiveness.
- Ensuring proper training on PPE usage and monitoring the effectiveness of the PPE program.
- Maintaining all required safety and health records (e.g., OSHA 300 Logs, incident/accident reports, training certificates and qualifications, equipment checklists, safety plans, air monitoring data and reports) throughout the life of the project.

6.1.4 Site Superintendent

Reports to the PM.

The Site Superintendent, Mr. Aaron Glad**,** is responsible for:

- Setting an example for all site personnel through actions and words regarding the importance of proper health and safety practices on the job.
- Assisting in the development of AHAs before beginning work.
- Communicating daily work plans and schedules with the SSHO.
- Monitoring overall safety performance of field personnel.
- Conducting a weekly general safety inspection of the site, when needed.
- Enforcing safety rules and correcting work practices or conditions that may result in injury or hazard exposure.
- Immediately stopping site operations in emergencies or serious hazard exposure.

- Participating in mishap investigations.
- Ensuring proper equipment is provided, utilized, and maintained in accordance with manufacturer recommendations.

6.1.5 Field Personnel

Reports to the SSHO, Site Superintendent, or CP.

Field personnel are responsible for understanding and abiding by the SSHP and performing work in a safe and responsible manner. Specific responsibilities include the following:

- Acting in a responsible manner at all times in order to prevent incidents, injury, and exposure to themselves and co-workers.
- Reporting all incidents, including near misses, and hazards to the SSHO.
- Attending and participating in all health and safety tailgate meetings.
- Following the instructions and directions of the SSHO, Site Superintendent, and/or CP.
- Utilizing the PPE provided.
- Following all field safety procedures for safe work practices.
- Performing tasks as instructed (unless the individual feels unqualified to perform the tasks safely).
- Conducting work in a manner compliant with the SSHP and AHAs.
- Reporting any personal condition that could affect their safety and/or the safety of coworkers (e.g., fatigue, drowsiness, illness, impairment by medications, influence by drugs or alcohol, emotional stress).

6.1.6 Subcontractors

Report to the SSHO or CP.

Subcontractors who perform work for ECC under this SSHP are responsible for the health and safety of their employees. The presence of an SSHO and the implementation of the SSHP do not relieve subcontractors of their responsibilities as employers. Specific responsibilities of subcontractors include:

- Complying with the requirements of their SOW.
- Development of AHAs for their work activities.
- Maintaining a safe and healthy work environment.
- Complying with contract requirements, laws, regulations, and EM 385-1-1.
- Reviewing the SSHP to ensure that the health and safety requirements of their specific tasks are satisfied.
- Performing all work in accordance with the SSHP requirements.
- Providing trained and experienced workers for the specific work activities.
- Participating in the Safety Tailgate Meetings.
- Identifying additional training needs for unique tasks.
- Reporting all incidents and participating in the investigations.
- Participating in routine site inspection activities.

- Ensuring all equipment brought to the site is in a "new or like new" condition, routinely inspected, and maintained in safe working order.
- Setting a positive safety example for all project staff.

6.1.7 Site Visitors

Site visitors will be responsible for the following:

- Participating in a site briefing before leaving the administrative office or site entry point.
- Following all site rules and instructions.
- Being escorted at all times unless otherwise approved by the SSHO.
- Wearing appropriate PPE.

6.2 Lines of Authority

ECC as the prime contractor is responsible for the implementation of the SOH Program as described in this SSHP and attachments. ECC will enforce compliance with the program requirements among our own employees, subcontractors and all others on the worksite.

The SSHO has a technical and administrative reporting relationship to the SHM who reports directly to ECC's President and Chief and Executive Officer. The reporting relationship provides for access to safety and health expertise as well as an independent reporting and line of communication. The SSHO has a functional reporting relationship to the PM, providing the PM and team with a resource for safety and health support for the project.

During field event, an SSHO or CP will perform daily and weekly health and safety inspections and provide general support to the PM for health and safety issues.

6.3 Competent Persons

The SSHO serves as the general CP, per EM 385-1-1 01.A.17 and 29 CFR 1926.20(b)(2). The qualifications of the SSHOs are included in **Attachment 5**.

CPs for specific activities will be designated in the AHAs for those activities, and their qualifications will be submitted and accepted with the AHA at the Preparatory Meeting.

No work will be performed unless a designated CP/SSHO is present at the job site.

6.4 Disciplinary Procedures

All employees are required to comply with APP and SSHP policies and procedures. Discipline will be in accordance with the Disciplinary Procedure described in the ECC Employee Handbook, which allows for immediate termination for serious infractions. ECC expects that all subcontractors will exercise proper discipline or terminate its employees at its sole discretion when justified. ECC retains the right to deny access to the site to any individual not compliant with safety requirements, in accordance with our subcontract agreement.

6.5 Manager and Supervisor Accountability

ECC managers and supervisors are accountable for providing a safe work environment through proper staffing, training, equipment availability, and by setting a leadership example for safety. Annual performance reviews for managers and supervisors include assessments of project safety performance as well as the individual's demonstrated attitude toward safety.

7.0 TRAINING

All ECC and subcontractor project personnel will have the training and certifications required to complete environmental remediation at RSA.

7.1 Project Meetings and Training Requirements

The training listed in **Table 7-1** will be provided to project personnel as noted. In addition to the topics listed below, the SSHO (in cooperation with the assistant SSHO), may identify additional topics and work tasks to be included in the training requirements. These special requirements may be noted on Project AHAs requiring additional training. All required training will be documented, and this documentation will be maintained on site.

Table 7-1: Project Meetings and Training Requirements

Topic	Description	Trainer	When Conducted	Personnel
General Training				
New Employee Indoctrination	Responsibilities for accident prevention; general SOH policies and procedures; reporting of mishaps; medical facilities and emergency response procedures; reporting of unsafe conditions and practices; job hazards and controls; other specific training as required.	SHM, SSHO, or other authorized by SHM	Before beginning field work	All new hires, and employees new to the project site.
APP/ SSHP	Review of APP/ SSHP requirements during site orientation.	SSHO	Before beginning field work	All project personnel
AHAs	Activity-specific hazards, controls, and training requirements for a specific phase or activity.	SSHO or designated CP	Before beginning specific tasks	Workers, supervisors, and oversight personnel engaged in the activity
HAZWOPER – General Training	40-Hour OSHA HAZWOPER initial training for general site employees, and three days of supervised on-the-job training for site workers.	HAZWOPER sites	Before beginning field work	Workers, supervisors, and oversight personnel working on-site who must enter the EZ or whose work exposes them to health or safety hazards related to hazardous waste or contaminated media.
HAZWOPER Supervisor Training	Eight-Hours of training for supervising activities on hazardous waste sites.	HAZWOPER sites	Before beginning field work	Supervisors at HAZWOPER sites
Respiratory Protection	In accordance with 29 CFR 1910.134	SHM, SSHO, or other authorized by SHM; by Subcontractor CP	Before use of respiratory protection	Employees engaged in operations requiring use of respirators
HAZWOPER Refresher	Eight-Hours of annual refresher training for workers on hazardous waste sites.	HAZWOPER sites or SHM	Before beginning field work	Workers, supervisors, and oversight personnel working on-site who must enter the EZ or whose work exposes them to health or safety hazards related to hazardous waste or contaminated media.
Emergency Action Plan	Roles, responsibilities, recognition of emergency conditions, reporting and notification, evacuation, and other procedures.	SSHO	Before beginning field work	All project personnel, with detailed information on procedures for workers with special responsibilities
Hazard Communication	Requirements for SDSs and labels; hazards of site materials and controls; signs and symptoms of exposure; location of and access to Hazardous Materials and their SDSs.	SSHO	Before beginning field work	All project personnel potentially exposed to hazardous materials

Topic	Description	Trainer	When Conducted	Personnel
Fire Protection and Prevention	Requirements of the Fire Protection and Prevention Plan, general education on selection, distribution, and proper use of fire extinguishers.	SSHO	Before beginning field work as necessary to document training	All project personnel. Fire extinguisher use for personnel designated as Fire Watch (other personnel as deemed necessary)
OSHA 30-hour construction or equivalent	Common hazards, controls, and OSHA requirements for construction activities.	Authorized OSHA Trainer	Prior to beginning field work	SSHO
Daily Safety Briefing	Review of Plan-of-the-Day and daily hazards; presentation of a specific topic; refresher training on various issues; and changes in hazards, controls, or procedures.	SSHO, Site Superintendent, CP	Daily, prior to work	All field workers, and field oversight personnel
Weekly safety Meeting	Incidents, modification to SSHP , upcoming work, new hazards, etc.	SSHO, CP	Weekly	All field personnel and field oversight personnel
Special Training				
First Aid/CPR	Principles and techniques for First Aid and CPR.	Red Cross, American Heart Association, or other authorized provider	Prior to beginning field work	At least two project personnel (SSHO, and other field personnel)
Fall protection	Fall (from elevation) hazards, fall protection techniques, proper use of personal fall arrest systems and rescue procedures.	SSHO, other qualified instructors	Prior to work at elevation	Task-specific, workers exposed to fall hazards
Lockout/tagout	Site-specific energy control and verification procedures.	SSHO, other qualified instructors	Prior to utilization of Lockout/tagout procedures	Authorized personnel engaged in lockout/ tagout, and affected employees whose work may be impacted by a lockout/ tagout situation
Forklifts	Hazards and operation procedures, including machine-specific safe operating procedures.	SSHO	Prior to operation of forklift; every three years	Forklift/powered industrial truck operators
Other heavy equipment operations	Qualified by SSHO, Site Superintendent or Equipment Supervisor as documented on ECC Equipment Operator Qualifications Form.	SSHO, Equipment Supervisor	Prior to heavy equipment operations on site	Equipment operators
Power tools (e.g., chain saws, chippers, powder-actuated tools, compressed air systems)	Hazards: proper use and maintenance of tools as described in operations manual. Powder-operated tool users certified by manufacturer.	SSHO, or trainer authorized by manufacturer (explosive-actuated tools)	As part of general site orientation; prior to use of specific tools	Project personnel using power tools
UXO Awareness Training	Recognition of munitions and explosives of concern that may be encountered during site activities	UXO Qualified Personnel	Prior to beginning site operations	All site personnel

Notes:
AHA – Activity Hazard Analysis
APP – Accident Prevention Plan
CFR – Code of Federal Regulations
CP – Competent Person
CPR – Cardiopulmonary Resuscitation
EZ – Exclusion Zone
HAZWOPER – Hazardous Waste Operations and Emergency Response
OSHA – Occupational Safety and Health Administration
SDS – Safety Data Sheet
SHM – Safety and Health Manager
SOH – Safety and Occupational Health
SSHO – Site Safety and Health Office
SSHP – Site Safety and Health Plan
UXO – Unexploded Ordnance

7.1.1 Excavation and Trenching Plan

See **Attachment 5.**

7.2 Safety Indoctrination Training for New Employees

New employees to ECC receive indoctrination training before they are allowed to participate in field work. The indoctrination training consists of the following:

- Review requirements and responsibilities for accident prevention and maintaining a safe and healthy workplace.
- Review ECC's general safety and health policies and procedures.
- Review ECC's incident reporting system and procedures.
- Identify employees' responsibilities for reporting incidents (safety, health, and quality).
- Review medical treatment facilities of the employee's assigned office.
- Review safety, emergency, and evacuation procedures for the employee's assigned office.

7.3 Periodic Safety and Health Training for Supervisors and Employees

All project personnel will participate in training/refresher topics throughout the project. These topics may be presented as part of the daily tailgate meetings, or as separate classes established for specific project work activities and procedures. All supervisors, managers, and employees are encouraged to participate in other seminars or courses provided by outside vendors as necessary to increase knowledge and to maintain currency with construction topics, hazards, and controls.

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8.0 EXPOSURE MONITORING AND AIR SAMPLING

Based on historical sampling analysis data (low-level concentrations of VOCs), elevated levels of VOCs in the breathing zone are not anticipated, air monitoring is required during intrusive activities. Air monitoring will be performed in the general work area and the breathing zone prior to starting and during intrusive activities. Personnel performing testing and monitoring will be trained in testing and monitoring procedures and hazards. Monitoring equipment will be used, inspected, maintained, and properly calibrated in accordance with the manufactures' instructions and standard industrial hygiene practice.

Table 8-1 below lists the monitoring requirements and response actions for this project. All direct and integrated air monitoring equipment will be properly calibrated before and after each period of use in accordance with the manufactures' instructions and standard industrial hygiene practice.

Table 8-1. Exposure Monitoring

Instrument / Contaminant	Frequency	Action Levels	Actions/Upgrade and Rationale
Real Time (air, noise, heat, radiation, light)			
Multi-RAE Plus or equivalent / VOCs	During any intrusive activities	Work Area: Sustained readings of 5 ppm VOC, 20.8% O_2 < 10% LEL 15 ppm CO < 5 ppm H_2S in the breathing zone.	Stop activities, suspend work activities for 15 to 30 minutes; if readings are sustained then contact SHM[(a).]
OSHA/NIOSH HEAT Index App + Body Temp / Heart Rate Monitoring	Daily during work in hot conditions (> 85°F Level D, > 70°F when impervious coveralls worn)	Variable depending on the individual and work activity	Follow Precautions recommended by the HEAT Index app. Implement physiological monitoring when Heat Index indicates Moderate Risk for employees in protective clothing working in sunlight; and for other workers when Heat Index indicates High Risk; and for any workers indicating signs and symptoms of heat stress.

Notes:

a. Contact with the SHM must be made prior to continuance of work. The SHM may then initiate perimeter/integrated air sampling along with additional engineering controls

% – percent
°F – degrees Fahrenheit
> – greater than
< - less than
CO – carbon monoxide
H_2S – hydrogen sulfide
LEL – lower explosive limit
NIOSH – National Institute for Occupational Safety and Heath
O_2 – oxygen
PID – Photoionization detector
ppm – parts per million
OSHA – Occupational Safety and Health Administration
SHM – Safety and Health Manager
VOC – Volatile organic compounds

Records will include the date, time, substances or hazards monitored, person conducting monitoring, calibration date and method, operations and location of monitoring, and results. Records are available to employees, their representatives, and to the Army.

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9.0 EFFECTIVENESS OF PLAN

The effectiveness of this SSHP will be determined by the inspections listed below, as well as from incident investigations and input by site personnel including reports of hazards, safety observations, and suggestions for improvement.

9.1 Safety and Health Inspections

ECC and its subcontractors will perform periodic health and safety inspections throughout the duration of the environmental remediation field activities at RSA. Results of all health and safety compliance review audits or inspections will become part of the project file.

9.2 General Inspection Procedures

Table 9-1 lists the general inspection requirements for this project.

Daily site-wide inspections will be conducted by the SSHO. Other CPs identified in specific AHAs will also conduct daily inspections of the work activities within their responsibility, as deemed necessary. Findings that represent deficiencies in the implementation of the SSHP or EM 385-1-1 will be added to the Tracking Log. Actions, timetable, and responsibility for correcting the deficiencies shall be recorded in the Deficiency Tracking Log. Follow-up inspections to ensure correction of any identified deficiencies will also be conducted and documented in the Deficiency Tracking Log. The Deficiency Tracking Log will be posted in the administrative area and updated daily. A monthly evaluation of the data should be discussed in the QC or SOH meeting with everyone on the project.

Table 9-1: General Inspection Requirements

What	Who	When	Documentation
General site conditions	SSHO	Daily	Mobile safety app
	CM/QC	Bi-Weekly	Site Health and Safety Inspection Checklist and Action Item Report, cc: SSHO, PM, Program/SHM
	PM	Monthly (as travel permits)	
	Program SHM	Monthly (as travel permits)	
Mobile construction equipment	Operators	Initial and Daily	Inspection checklist, cc: Construction/Equipment Supervisor (Note: Notify Army before initial to coordinate joint inspection)
Construction tools and equipment	Users	Daily	None. Tag defective items "out of service"
Lock out/Tag Out	SSHO	Prior to working on machinery, equipment, or process units where employees may be exposed to hazardous energy sources.	Lockout/Tagout Permit
Rigging	CP	Daily	None. Rigging items must be tagged with load capacities.
Ladders	SSHO	Weekly	Logbook, tag or inspection log form
Emergency supplies and equipment (fire extinguishers, spill response, PPE, First Aid, etc.)	SSHO	Weekly	Logbook, tag or inspection log form

What	Who	When	Documentation
PPE	SSHO	Initial, Periodic	None
	Users	Daily	None
Hazardous energy sources and processes (electrical systems, pneumatic equipment, etc.)	CP or QP	Initial	Per operating instructions, QCP, O&M procedures
	User/Operator	Daily	TBD

Notes:
CM – Construction Manager
CP – Competent Person
O&M – Operations and Maintenance
PPE – Personal Protective Equipment
PM –Project Manager
QC – Quality Control
QCP – Quality Control Plan
QP – Qualified Person
SHM – Safety and Health Manager
SSHO – Site Safety and Health Officer
TBD – To be Determined

9.3 External Inspections and Certifications

If regulatory agency personnel arrive on site to conduct an inspection, the ECC PM and the following individuals will be contacted immediately:

- COR
- Subcontractor's site representative
- ECC SHM
- ECC General Counsel

If a citation is issued to ECC or its subcontractors, a copy of the citation will be submitted to the COR along with a Corrective Action Plan.

9.4 Follow-up Procedures for Inspection Deficiencies

All deficiencies identified during project or equipment inspections are noted and tracked through closure. Deficiencies identified by operators during equipment inspections are noted on the equipment inspection form. Any deficiency noted must be reviewed by the SSHO or site supervisor/foreman prior to the equipment being allowed to operate. Any deficiency that affects safe work performance must be corrected before the equipment is put back into operation. Minor deficiencies that do not affect safe performance will be corrected as soon as practical. Following correction of the deficiency, the noted item is initialed by the SSHO on the inspection form as corrected.

Deficiencies identified during the weekly formal site inspections are noted on the inspection form (with a due date and responsible individual) as well as on the SOH Deficiency Tracking Log posted on the project Safety and Health Bulletin Board. These deficiencies are also tracked to closure and verified upon completion. Deficiencies corrected immediately will be noted on the weekly inspection form.

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10.0 REFERENCES

ADEM. 2021a. *"ADEM Review and Concurrence – Revision 1 Resource Conservation and Recovery Act Facility Investigation Report (RFI), RSA-217, Inert Storage Warehouse Facilities, Operable Unit 12, dated January 8, 2021"* letter. May.

Occupational Safety and Health Administration (OSHA). 1999. *Occupational Safety and Health Standards, 29 Code of Federal Regulations 1910*. 1 July.

ATTACHMENTS

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ATTACHMENT 1

ACTIVITY HAZARD ANALYSIS

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Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Activity/Work Task: **In Situ Bioremediation**	Overall Risk Assessment Code (RAC) (Use highest code) **M**
Project Location: **Redstone Arsenal (RSA), Alabama (AL)**	**Risk Assessment Code (RAC) Matrix**
Contract Number: **W9124J-18-D-0004/ W9124J-22-F045**	
Date Prepared/ Revised : **01 June 2023**	
Prepared by (Name/Title): **Courtney Bigelow, Associate Scientist**	
Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / SHM**	
Competent Person (Name/Title): **Site Superintendent or SSHO or SSHO representative**	Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)
Notes: (Field Notes, Review Comments, etc.)	**"Probability"** is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

JOB STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS *(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHS in accordance with ECC SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)*	RAC
Verify emergency communications & services are readily available. Review work plan for procedures and site contaminants Verify utilities are located. Set up site controls. Perform inspections and observations. Off-load equipment/materials.	Lack of training and knowledge of system and system components, tools, equipment, materials, and conditions during operation and maintenance activities.	All system operators and maintenance personnel will be trained in the system components, manufacturer's specifications, normal operating parameters, shutdown procedures, and emergency shutdown procedures prior to being allowed to work unsupervised on the treatment systems. All system operators and maintenance personnel will be trained in the use of procedures, tools, materials, and equipment necessary for the operation and maintenance activities. Perform operation and maintenance activities in accordance with the Accident Prevention Plan, the O&M manuals, equipment and tool manufacturer's recommendations, the MSDSs, and all applicable AHAs. Documentation of training shall be filed in the on-site project files.	M
	Changing tasks and conditions.	Prepare a Job Safety Analysis (JSA) prior to commencing daily activities. Revise the JSA at any time throughout the workday when new tasks are initiated, unforeseen circumstances arise, or if working conditions change. Continuously review and assess the job steps, hazards, and hazard mitigation measures for each work task in accordance with the CB&I Step Back for Safety procedure.	M

Tool use and equipment operation; potential to operate mechanical equipment to inject amendments.		Use the focused I-CARE observation process to identify and correct safe work conditions and behaviors, at risk behaviors and conditions, and imminent hazard situations and conditions.	

Job Steps	Hazards	Controls	RAC
General housekeeping and facility maintenance. Use of electrical sources; wiring. Augering/drilling. Sample collection & potential contact with hazardous materials or chemicals. General house keeping	Loss of situational awareness (knowing what is going on around you).	Stop work - do not proceed until situational awareness is regained by all members of the work team. Retain or regain situational awareness: • Be alert for deviations from standard procedures. • Watch for changes in the performance of other team members. • Be proactive - provide information in advance. • Identify problems in a timely manner. • Show you are aware of what's going on around you - stay alert for changing conditions. • Communicate effectively. • Stay mindful of the activity status; continually assess and reassess the situation. • Ensure that all expectations are shared for complete awareness by the whole team.	**M**
	Struck by and against (vehicles and equipment)	Use care when exiting or entering roads. Park vehicles completely off of roads. Use warning signs, lights, and signalmen as necessary. Wear personal protective equipment (PPE) with high visibility vests when working near roads, moving equipment, or vehicles. Personnel shall maintain a safe distance from other operations. Keep away from areas between vehicles, equipment, and stationary objects. Do not assume equipment and vehicle operators have seen you unless the operator has made eye contact with you and has signaled to you. All equipment will be shut down with energies dissipated prior to performing maintenance activities. Lock out/Tag out procedures may apply. All moving equipment will have an operating backing alarm.	**M**
	Heavy lifting, strains, and sprains.	Proper lifting techniques shall be used for all materials and equipment. No individual worker is permitted to lift any object that weighs over 50 pounds. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 50-pound limit. Personnel shall use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help in moving bulky/heavy materials and equipment.	**M**
	Fire, burns, smoke inhalation.	A fire extinguisher appropriate for all types of work being conducted shall be placed in the work area. Use caution with vehicle exhaust systems and portable generator use in dry grassy areas. Establish smoking areas and smoke only in designated areas. Only discard cigarette butts in proper receptacles – never discard cigarette butts onto the ground. Smoking shall not be permitted within 50 feet of fueling operations. Store gasoline in safety cans with flash arresters and spring-loaded vents. Engines shall be shut off and allowed to cool before refueling. Follow AHA for "Fueling Operations."	**M**

Job Steps	Hazards	Controls	RAC
See job steps above.	Slips, trips, and falls.	Understand the hazards of slips, trips, and falls – consider the consequences. Increase your awareness, keep alert, stay focused, and know your environment. Slow down - take smaller steps and lower your center of gravity when necessary. Do not jump from equipment or elevated surfaces. Use three-point contact rule for entering/exiting vehicles, trucks, and equipment. Be cautious when using stairs. Use hand rails and other stationary objects (door frames, door knobs, steering wheels, walls, etc.) to increase stability. Avoid slippery areas or areas that have steep or uneven grades, when possible and use extra caution when walking on wet, muddy, frosty, icy, or snow-covered surfaces. Provide warning signs or cordon off areas where necessary. Clean-up work areas throughout the day, before leaving work area, and at the end of each workday. Maintain proper illumination in work areas.	M
	Hand injuries.	Items to be handled shall be inspected for sharp edges, rough surfaces, etc. prior to being handled. Personnel shall wear leather gloves when handling equipment or materials with sharp edges, splinters, burrs, rough surfaces, etc. Personnel shall wear cut resistant gloves when using cutting tools. Personnel shall be aware of and avoid pinch point hazards related to the equipment being used. Do not wrap rope, cables, wires, etc. around hands or fingers.	M
	Noise, hearing impairment.	Proper hearing protection shall be used for the work being conducted by all employees in the work area. Noise dosimetry shall be performed to verify hearing protection is adequate. Efforts shall be made to minimize noise whenever possible (for example, generator noise may be minimized by positioning the equipment away from the work area).	L
	Tools and general equipment operation - laceration, electric shock, entanglement, vision/hearing impairment.	Select the proper tool – do not improvise. Tools shall be appropriate for the task and in good condition. Read and follow manufacturer's operator manual for tools before use. Wear appropriate PPE including gloves, eye protection, and hearing protection for the tool in use. Inspect all power and hand tools before each use (do not use damaged tools). Verify proper guards or shields are present on power tools before use. Check your position, footing, and grip before tool use. Avoid distraction, keep your focus, and concentrate on the job. Maintain a steady pace when using tools and take adequate rest periods. Keep electric cords untangled and out of the way of rotating tools. Protect electric tools with ground-fault circuit interrupters (GFCI). Use double-insulated power tools when possible. Power tools that are not double-insulated must have ground pin in place.	M

Job Steps	Hazards	Controls	RAC
See job steps above.	Shock, electrocution, arc flash.	Shut-off, lock-out, tag-out, and try-out power supply to site equipment in accordance with CMS-710-02-PR-1500, *Control of Hazardous Energy*. Power is not considered shut-off, locked-out, tagged-out, and verified as de-energized unless performed by a qualified electrician (experience and training as specified by CMS-710-02-PR-01400, *Employee Electrical Safety* and National Fire Protection Association (NFPA) 70 E, Standard for Electrical Safety in the Workplace (2012). Do not touch, scrape, or damage any electrical wires. A qualified electrician must be present to monitor work and determine appropriate protective measures when any work is performed near or adjacent to electrical conductors and circuits. Do not work on energized electrical conductors or parts without an Energized Electrical Work Permit. Only qualified electricians shall perform electrical work on electrical circuits using PPE, insulating tools and equipment, and alerting techniques (specified by Section 130.7) of NFPA 70 E (2012). All electrical installations shall be made as required by NFPA 70, National Electrical Code (2014) and the safety requirements of NFPA 70E (2012). GFCIs shall be used on all AC pumps, lights, power tools, and extension cords. Extension cords, power tools, and lighting equipment shall be inspected before each use, protected from damage, and kept out of wet areas. The extension cords amp rating will exceed the sum of amp ratings of equipment connected to them.	**M**
	Operating equipment with moving/rotating parts - pinch points, burns, entanglement, roll-over.	Keep hands out of areas that may present a pinching hazard and be aware of pinch-point hazards. Personnel will not position themselves between equipment and a stationary area. Personnel will not wear loose clothing or jewelry. The operator will verbally alert employees and visually ensure employees are clear from dangerous parts of equipment prior to starting or engaging equipment. Be aware of and avoid hot surfaces (including heat generated from engines and rope friction). Equipment will be equipped with easily accessible emergency shutdown devices or kill switches.	**M**
	Use of mechanical / heavy equipment - struck-by, crushing, roll-over, overhead or underground hazards, falls.	Only qualified personnel shall be permitted to operate equipment (CFS DQO qualified). Inspect equipment daily. Verify all mechanical guards and backing alarms are in place and functioning properly. Note equipment deficiencies on the inspection form. Do not use unsafe equipment. Operator to wear safety belt, operate the equipment at safe speeds and in a safe manner, and is prohibited from using telephone while operating equipment. Review hand signals and communication procedures between operators and spotter. Personnel are only permitted to approach equipment after a signal from the operator. Ground personnel and spotter shall wear high visibility vests, stay out of swing radius, and not position themselves between equipment and stationary objects. Evaluate conditions to determine proper equipment to use for task. Obtain proper equipment for task, such as fork lift with drum grapple or backhoe/excavator with lifting strap or drum hooks. Do not use skid-steer equipment for loading and handling drums unless specially equipped with drum grapple attachment.	**M**

Job Steps	Hazards	Controls	RAC
See job steps above.	Use of cutting tools and equipment - laceration, electric shock, entanglement, vision/hearing impairment.	Keep extraneous personnel away from areas where cutting is in progress. Wear appropriate PPE including gloves, eye/face protection, and hearing protection for the tool in use. Use the safest cutting tool for the job (e.g., knives with automatic retractable blades, liner cutters, strippers, etc.). Personal knives (e.g., pocketknives) shall not be considered as a tool for any type of work-related cutting. Keep knives sharp and clean. Any unprotected blade tool must be the last resort when choosing a cutting tool. Do not use additional force when a blade is dull. Maintain a supply of either replacement knives and/or blades and make them readily available. Cut away from yourself, ending the knife stroke away from your body. Hold the item you are cutting firmly, and do not cut downwards or towards your body. The Site Manager/Site Safety and Health Officer (SSHO) is to inspect material cutting activities to verify that leather or cut resistant gloves are being used to protect hands. Chainsaw operators shall wear a specifically designed helmet system (consisting of head, face, and hearing protection) with gloves and chaps. Do not wear loose clothing or jewelry during work. All chainsaws shall be equipped with automatic chain brake and other anti-kickback devices. Always hold a chainsaw with both hands during cutting, & be aware of kickback hazards. Only use new or professionally sharpened chains. Do not increase speed as cutters become dull. With engine off, check and adjust tension on chain. Idle speed shall be adjusted to prevent the chain from moving when the engine is idling.	**M**
	Use, handling, and management of operational chemicals and hazardous materials - injury or illness from chemical exposure, fire, explosion, burns, spills/environmental damage.	Do not use any chemical that you have not been trained to safely use. Review material safety data sheets (MSDSs or SDSs) for all operational chemicals and hazardous materials being used, handled, or managed. Verify you are working with the correct chemical(s) (some chemicals have similar names but are very different). Read all chemical and warning labels. Verify all containers are properly labeled. Verify containers are structurally sound and not leaking. Identify and understand the chemical and physical hazards associated with the hazardous materials, the operations, and the area surrounding the operations. Review and understand emergency procedures prior to handling hazardous materials. Set up work zones and decontamination station, including emergency eye wash and shower prior to commencing hazardous materials handling operations. Spill containment and cleanup materials will be readily available. Minimum PPE for handling bulk operational chemicals includes hard hat, safety-glasses with side-shields, chemical-resistant safety boots or leather safety boots with disposable boot covers, chemical protective inner gloves, cut-resistant outer gloves, and disposable coveralls. Some hazardous chemicals, such as corrosives, irritants, and toxic chemicals may require additional PPE, such as hooded poly-coated Tyvek (Tychem-QC) or Saran-coated (Tychem-SL) coveralls, chemical protective goggles, face-shield, and/or respiratory protection - refer to MSDS, SDS, APP, and JSA or contact HSE Manager for proper PPE selection and use.	**M**

Job Steps	Hazards	Controls	RAC
See job steps above.	Use, handling, and management of operational chemicals and hazardous materials - injury or illness from chemical exposure, fire, explosion, burns, spills/environmental damage (continued)	Avoid physical contact with contaminated containers, equipment, and materials. Personnel who sustain eye or skin contact with contaminated or hazardous materials shall immediately wash the affected area with water (eyes should be irrigated for 15 minutes with potable water) and report the incident to the Site Manager/SSHO. Check chemical compatibility charts. Acids must be segregated from caustics (bases) and from flammable liquids. Oxidizers (such as peroxides, permanganates, and persulfates) must be segregated from fuels, solvents, combustible materials (wood, paper, *etc.*) and reducing agents such as sodium meta-bisulfite or ferrous chloride. Check atmosphere for flammable vapors, hydrogen sulfide, and volatile organic compounds, as necessary. Perform personnel and work area air monitoring as necessary and as specified in the APP/SSHP. Verify all ignition sources have been controlled prior to initiating work with flammable and combustible materials. Provide fire extinguishing equipment in the work area. Determine wind direction and stand upwind during work. Provide ventilation as necessary. Prevent downwind migration and exposures. Perform decontamination during and after work. At a minimum, workers shall wash hands, arms, face, and neck after working with chemicals. Workers shall not eat, drink, smoke, etc. until decontamination procedures have been completed.	**M**
	Use of forklift - crushing, pinch-points, roll-over, impalement, or overhead hazards, electrocution.	Forklift operators must have proper qualifications with valid license. Read and follow manufacturer's operating manual. Follow all equipment warnings. Know the capacity and operating characteristics of the forklift equipment being used. Wear seatbelt when operating a forklift. Do not allow riders for any reason on forklift. Ensure personnel within the area are kept to a minimum number to do the job. Always use three point contacts when mounting or dismounting a forklift. Ensure forklift has overhead guard, falling/rollover protection, and load backrest extension. Never allow anyone to stand or pass under the raised pallet forks, mast, carriage, boom or attachments. Survey operation area for overhead hazards before use. De-energize or otherwise control electrical hazard from overhead power lines. Carry the load low – at minimum clearance. Use a spotter whenever necessary. Refer to manufacturer's operating manual before adjusting forks. Identify all pinch points before making adjustments. Wear heavy duty gloves and keep hands away from all pinch points. No loads shall be suspended from the forks without use of a manufacturer-approved lifting device (*e.g.*, a “truss boom”). Never use attachments unless specifically authorized by the manufacturer of the forklift. Extendable-boom forklifts are subject to decreasing lift capacity as the boom is extended and the center of gravity changes. Prior to performing the lift, the following shall be documented: the total weight of the lift (*i.e.*, the cumulative weight of the truss boom, load, and rigging), the capacity of the forklift at the maximum boom extension, and the percentage of the forklift capacity at the maximum boom extension to be used for the pick and placement.	**M**

Job Steps	Hazards	Controls	RAC
See job steps above.	Use of pumps and hoses - electric shock, burns, spills, strains/sprains, carbon monoxide poisoning, struck-by, chemical exposure.	Review operator's manual for recommended operating procedures. Portable pumps shall be inspected daily before use. Prepare specific Job Safety Analysis covering pumping operations using portable pumps. Personnel operating pumps shall be trained in the use and emergency shutdown of the equipment. Utilize the appropriate PPE, as specified in the APP/SSHP. Splash goggles and face shields shall be worn by all personnel in the vicinity of breaking hose connections. Be prepared for spills. Have appropriate spill response equipment readily available. Use proper lifting procedures for pumps and handle hoses to avoid strains from moving heavy hoses. Maintain control of hose ends when moving hoses to prevent striking self or other workers. Secure hoses with lashing to prevent whipping - do not allow hoses to whip. Identify and avoid pinch points and hot exhaust and hot surfaces.	**M**
	Portable generator operation - electric shock, burns, carbon monoxide poisoning, fire, noise, strains, sprains.	Review operator manual before use, and check for any generator grounding requirements. Use proper lifting procedures when moving portable generators. A 4-A:60-B:C fire extinguisher shall be readily available in locations where a generator is being used. Fuel generators at beginning of day when cool. Before refueling the generator, turn it off and let it cool down. Gasoline spilled on hot engine parts could ignite. Follow AHA for fueling operations. Position generators downwind (to reduce exhaust / carbon monoxide exposures) and away from work area (to reduce noise exposures). Do not use indoors or in areas with poor ventilation without performing air monitoring for carbon monoxide. Use hearing protection as required. Keep the generator dry and do not use in rain or wet conditions. Dry your hands (if wet) before touching the generator. Use a heavy duty, outdoor-rated extension cord that is rated (in watts or amps) at least equal to the sum of the connected appliance loads (S, ST, SO, STO, SJ, SJO, SJT, SJOT). Check that the entire cord is free of cuts or tears and that the plug has all three prongs, especially a grounding pin. Do not use portable generators in areas with dry grass unless area has been cleared.	**M**

Job Steps	Hazards	Controls	RAC
See job steps above.	Pressure testing - explosion, struck-by, injury.	Hydrostatic pressure testing shall only be performed under the supervision of a qualified person. Pneumatic pressure testing is prohibited. Perform testing in accordance with ASTM International, formerly American Society for Testing and Materials (ASTM) F2164, "Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure." Prepare hazard notifications for work area (including marking off testing areas with caution tape or rope, providing shielding when necessary, posting hazard-warning signs such as: "Warning: Do Not Enter, Pressure Testing in Progress"). Do not allow extraneous personnel in the testing area. Personnel shall position themselves as far away from the test as possible during pressurization. Keep personnel away from pipe ends. Perform an additional visual inspection prior to applying pressure. Verify pressure relief device is installed. Fill the test sections slowly. Purge all air. Take all appropriate precautions to prevent trapping air in the test section. (**Warning**—Entrapped air can result in an explosive, violent, and dangerous catastrophic failure because both the pressure stress on piping and the energy used to compress the entrapped air are released.) Regulate the test pressure so as not to exceed the maximums specified in the testing procedure. Increase pressure in small increments and allow pressure to stabilize between the incremental increases. Apply the least amount of pressure necessary to satisfactorily complete the tests. Decrease the test pressure in accordance with the testing procedure prior to checking for leaks. Always depressurize the system slowly.	**M**
	Slips, trips, falls, fire, spills, environmental damage from poor housekeeping.	Job sites shall comply with company housekeeping policies as described in CMS-710-02-PR-00100. Regular inspections of the job site shall be performed to assure ongoing safe work areas. Clean and organize work areas regularly during the shift and throughout the day to eliminate tripping or fire hazards. Clearly post safety information and hospital routes. Provide easily accessible safety/work plans for continued reference. Keep work areas clear and maintain a clean and organized work environment. Assure necessary PPE is in stock and made available to workers. Be sure clothing, boots, gloves, etc. are in good working order and suitable for the tasks. Unsafe clothing could allow for additional hazards (for example: torn or ragged clothing could present an entanglement hazard; grease/oil/other chemicals on clothing could present a fire hazard). Eliminate, mark, or barricade potential slip, trip, and fall hazards. Maintain sufficient clean and clear work areas, passageways, and stairways. Keep areas free of debris or unused materials. Keep work areas, passageways, and stairways well lit	**M**

Job Steps	Hazards	Controls	RAC
See job steps above.	Slips, trips, falls, fire, spills, environmental damage from poor housekeeping (continued)	Maintain secured storage areas, and provide clear directives on locations for equipment and materials storage. Tools should be kept in good condition and stored properly when not in use. Protect cutting edges of tools, and assure tools are stored where they will not present a tripping hazard. Flammable, combustible, toxic, and other hazardous materials shall be stored in approved containers in designated areas that are appropriate for the different hazards that they pose. All storage materials shall meet the requirements specified in the fire codes and regulations of environmental and occupational health and safety agencies. All construction debris should be kept a minimum of 10 feet from the building/work area. Elevated work areas shall be kept free of excess tools and materials. Overhead protection shall be provided for areas where potential overhead hazards exist. Keep floors in good order; replace any work or damaged flooring which could pose a tripping hazard. Floors that cannot be cleaned continuously shall have anti-slip flooring. Regularly clean and maintain machines. Use secondary containment, guards, or drip pans when possible to prevent hazards from spills or leaks. Properly dispose of any used absorbent materials. Waste materials shall be properly disposed throughout the work day. All waste and recycle containers shall be readily accessible and clearly labeled.	**M**
	Use of mowers and trimmers - rotating parts, laceration, amputation, struck-by, flying debris, projectiles, allergens, fire.	Read operators manuals before use. Follow all manufacturers' recommendations. Select workers for activities without sensitivities to plant materials, insect bites/stings, pollen, mold, etc. Keep hands and feet away from blades, strings, pinch points, and moving parts. All equipment-guard devices, as supplied by the manufacturer, shall be in place and verified to be functioning properly. Extraneous ground personnel shall only be present in the area when absolutely necessary. Personnel shall visually scan the area to be mowed prior to mowing. Rocks and other debris shall be removed from the area to be mowed when possible. Use caution when trimming near loose stone or other debris (remove debris when possible). Stop the trimmer rotation when crossing gravel drives, walks or roads, and under any conditions where flying objects might be a hazard. When mowing along driveways and roads, the mower operator shall stop the mower and disengage the blade when vehicles are approaching - standby until the vehicle passes before resuming mowing. Follow AHA for fueling operations.	**M**

Job Steps	Hazards	Controls	RAC
See job steps above	Severe weather.	The Site Manager/SSHO will monitor weather conditions each day in order to plan and prepare for hazardous conditions and to identify the nearest, accessible storm/tornado shelter at each work location. Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate). Operations may resume no sooner than 30 minutes after the last lightning/thunder has occurred.	**M**
	High/Low Ambient Temperature	Monitor for heat/cold stress in accordance with CB&I Procedures CMS-710-01-PR-00600, *Heat Stress Prevention and Control* and CMS-710-01-PR-00700, *Cold Stress Prevention and Control* Personnel shall drink plenty of water and minimal carbonated or caffeine-containing beverages to prevent dehydration EM 385-1-1, Section 06.I.03.a]. Personnel shall take breaks to cool down as needed. [EM 385-1-1, Sections 06.I.03] Personnel shall take required breaks to warm-up as needed. Personnel shall wear insulated clothing based the ambient temperature and wind chill conditions.	**M**
	Poisonous and irritating plants (poison ivy, poison oak, and poison sumac) - dermatitis.	Learn to identify poisonous and irritating plants. Inspect work areas to identify if poisonous and irritating plants are present. Identify workers who are known to be especially sensitive to irritating plants and plan work accordingly. Clear plant/vegetation around work areas, but avoid unnecessary clearing. Wear Tyvek® coveralls and disposable gloves to avoid skin contact with irritating plants when clearing vegetation and when working in areas suspected to have irritating plants present. Immediately notify the Site Manager/SSHO if you suspect you contacted an irritating plant.	**L**
	Insect bites and stings.	Review injury and illness potential with workers. Expect to encounter insects when working in warm weather – especially at locations with vegetation present. Use protective insect repellents containing DEET (Deep Woods Off or equivalent) to prevent insect bites, unless individual allergies and sensitivities prevent its use. Consider applying Permethrin (Repel Permanone or equivalent) preparations to clothing to repel ticks, chiggers, mosquitoes, and/or spiders. Inspect work areas for bee nests and insect activity prior to commencing work in that area. Wear PPE, such as disposable coveralls, to keep insects away from the skin. Check limbs and body for insects/ insect bites upon removing PPE and again during showering. Immediately notify Site Manager/SSHO of insect bites, stings, irritations, rashes, or flu-like symptoms.	**L**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment: Level D: • Hard hat • Safety glasses with side shields • Goggles/faceshield • Safety-toed boots • Gloves • Disposable coveralls • ANSI Class 2 reflective warning vests • Hearing protection, as necessary • Electrical PPE (section 130.7, NFPA 70E, 2012) • Level D-Modified and/or Level C: Refer to SSHP. **Equipment:** • Fire Extinguishers • Emergency Eyewash • First Aid Kit • Insect repellant with DEET • Repel Permanone™ • Drinking water • DPT/Drill rig • Weather radio • Caution tape • Mechanized Equipment • Forklift • Air monitoring instruments • Pumps/valves manifold • Electrical tools and equipment (section 130.7, NFPA 70E, 2012	**Competent Person (CP) / Qualified Person (QP):** CP/SSHO_____ Alternate CP/SSHO _____ QP/First Aid and CPR _____ QP/First Aid and CPR _____ QP/DPT/Drill Rig Operator _____ QP/Equipment Operator _____ QP/Forklift Operator _____ **Training Requirements (as determined by Site Manager/SSHO):** • HAZWOPER 40-Hour • Site safety orientation • Emergency procedures • Hazard communication • Applicable AHAs • Qualified equipment/process operators • Lifting/back safety (proper lifting techniques) • Good housekeeping practices • Fire extinguisher use • Biological hazard identification and control • Storm/Tornado shelter location • Lightning safety procedures • Heat stress prevention and heat stroke treatment • Cold stress prevention	Daily safety inspection (SSHO): _____ Daily safety inspection (Site Manager): _____ **Daily inspection:** • Daily safety inspection (SSHO) • Check training, and medical certifications against personnel roster • Check Known Allergies Questionnaire, training, and medical certifications against personnel roster • Vehicle inspection (daily) • Mechanized equipment (U.S. Army Corps of Engineers form prior to use) • Mechanized equipment and/or fork lift (daily) • Equipment and tools inspection daily and before use • Fire extinguishers (weekly) • Eye wash (daily) • Overhead/underground utilities • Housekeeping (daily) • Survey areas for poisonous plants, insects, and animals • Check body for ticks • Verify tornado shelter is available

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Activity/Work Task: **Chemical Injections**	Overall Risk Assessment Code (RAC) (Use highest code)	**L**
Project Location: **Redstone Arsenal (RSA), Alabama (AL)**	**Risk Assessment Code (RAC) Matrix**	
Contract Number: **W9124J-18-D-0004/ W9124J-22-F045**		
Date Prepared/ Revised: **01 June 2023**		
Prepared by (Name/Title): **Courtney Bigelow, Associate Scientist**		
Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / SHM**		
Competent Person (Name/Title): **Site Superintendent or SSHO or SSHO representative**		
Notes: (Field Notes, Review Comments, etc.)		

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

JOB STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS **Consider People, Equipment, Materials and Environment** *(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHS in accordance with ECC SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)*	RAC
Mobilization	General Safety	To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures and equipment, operational aspects & heavy equipment use, and change(s) in site/work conditions. Daily housekeeping will be implemented at the end of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples".	L
Load Trailer with supplies for transport to static system, or for use with mobile system. Mix chemicals	Slips, Trips, and falls (applies to all job steps)	Make sure that all sampling equipment (i.e., hoses, pumps, generator, misc tools) is positioned out of the travel path to avoid trip hazards	L
	Chemical exposure / Hazardous Atmosphere	• Mixing and dilution of chemical for injections could present a splash hazard into the eyes. • Modified Level D PPE required, including: Tyvek (or similar), nitrile gloves, face shield, hard hat, safety glasses, reflective vest, and	L

Load Trailer with supplies for transport to static system, or for use with mobile system. Mix in- situ chemicals (continued)	Chemical exposure / Hazardous Atmosphere (continued)	steel toed boots. • An ANSI specification chemical shower/eye wash must be setup within 25' of chemical mixing areas.	
	Exposure to excessive noise levels (applies to all job steps)	All personnel shall wear hearing protection when working adjacent to noise emitting equipment (i.e., portable generators)	L
	Lifting Strains & Sprains (applies to all job steps)	• No individual employee is permitted to lift any object that weighs over 50 pounds. Proper lifting techniques shall be used. • Multiple employees or the use of mechanical lifting are for lifting objects over the 50-pound limit. • Materials shall be inspected for sharp edges prior to being handled, and avoid pinch point hazards.	L
Transport vehicle, trailer and supplies to work area	Mechanical failure of work truck or trailer during transport, or uncontrolled roll away after transport.	• Truck must be inspected daily before use per operation standard. Only qualified drivers are allowed to operate vehicle. • Vehicle must be parked with the parking brake set, on level surface. If the trailer must be disconnected, it must have its wheels chocked.	L
	Vehicle strike on other vehicle, or stationary object.	• Only qualified operators may operate vehicle/trailer combination. Only operate vehicles when fit for duty. • Cell phone usage forbidden during operation of vehicles. Operate within site speed limits only.	L
Mobilize materials and equipment for low pressure injection	Chemical release during transport and during transfers and mixing	• All fittings and connections to be secured and inspected for proper locking of connections. Any "quick-connect" type fitting (Chicago, cam-lock) shall be secured with whip checks rated for that hose size. • Adhere to safety provisions on product SDSs including provisions for spill response. If a spill is observed, STOP WORK immediately and contain it.	L
Pressure injection of chemicals	Spillage from hoses and connections	• Personnel must remain in vicinity of flow controls during injection and monitor flow, pressure, temperature and other parameters for comparison to pre-established limits. • All fittings and connections to be secured and inspected for proper locking of connections. Any "quick-connect" type fitting (Chicago, cam-lock) shall be secured with whip checks rated for that hose size.	L
	Chemical exposure	• Adhere to safety provisions on product SDSs including provisions for spill response. • Modified Level D PPE required, including: Tyvek, nitrile gloves, face shield, hard hat, safety glasses, reflective vest, and steel toed boots.	L

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Stop work and notify the Site Superintendent or SSHO if you are not sure how to perform your task safely!	*Stop work and notify your Site Superintendent or SSHO if you are not sure how to perform your task safely!*	*Stop work and notify your Site Superintendent or SSHO supervisor if you are not sure how to perform your task safely!*

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
1. Chemical storage and transfer containers 2. Hoses with cam-lock connections and whip checks 3. Mixing tanks 4. Low pressure injection system 5. Hand tools Support Zone • Cell phone or Radio communication • Eyewash station/filed wash facilities • Fire extinguishers • First aid kit, • drinking water • 911 Air horn • Spill containment supplies • Air Monitoring equipment, if needed • Emergency decontamination supplies **PPE: Modified Level D PPE (Tyvek, nitrile gloves, face shield, hard hat, safety glasses, reflective vest, and steel toed boots).**	• Initial Safety Orientation • Daily Safety Tailgate Meetings • Emergency Response Plan • First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite)	• Chemical storage, handling, and spill response equipment to be inspected daily for function of safety features and general assembly. • Eye wash and field wash facilities to be inspected daily for function of safety features and general assembly. • GFCI test to be performed daily. **Extension cords must be, rated for outdoor use, equipped with a ground plug and inspected daily.** • Hose connections and integrity of injection system to be inspected daily for function of safety features and general assembly. **Whip checks shall be installed on high pressure side on all quick connect fittings.** • Daily inspection of hand and power tools with replacement of damaged.

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Activity/Work Task: **Mobilization, Site Inspection, and Site Preparation Activities**	Overall Risk Assessment Code (RAC) (Use highest code)	**L**
Project Location: **Redstone Arsenal (RSA), Alabama (AL)**		
Contract Number: **W9124J-18-D-0004/ W9124J-22-F045**		
Date Prepared / Revised: **01 June 2023**		
Prepared by (Name/Title): **Courtney Bigelow, Associate Scientist**		
Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager**		
Competent Person (Name/Title): **Aaron Glad, Site Superintendent**		
Notes: (Field Notes, Review Comments, etc.)		

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

JOB STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS **Consider People, Equipment, Materials and Environment** *(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHO in accordance with WE SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)*	RAC
Underground utility survey Identify all overhead utilities	Contact with Overhead Utility Lines – Electrocution, Fires/underground utilities	General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures, operational aspects & heavy equipment use, and change(s) in site work conditions. Daily housekeeping will be implemented during and at the ends of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples". • Before work begins, survey the site for overhead power lines. LOOK UP! Equipment will not be used that is able to reach overhead power lines. • If work must be conducted closer to utilities than guidelines allow, the utility company must be contacted. • An observer/spotter shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. This shall be the ONLY job the observer is performing when an observer is required.	L

Underground utility survey Identify all overhead utilities (Continued)	Contact with Overhead Utility Lines – Electrocution, Fires/underground utilities (Continued)	• Keep all personnel well away from the equipment whenever it is close to power lines. • If intrusive activities, Louisiana 811 shall be notified prior to with sufficient time allowed for white-lining and utility marking. — Excavation Permit Procedure: Mark the area for the requested clearance and then submit an excavation permit with RSA. Alabama 811 is contacted 48 hours prior to activity start. • ECC personnel will "white-line" or otherwise mark the area where the wells are to be installed, prior to utility marking. • Intrusive soil activities conducted within a five foot "Buffer Zone" (horizontal or vertical, as measured from the outside edge of the utility) of any utility (electric, gas, high pressure, chemical storage tanks, pipelines, sewers, etc.) may require the use of non-aggressive excavation methods such as hand excavation using non-conductive hand tools, use of an air spade, hydro-excavation, or similar means (some jurisdictions require more stringent buffer zones). Spotter will assist the operator/workers to identify unknown conditions during drilling. • If a previously unknown utility line is identified, uncovered, or disturbed during intrusive activities, stop immediately and project management notified. Intrusive operations shall not recommence until the line has been evaluated, identified, and the appropriate utility notified. • Most utilities and marking services utilize the American Public Works Association Uniform Color Code for marking out utilities. All personnel involved in excavation projects will be familiar with this code.	L
	Back Strain or Sprain	• Use proper lifting techniques, move heavy objects with wheelbarrow/carts, seek assistance if items weigh over 50 pounds.	L
Receipt and placement of equipment vehicle: Spotting of equipment vehicle	Struck-by moving truck	• Always ensure a spotter for delivery truck stays in line-of-sight of driver at all times.	L
	Caught in or under equipment vehicle	• Use a spotter to coordinate activities of driver and person setting cribbing, tie-downs, chains. • Keep hands out of pinch points. • Wear leather work gloves.	L
	Contact with Overhead Utility Lines – Electrocution, Fires	• Before work begins, survey the site for overhead power lines. LOOK UP! Equipment will not be used that is able to reach overhead power lines. An observer/spotter shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. This shall be the ONLY job the observer is performing when an observer is required. • Keep all personnel well away from the equipment whenever it is close to power lines.	L
Installation of temporary work zones construction fencing	Struck-by hand tools	• Wear leather gloves, safety-glasses, hard hats, safety-toe footwear. Keep hands out of pinch points. • Use post driver, not sledgehammer, for placing fence posts. Tape top of fence post or install mushroom caps to reduce potential for scrapes.	L

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Installation of erosion controls	Sprains/strains Struck-By (hand tools)	• Use two people to carry heavy loads of fencing/posts. Do not lift and carry more than comfortable weight for individual; 50 lbs. maximum.	L
Establishment of work zones, decontamination stations for personnel and equipment	Slips/trips/falls	• Wear high traction safety-toe footwear. • Keep loads manageable to not obstruct vision.	L
	Scrapes and cuts	• Wear safety glasses, gloves and long sleeves.	L
	Contact with poisonous plants (e.g. poison ivy)	• Inspect area before starting. • Wear long sleeve shirts, tuck sleeves and pant legs. If there is heavy growth, wear disposable coveralls and use barrier cream (e.g. Ivy Block). • Have Tecnu or other poison ivy cleanser on-hand, and wash immediately after contact.	L
	Stung by bees/hornets, bit by ticks or snakes	• Inspect areas for hives. • Ensure allergic individuals have emergency medical kit and are committed to using it. • Use insect repellant containing DEET on exposed skin and Permethrin on clothing. • Do not approach snakes. If bitten, seek medical attention.	L
	Struck by moving equipment	• Personnel will stay out of equipment swing areas and pinch-points.	L
	Fire/explosion of gasoline	• Allow equipment to cool before refueling and eliminate other sources of ignition. • Use only approved NFPA safety cans for gasoline. • Cleanup spills immediately.	L
	Heat Stress/Cold Stress (applies to all job steps)	• Monitor weather conditions and implement controls in accordance with Heat/Cold Stress Prevention Plan in APP. • Stay hydrated. • Stop and rest in cool shaded area if heat strain symptoms occur and when instructed by SSHO. • Report all signs and symptoms of heat strain immediately to SSHO.	L
	Severe Weather (applies to all job steps)	• Shut down operations during severe electrical storms, heavy rain, high wind and evacuate site/take cover. • Train personnel on Emergencies Response. • Monitor weather systems.	L
	Eye injuries	• Safety glasses with side shields (impact resistant).	L

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Stop work and notify the Team Leader if you are not sure how to perform your task safely!	*Stop work and notify the Team Leader if you are not sure how to perform your task safely!*	*Stop work and notify the Team Leader if you are not sure how to perform your task safely!*
Equipment to be Used	**Training Requirements**	**Inspection Requirements**
1. Support Vehicles 2. Skid steer/forklift <u>Support Zone</u> • Cell phone or Radio communication • Eyewash station • Fire extinguishers • First aid kit • Drinking water • 911 Air horn • Spill containment supplies • Air Monitoring equipment, if needed • Emergency decontamination supplies **PPE: Level D (hardhat, steel toe boots, work gloves, orange safety vest, safety glasses, and hearing protection, as needed)**	• Only qualified operators permitted to operate mobile equipment • Operators of forklifts will have recent certification / training in safe forklift operation (20 CFR 1910, Subpart N – Powered Industrial Trucks) • First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite) • Initial Safety Orientation • Daily Safety Tailgate Meetings • Emergency Response Plan/Procedures • Fire extinguishers. **Competent Person: Site Superintendent and/or SSHO**	• SSHO daily site inspection • Equipment - Receipt and inspected by SSHO • Competent person will inspect equipment daily prior to each use. No equipment will be placed in service until all deficiencies are corrected • Complete ECC daily equipment inspection form • Weekly inspection of first aid kits • Monthly inspection of fire extinguishers • GFCIs (at least monthly).

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Activity/Work Task: **Environmental Sampling**	Overall Risk Assessment Code (RAC) (Use highest code) **L**
Project Location: **Redstone Arsenal (RSA), Alabama (AL)**	
Contract Number: **W9124J-18-D-0004/ W9124J-22-F045**	
Date Prepared / Revised: **01 June 2023**	
Prepared by (Name/Title): **Courtney Bigelow, Associate Scientist**	
Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager**	
Competent Person (Name/Title): **Aaron Glad, Site Superintendent**	
Notes: (Field Notes, Review Comments, etc.)	

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

JOB STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS Consider People, Equipment, Materials and Environment *(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHS in accordance with ECC SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)*	RAC
Labeling sample containers Handling sample containers w/ preservation / adding preservation to containers Purging monitoring wells Filling sample containers from soil borings or well sample pump Cleaning outer surface of sample containers	• Personal injury • Slips & Trips • Lifting Strains & Sprains • Heat Stress/Cold Stress • Splash hazard • Handling Materials Containing Hazardous Materials • Proper Material Handling • Biohazard and Controls	General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Tailgate meeting. Review JSA to familiarize themselves to hazards, emergency procedures and equipment, operational aspects & heavy equipment use, and change(s) in site/work conditions. Daily housekeeping will be implemented at the end of each workday. Equipment/vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit w/ eye wash. Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples". **Stay on established pathways and ensure tools, cords, other objects are removed from walk areas to prevent trips and falls.** **Be cautious of muddy, wet, icy, or other slippery surfaces. Ensure surfaces are cleared and proper footwear is utilized to prevent slips/falls.**	L

Labeling sample containers Handling sample containers w/ preservation / adding preservation to containers Purging monitoring wells Filling sample containers from soil borings or well sample pump Cleaning outer surface of sample containers (CONTINUED)	• Personal injury • Slips & Trips • Lifting Strains & Sprains • Heat Stress/Cold Stress • Splash hazard • Handling Materials Containing Hazardous Materials • Proper Material Handling • Biohazard and Controls (CONTINUED)	**Hand & Power Tool Use:** Prior to use all tools must be inspected. Any damaged or defective tools will be tagged and removed from service for repair and/or discarded. Ensure all guards are in place on tools. Wear protective gloves based on hazard associated with tool. Cutting devices must have blade protection. Fixed blade utility knives that cannot be retracted are prohibited. Ensure electrical tools are double insulated or properly grounded. Extension cords shall be connected to a GFCI. **Working with Hazardous Materials:** Employees will be provided with an overview of the hazards associated with the chemicals that will be used. A copy of the SDS will be available for review and proper PPE will be provided.	L
		Heat Stress/Cold Stress: • Monitor weather conditions and implement controls in accordance with Heat/Cold Stress Prevention Plan in APP. • Stay hydrated. • Stop and rest in cool shaded area if heat strain symptoms occur and when instructed by SSHO. • Report all signs and symptoms of heat strain immediately to SSHO. **PPE:** Modified Level-D PPE will be worn inside posted areas. Any PPE upgrade will be in accordance with the SSHP action level guidelines. A face shield or goggles shall be used during activities where a splash hazard exists. Use of chemical resistant gloves shall be worn when there is potential skin contact with contaminated fluids. Hearing protection shall be worn if noise survey results above TWA of 85dBA. Wear Permethrin treated gaiters. **Material Handling & Storage:** No individual employee is permitted to lift any object that weights over 50-pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting are for lifting objects over the 50-pounds limit. Know the weight of the load and ensure loads are stable and secure before transporting. Ensure stages materials are properly stacked and secured to prevent sliding/falling. **Biohazard Controls:** • Inspect area before starting. • Wear long sleeve shirts, tuck sleeves and pant legs. If there is heavy growth, wear disposable coveralls and use barrier cream (e.g. Ivy Block). Wear Permethrin treated gaiters. • Have Tecnu or other poison ivy cleanser on-hand and wash immediately after contact. • Do not approach any wild animals. If bitten seek medical attention.	L

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Use of Generator	• Lift and carrying generator • Fire hazard while refueling	**Back Injury:** • Do not lift awkward sized items use proper lifting techniques • Do not use equipment to lift and move drums, equipment and supplies. Lift with your legs not with your back. • Additional personnel will be used to lift items weighing over 60 pounds. If possible, use mechanical movement aids (i.e., hand truck or wheelbarrow). • A fire extinguisher and spill containment supplies should be readily available. Ensure generator is on the ground while refueling. • Fuel generator only after engine has been shut down and cooled	**L**

Stop work and notify the Team Leader if you are not sure how to perform your task safely!	***Stop work and notify the Team Leader if you are not sure how to perform your task safely!***	***Stop work and notify the Team Leader if you are not sure how to perform your task safely!***
Equipment to be Used	**Training Requirements**	**Inspection Requirements**
• Hand Sampling Tools • Generator <u>Support Zone</u> • Cell phone or Radio communication • Eyewash station • Fire extinguishers • First aid kit • Drinking water • 911 Air horn • Spill containment supplies • Air Monitoring equipment, if needed • Emergency decontamination supplies **PPE: Modified Level D (hardhat, steel toe boots, nitrile gloves when sampling/leather gloves when cutting plastic tubes, gaiters, orange safety vest, safety glasses, and hearing protection, as needed). A face shield or goggles shall be used during activities where a splash hazard exists. Wear Permethrin treated gaiters.**	• Only qualified operators permitted to operate First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite) • Initial Safety Orientation • Daily Safety Tailgate Meetings • Emergency Response Plan/Procedures • Fire extinguishers **Competent Person: Site Superintendent and/or SSHO**	• Daily inspection of hand and power tools with replacement of damaged items. • Annual and monthly inspection of fire extinguishers • Weekly inspection of first aid kits/eyewash

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Activity/Work Task: **Well Installation, Maintenance and Abandonment**	Overall Risk Assessment Code (RAC) (Use highest code): **L**
Project Location: **Redstone Arsenal (RSA), Alabama (AL)**	
Contract Number: **W9124J-18-D-0004/ W9124J-22-F045**	
Date Prepared / Revised: **01 June 2023**	
Prepared by (Name/Title): **Courtney Bigelow, Associate Scientist**	
Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager**	
Competent Person (Name/Title): **Aaron Glad, Site Superintendent**	
Notes: (Field Notes, Review Comments, etc.)	

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

JOB STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS Consider People, Equipment, Materials and Environment *(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHS in accordance with ECC SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)*	RAC
Mobilization		General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures, operational aspects & heavy equipment use, and change(s) in site work conditions. Daily housekeeping will be implemented during and at the ends of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples". • Level D PPE will be worn inside the designated EZ. Any PPE upgrade will be in accordance with APP guidelines. Hearing protection shall be worn if noise survey results above TWA of 85 dBA	L

Direct Push Technology (DPT), Hollow Stem Auger (HSA), Air Rotary Activities	Contact with Underground and Overhead Utility Lines – Electrocutions, Fires/underground utilities	• Before work begins, survey the site for overhead power lines. LOOK UP! Equipment will not be used that is able to reach overhead power lines. • If work must be conducted closer to utilities than guidelines allow, the utility company must be contacted. • An observer/spotter shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. This shall be the ONLY job the observer is performing when an observer is required. • Keep all personnel well away from the equipment whenever it is close to power lines. • If intrusive activities, Alabama 811 shall be notified prior to with sufficient time allowed for white-lining and utility marking. — Excavation Permit Procedure: Mark the area for the requested clearance and then submit an excavation permit with RSA DPW. Alabama 811 is contacted 48 hours prior to activity start. • ECC personnel will "white-line" or otherwise mark the area where the wells are to be installed, prior to utility marking. • Intrusive soil activities conducted within a five foot "Buffer Zone" (horizontal or vertical, as measured from the outside edge of the utility) of any utility (electric, gas, high pressure, chemical storage tanks, pipelines, sewers, etc.) may require the use of non-aggressive excavation methods such as hand excavation using non-conductive hand tools, use of an air spade, hydro-excavation, or similar means (some jurisdictions require more stringent buffer zones). Spotter will assist the operator/workers to identify unknown conditions during drilling. • If a previously unknown utility line is identified, uncovered, or disturbed during intrusive activities, stop immediately and project management notified. Intrusive operations shall not recommence until the line has been evaluated, identified, and the appropriate utility notified. Most utilities and marking services utilize the American Public Works Association Uniform Color Code for marking out utilities. All personnel involved in excavation projects will be familiar with this code. Before derrick is raised a thorough walkthrough of surrounding area is required to ensure there are no overhead utilities within 100 feet horizontally. If overhead utilities are within 100 ft horizontally of the derrick, consult local utility company and refer to EM 385-1-1 Table 11-1 before commencing operations.	L
	Equipment Malfunction	• Rig operators must be qualified and designated. • All operations must be conducted in accordance with manufacturer's operations manual. Ensure equipment manual is on site at all times and contents of the manual, specifically related to safe operations, have been reviewed will all employees engaged in activities. Ensure this review is documented. • Complete inspections and maintenance of the rig in accordance with the manufacturer's operations manual.	L

DPT, HSA, Air Rotary Activities (CONTINUED)	Cuts/Lacerations	• A cutting device designed for cutting acetate liners (procured through Geoprobe) shall be used. If a safety utility knife is used, snubbed nose blades are required and the user must wear Kevlar gloves under leather gloves. Non-retractable utility knives are prohibited. Blades must be secured when not in use. • Utilize proper cutting technique and ensure cuts are made away from the body, keep hands clear. • Utilize leather work gloves or other cut resistant work gloves at all times when handling equipment. Ensure gloves are appropriate for potential laceration hazard if sharp edges are encountered.	L
	Lifting Strains/Sprains	• No individual employee is permitted to lift any object that weighs over 50 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting are for lifting objects over the 50-pound limit. Materials shall be inspected for sharp edges prior to being handled and avoid pinch point hazards. • While handling direct push rods and filled acetate liners, make sure proper lifting techniques are used.	L
	Struck by or caught in drill rig equipment	• Only qualified personnel shall be permitted to operate equipment. The equipment shall be inspected daily using an ECC inspection form specific for the equipment in use. Equipment must have functioning safety devices as installed by the manufacturer. Deficiencies in equipment shall be corrected prior to operating. Equipment found to be unsafe shall not be used. Fire extinguishers of the appropriate size will be available on the equipment. All equipment shall have back up enunciators. • Only personnel essential to drill rig operation will be permitted in area directly surrounding drill rig. All personnel not directly contributing to drill rig operations will be required to stay a minimum of 25' away. • Check all safety devices, emergency shut-down switches daily or at the start of drilling shift. Drilling will not be permitted until all emergency shut-down switches and warning systems are working properly. • Drill rig operator is required to do a daily equipment checklist to ensure equipment is in safe working condition. ○ Personnel need to be cognizant of surroundings and keep clear of cuttings discharge point. Eye protection will be worn at all times. ○ Personnel need to remain away from air compressor and air hose unless a specific task requires work in close proximity. ○ Do not operate compressed air system with broken or inoperable safety controls. ○ Inspect airline safety cables to verify they are in good working condition. • If augers are used during drilling operations, auger guards will be required. • All work areas on and around the drill rig operation will be required to be kept clear of unnecessary equipment and materials. Ongoing housekeeping throughout the day will keep work areas free of slip, trip and fall hazards.	L
	Struck by Traffic	When working adjacent to or on active roadways adequate traffic control devices must be installed to establish a safe work zone. Adequate signage must be established to identify the work zone. All personnel entering and working in an established work zone must wear the classification of reflective vests (appropriate based on speed of vehicles).	L

DPT, HSA, Air Rotary Activities (CONTINUED)	Struck-By / Pinch Points	• All personnel will wear ANSI Type 2 high-visibility traffic safety vests. Operators shall maintain a constant awareness of personnel and equipment in the work areas. • Moving heavy equipment must have properly functioning back-up alarms. • Spotters on the ground will assist operators in manipulating vehicles and equipment into tight or confined spaces. • Getting off or on any equipment while it is in motion is prohibited. • Three points of contact shall be maintained when getting on or off equipment. • Seats will be provided for each occupant of the equipment. • The operator shall use safety belts while equipment is in use. • All original manufacturer-installed safety equipment such as lights, guards, brakes, horn, etc. must be functional at all times. • Whenever equipment is parked, the parking brake shall be set, and wheels chocked when on an incline • Heavy equipment operators shall inform their Supervisor(s) of any prescribed medication that they are taking that would impair their judgment and/or vision • Never walk or work directly in back of or to the side of heavy equipment without the operator's knowledge and approval.	L
		• Personnel will stay out of equipment swing areas and pinch-points. When dumping a load from a bed equipped with a tailgate, a spotter must be positioned a safe distance from the vehicle, such that they can observe the bed to notify the operator if an obstruction occurs	L
	Excessive Noise Exposure	• Wear hearing protective devices (Ear muffs/plugs) when working, when using or near high noise producing equipment, or when directed by ECC SSHO in response to noise monitoring. • Ensure adequate maintenance on equipment. • Conduct periodic sound level surveys.	L
	Inhalation of materials containing crystalline silica	• Review SDS for grout/concrete and other materials utilized to install wells to determine silica content. If silica is present, adhere to controls in APP. Work upwind, avoid dust clouds, keep materials wet, avoid dry sweeping	L
	Heat/Cold Stress (applies to all steps in this AHA)	• Monitor weather conditions and implement controls in accordance with Heat/Cold Stress Prevention Plan in APP. • Stay hydrated. • Stop and rest in cool shaded area if heat strain symptoms occur and when instructed by SSHO. — Report all signs and symptoms of heat strain immediately to SSHO.	L
	Severe weather (applies to all steps in this AHA)	• Shut down operations during severe storms, heavy rain, high wind, and lightning episodes. Evacuate the project site and take shelter at the designated shelter location. • All personnel shall be trained on the project Emergencies Response procedures.	L

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Welding/Cutting	Fire	• Personnel that weld or cut will be required to wear proper PPE including flame resistant gloves, aprons, safety shoes, welding helmets, goggles, and shaded glasses. • Fire extinguisher must be present. • Hot work permit must be obtained before any welding or cutting begins. • Verify that no combustible materials are within work area. • Fire watch must continue for 30 minutes after any welding or cutting concludes. • Protective caps must be used when moving cylinders. • Cylinders must be stored properly.	L
Equipment Decontamination	Chemical Contamination Exposure	• All personnel assigned to drilling operations will operate inside a designated EZ. • All PPE will be removed properly prior to exiting the CRZ. • Air monitoring will be performed. All equipment and hand tools will be decontaminated in accordance with the established procedure. • Air monitoring will be conducted for combustible gas, oxygen levels, and toxic gas exposure during drilling and well abandonment.	L

Stop work and notify the Team Leader if you are not sure how to perform your task safely!	***Stop work and notify the Team Leader if you are not sure how to perform your task safely!***	***Stop work and notify the Team Leader if you are not sure how to perform your task safely!***
Equipment to be Used	**Training Requirements**	**Inspection Requirements**
1. Support Vehicles 2. Drill Rig 3. Hand Tools 4. Air Monitoring Equipment (Multi-RAE Plus or equivalent) <u>Support Zone</u> • Cell phone or radio communication • Eyewash station • Fire extinguishers • First aid kit • Drinking water • 911 air horn • Spill containment supplies • Air monitoring equipment, if needed • Emergency decontamination supplies • GFCI • Hand and power tools. **PPE: Level D (hardhat, steel toe boots, work gloves, Class 2 hi-viz safety garment, safety glasses, and hearing protection as needed), unless noted otherwise in this AHA**	• Only qualified operators permitted to operate mobile equipment • Operators of DPT and HSA rig will be a licensed driller. • Operators of forklifts will have recent certification / training in safe forklift operation (20 CFR 1910, Subpart N – Powered Industrial Trucks) • First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite) • Initial Safety Orientation • Daily Safety Tailgate Meetings • Emergency Response Plan/Procedures • Fire extinguishers. **Competent Person: Site Superintendent and/or SSHO** **Designated Drill Rig Operator:**	• SSHO daily site inspection • Equipment – Receipt and inspected by SSHO • Competent person will inspect equipment daily prior to each use. No equipment will be placed in service until all deficiencies are corrected • Complete daily equipment inspection form will be completed by the operator • Weekly inspection of first aid kits • Monthly inspection of fire extinguishers • GFCIs (at least monthly) • Air monitoring equipment will be calibrated at least monthly and bump tested daily before each shift and as often as necessary. Equipment that cannot pass bump test criteria will be recalibrated or replaced. • Drill rig and associated equipment in accordance with manufacturer's requirements.

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Activity/Work Task: **Land Use Control (LUC) Inspection and Geophysical Survey**	Overall Risk Assessment Code (RAC) (Use highest code)	**L**
Project Location: **Redstone Arsenal (RSA), Alabama (AL)**		
Contract Number: **W9124J-18-D-0004/ W9124J-20-F-0020**		
Date Prepared: **4 February 2021**		
Prepared by (Name/Title): **Lauren Sparkman/ Environmental Engineer**		
Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager**		
Competent Person (Name/Title): **Aaron Glad, Site Superintendent**		
Notes: (Field Notes, Review Comments, etc.)		

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

JOB STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS **Consider People, Equipment, Materials and Environment** *(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHS in accordance with ECC SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)*	RAC
LUC Inspection	Slips & Trips	General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures and equipment, operational aspects & heavy equipment use, and change(s) in site/work conditions. Daily housekeeping will be implemented at the end of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples". • Wear high traction safety-toe footwear. • Keep loads manageable to not obstruct vision.	L

LUC Inspection (CONTINUED)	Lifting Strains & Sprains	• No individual employee is permitted to lift any object that weighs over 50 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting are for lifting objects over the 50-pound limit. Materials shall be inspected for sharp edges prior to being handled, and avoid pinch point hazards.	L
	Exposure to excessive Noise levels	• Hearing protection shall be worn around heavy equipment of other noise generating equipment or when noise levels exceed TWA of 85 dBA.	L
	Using damaged / malfunctioning power tools	• Prior to use all tools must be inspected. Any damaged or defective tools will tagged and removed from service for repair and/or discarded. • Proper PPE shall be worn when operating power tools. At a minimum, Level "D" will be required.	L
	Caught in or between equipment	• Only qualified personnel shall be permitted to operate equipment. Operators will have constant communication with ground support crews and will be aware of activities around their piece of equipment during operation. • Mobile equipment shall be inspected daily. Deficiencies in equipment shall be noted on the inspection form. Equipment found to be unsafe shall not be used. • Fire extinguishers of the appropriate size will be available in the operators of all heavy equipment. • All equipment shall have backing alarms. • All equipment will be properly secured / rigged prior to transportation off site. All rigging equipment shall be inspected prior to use.	L
	Contact with stinging or biting insects	• Personnel shall wear light colored clothing and apply insect repellent (i.e., DEET) to outer pants legs; Body checks should be performed at the end of the workday. • Any individual who has a known or has a potential for allergic reaction to insect stings shall notify the SSHS and an Epi-Pen shall be readily available.	L
	Contact with poisonous plants (e.g. poison ivy)	• Inspect area for known plants before starting field activities • Wear long sleeve shirts, tuck sleeves and pant legs. If there is heavy growth, wear disposable coveralls and use barrier cream, e.g. Ivy Block. • Have TecNu or other poison ivy cleanser on hand and wash immediately after contact.	L
	Scrapes and cuts	• Wear safety glasses, gloves and long sleeves.	L

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

LUC Inspection (CONTINUED)	Heat/Cold Stress (applies to all steps in this AHA)	• Monitor weather conditions and implement controls in accordance with Heat/Cold Stress Prevention Plan in APP. • Stay hydrated. • Stop and rest in cool shaded area if heat strain symptoms occur and when instructed by SSHO. • Report all signs and symptoms of heat strain immediately to SSHO.	L
	Severe weather (applies to all steps in this AHA)	• Shut down operations during severe storms, heavy rain, high wind, and lightning episodes. Evacuate the project site and take shelter at the designated shelter location. • All personnel shall be trained on the project Emergencies Response procedures.	L
Stop work and notify your supervisor if you are not sure how to perform your task safely!	***Stop work and notify your supervisor if you are not sure how to perform your task safely!***	***Stop work and notify your supervisor if you are not sure how to perform your task safely!***	

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
• Hand and Portable power tools <u>Support Zone</u> • Cell phone or Radio communication • Eyewash station • Fire extinguishers • First aid kit • drinking water • 911 Air horn • Spill containment supplies • PDR and PID air monitors • Emergency decontamination supplies • Hand tools **PPE: Level D (hardhat, steel toe boots, work gloves, orange safety vest, safety glasses, and hearing protection as needed)**	• Initial Safety Orientation • Daily Safety Tailgate Meetings • Emergency Response Plan • First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite) **Competent Person: Site Superintendent and/or SSHO**	• Documented daily equipment inspections by operator are to be conducted and recorded on ECC inspection checklist form. • Competent person will inspect equipment daily prior to each use. No equipment will be placed in service until all deficiencies are corrected • Weekly inspection of first aid kits • Monthly inspection of fire extinguishers

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Activity/Work Task: **Drilling: Direct Push Technology (DPT)/ Hollow Stem Auger (HAS)/ Air Rotary/ Membrane Interface Probe (MIP)**	Overall Risk Assessment Code (RAC) (Use highest code) **M**
Project Location: **Redstone Arsenal (RSA), Alabama (AL)**	
Contract Number: **W9124J-18-D-0004/ W9124J-22-F045**	
Date Prepared / Revised: **01 June 2023**	
Prepared by (Name/Title): **Courtney Bigelow, Associate Scientist**	
Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager**	
Competent Person (Name/Title): **Master Driller**	
Notes: (Field Notes, Review Comments, etc.)	

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

JOB STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS Consider People, Equipment, Materials and Environment *(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHS in accordance with ECC SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)*	RAC
Location of Underground and Above ground Utilities	Hitting Utilities	General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures, operational aspects & heavy equipment use, and change(s) in site work conditions. Daily housekeeping will be implemented during and at the ends of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples". • Before work begins, survey the site for overhead power lines. LOOK UP! Equipment will not be used that is able to reach overhead power lines. • If work must be conducted closer to utilities than guidelines allow, the utility company must be contacted.	L

Location of Underground Utilities (CONTINUED)	Hitting Utilities (CONTINUED)	• An observer/spotter shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. This shall be the ONLY job the observer is performing when an observer is required. • Keep all personnel well away from the equipment whenever it is close to power lines. • If intrusive activities, Alabama 811 shall be notified prior to with sufficient time allowed for white-lining and utility marking. Additionally, private locating services will be contacted for locations on base. — Excavation Permit Procedure: Mark the area for the requested clearance and then submit an excavation permit with RSA. Alabama 811 is contacted 48 hours prior to activity start. • ECC personnel will "white-line" or otherwise mark the area where the wells are to be installed, prior to utility marking. • Intrusive soil activities conducted within a five foot "Buffer Zone" (horizontal or vertical, as measured from the outside edge of the utility) of any utility (electric, gas, high pressure, chemical storage tanks, pipelines, sewers, etc.) may require the use of non-aggressive excavation methods such as hand excavation using non-conductive hand tools, use of an air spade, hydro-excavation, or similar means (some jurisdictions require more stringent buffer zones). Spotter will assist the operator/workers to identify unknown conditions during drilling. • If a previously unknown utility line is identified, uncovered, or disturbed during intrusive activities, stop immediately and project management notified. Intrusive operations shall not recommence until the line has been evaluated, identified, and the appropriate utility notified. • Most utilities and marking services utilize the American Public Works Association Uniform Color Code for marking out utilities. All personnel involved in excavation projects will be familiar with this code	L
Drill Rig Operations	Cuts/Lacerations	• A cutting device designed for cutting acetate liners (procured through Geoprobe) shall be used. If a safety utility knife is used, snubbed nose blades are required, and the user must wear Kevlar gloves under leather gloves.	L
	Lifting Strains/Sprains	• No individual employee is permitted to lift any object that weighs over 50 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting are for lifting objects over the 50-pound limit. Materials shall be inspected for sharp edges prior to being handled, and avoid pinch point hazards. • While handling direct push rods and filled acetate liners, make sure proper lifting techniques are used.	L
	Struck by or caught in drill rig equipment	Only qualified and designated personnel shall be permitted to operate equipment. The equipment shall be inspected daily using an ECC inspection form specific for the equipment in use. Equipment must have functioning safety devices as installed by the manufacturer. Deficiencies in equipment shall be corrected prior to operating. Equipment found to be unsafe shall not be used. Fire extinguishers of the appropriate size will be available on the equipment. All equipment shall have back up enunciators. • Only personnel essential to drill rig operation will be permitted in area directly surrounding drill rig. All personnel not directly contributing to drill rig operations will be required to stay a minimum of 25' away.	L

Drill Rig Operations (CONTINUED)	Struck by or caught in drill rig equipment (CONTINUED)	• Check all safety devices, emergency shut-down switches daily or at the start of drilling shift. Drilling will not be permitted until all emergency shut-down switches and warning systems are working properly. • Drill rig operator is required to do a daily equipment checklist to ensure equipment is in safe working condition. • If augers are used during drilling operations, auger guards will be required. • All work areas on and around the drill rig operation will be required to be kept clear of unnecessary equipment and materials. Ongoing housekeeping throughout the day will keep work areas free of slip, trip and fall hazards.	L
	Struck by Traffic	• When working adjacent to or on active roadways adequate traffic control devices must be installed to establish a safe work zone. Adequate signage must be established to identify the work zone. All personnel entering and working in an established work zone must wear the classification of reflective vests (appropriate based on speed of vehicles).	L
	Struck-By / Pinch Points	• All personnel will wear ANSI Type 2 high-visibility traffic safety vests. Operators shall maintain a constant awareness of personnel and equipment in the work areas. • Moving heavy equipment must have properly functioning back-up alarms. • Spotters on the ground will assist operators in manipulating vehicles and equipment into tight or confined spaces. • Getting off or on any equipment while it is in motion is prohibited. • Three points of contact shall be maintained when getting on or off equipment. • Seats will be provided for each occupant of the equipment. • The operator shall use safety belts while equipment is in use. • All original manufacturer-installed safety equipment such as lights, guards, brakes, horn, etc. must be functional at all times. • Whenever equipment is parked, the parking brake shall be set, and wheels chocked when on an incline • Heavy equipment operators shall inform their Supervisor(s) of any prescribed medication that they are taking that would impair their judgment and/or vision • Never walk or work directly in back of or to the side of heavy equipment without the operator's knowledge and approval.	L
	Severe weather (applies to all job steps)	• Shut down operations during severe storms, heavy rain, high wind, and lightning episodes. Evacuate the project site and take shelter at the designated shelter location. • All personnel shall be trained on the project Emergencies Response procedures.	L
	Excessive Noise Exposure	• Wear hearing protective devices (Ear muffs/plugs) when working, when using or near high noise producing equipment, or when directed by ECC SSHO in response to noise monitoring. • Ensure adequate maintenance on equipment. • Conduct periodic sound level surveys	L

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Drill Rig Operations (CONTINUED)	Exposure to dust	• Dust control measures will be implemented, as needed, and include some or all of the following: — Visual monitoring for fugitive dust. — Covering soil stockpiles with plastic sheeting or tarps. — Covering loaded dump truck beds with tarps. — Applying magnesium chloride, or similar dust-suppressing agent, for stockpiles and roads to reduce dust emissions. — Spraying potable water on dirt roadways outside the work zone and along dirt access roads. — Spraying the surface of the area to be excavated with water or a dust-suppressing agent, if required. — Work stoppage during wind speed in excess of 25 miles per hour. • Proper PPE	L

Stop work and notify the Team Leader if you are not sure how to perform your task safely!	***Stop work and notify the Team Leader if you are not sure how to perform your task safely!***	***Stop work and notify the Team Leader if you are not sure how to perform your task safely!***
Equipment to be Used	**Training Requirements**	**Inspection Requirements**
1. Heavy equipment 2. Dust suppressant <u>Support Zone</u> • Cell phone or radio communication • Eyewash station • Fire extinguishers • First aid kit • Drinking water • 911 air horn • Spill containment supplies • Air monitoring equipment • Emergency decontamination supplies • GFCI • Hand and power tools **PPE: Modified Level D (hardhat, steel toe boots, work gloves, Class 2 high-visibility garment, hearing protection, and safety glasses). If direct contact with soils, boot covers/over boots and Tyvek may be required (SSHO will determine when boot covers and Tyvek are needed).**	• Only qualified operators permitted to operate mobile equipment • Review of Excavation Plan • First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite) • Initial Safety Orientation • Daily Safety Tailgate Meetings • Emergency Response Plan/Procedures • Fire extinguishers **Competent Person: Site Superintendent and/or SSHO** Designated Equipment Operators:	• SSHO daily site inspection • Equipment – Receipt and inspected by SSHO • Competent person will inspect equipment daily prior to each use. No equipment will be placed in service until all deficiencies are corrected • Complete ECC daily equipment inspection form • Weekly inspection of first aid kits • Monthly and annual inspection of fire extinguishers • GFCIs (at least monthly).

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Activity/Work Task: **Excavation, Transportation, and Disposal**	Overall Risk Assessment Code (RAC) (Use highest code) **M**
Project Location: **Redstone Arsenal (RSA), Alabama (AL)**	
Contract Number: **W9124J-18-D-0004/ W9124J-22-F045**	
Date Prepared / Revised: **01 June 2023**	
Prepared by (Name/Title): **Courtney Bigelow, Associate Scientist**	
Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager**	
Competent Person (Name/Title): **Aaron Glad, Site Superintendent**	
Notes: (Field Notes, Review Comments, etc.)	

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

JOB STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS Consider People, Equipment, Materials and Environment *(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHS in accordance with ECC SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)*	RAC
Location of Underground and Above ground Utilities	Hitting Utilities	General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures, operational aspects & heavy equipment use, and change(s) in site work conditions. Daily housekeeping will be implemented during and at the ends of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples". • Before work begins, survey the site for overhead power lines. LOOK UP! Equipment will not be used that is able to reach overhead power lines. • If work must be conducted closer to utilities than guidelines allow, the utility company must be contacted.	L

Location of Underground Utilities (CONTINUED)	Hitting Utilities (CONTINUED)	• An observer/spotter shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. This shall be the ONLY job the observer is performing when an observer is required. • Keep all personnel well away from the equipment whenever it is close to power lines. • If intrusive activities, Alabama 811 shall be notified prior to with sufficient time allowed for white-lining and utility marking. Additionally, private locating services will be contacted for locations on base. — Excavation Permit Procedure: Mark the area for the requested clearance and then submit an excavation permit with RSA. Alabama 811 is contacted 48 hours prior to activity start. • ECC personnel will "white-line" or otherwise mark the area where the wells are to be installed, prior to utility marking. • Intrusive soil activities conducted within a five foot "Buffer Zone" (horizontal or vertical, as measured from the outside edge of the utility) of any utility (electric, gas, high pressure, chemical storage tanks, pipelines, sewers, etc.) may require the use of non-aggressive excavation methods such as hand excavation using non-conductive hand tools, use of an air spade, hydro-excavation, or similar means (some jurisdictions require more stringent buffer zones). Spotter will assist the operator/workers to identify unknown conditions during drilling. • If a previously unknown utility line is identified, uncovered, or disturbed during intrusive activities, stop immediately and project management notified. Intrusive operations shall not recommence until the line has been evaluated, identified, and the appropriate utility notified. • Most utilities and marking services utilize the American Public Works Association Uniform Color Code for marking out utilities. All personnel involved in excavation projects will be familiar with this code	L
Heavy Equipment Activities (trenching, moving earthwork, T&D)	Struck by equipment and loads	• Only qualified and designated operators will be authorized to operate mobile construction equipment. • Inspect equipment daily before use. • All mobile equipment will have working back up alarms, tested each day. • Stay outside the working radius of the machine. If you need to speak to operator, make eye contact first, use hand signal, and wait until operator stops the machine, grounds the bucket, and takes hands off controls before approaching cab. • Operators will not lift buckets, booms or loads over people. • Operator will immediately stop whenever ground personnel encroach on the working radius.	L
	Roll over into excavation	• There will be no vehicles in the vicinity of the excavations. The only equipment in the area will the equipment directly involved in excavation activities including an excavator and either a front end loader or a dump truck to move the excavated materials from the excavation to the staging area. Areas where the transfer equipment enters or approaches the excavation will be sloped to avoid sharp edges/drops. • Excavators will be positioned at one end of the trench with tracks parallel to the trench and the operator will not undermine the machine.	L

Heavy Equipment Activities (trenching, moving earthwork, T&D) (CONTINUED)	Exposure to Noise	• Operators and workers in the vicinity shall wear hearing protection or when instructed by the SSHO. • Reference USACE EM 385-1-1 Section 5.	L
	Fire and hydraulic fuel spill from heavy equipment	• Daily inspection of all heavy equipment. A fire extinguisher will be located in each piece of equipment. • Spill containment supplies will be readily available at the fueling area. NO SMOKING allowed in the operating equipment or fueling area. • See Fire Protection Plan and Emergency Response Plan in APP.	L
	Heat/Cold Stress (applies to all job steps)	• Monitor weather conditions and implement controls in accordance with Heat/Cold Stress Prevention Plan in APP. • Stay hydrated. • Stop and rest in cool shaded area if heat strain symptoms occur and when instructed by SSHO. • Report all signs and symptoms of heat strain immediately to SSHO	L
	Severe weather (applies to all job steps)	• Shut down operations during severe storms, heavy rain, high wind, and lightning episodes. Evacuate the project site and take shelter at the designated shelter location. • All personnel shall be trained on the project Emergencies Response procedures.	L
Entering/ exiting excavation	Excavation collapse Unauthorized personnel Excavated soils near the excavation	• Entry into excavations only after inspection by a competent person determines there are no cave-in hazards to employees. • Excavation faces will be sloped as determined by competent person. A restricted access zone will established. • Appropriate fencing and warning signs will be implemented on site. • Excavated soil shall be a minimum of 2 ft from the excavation. • Reference Excavation Plan in the APP and SOP ESQ 7.7	M
General Earthwork	Exposure to dust	• Dust control measures will be implemented, as needed, and include some or all of the following: — Visual monitoring for fugitive dust. — Covering soil stockpiles with plastic sheeting or tarps. — Covering loaded dump truck beds with tarps. — Applying magnesium chloride, or similar dust-suppressing agent, for stockpiles and roads to reduce dust emissions. — Spraying potable water on dirt roadways outside the work zone and along dirt access roads. — Spraying the surface of the area to be excavated with water or a dust-suppressing agent, if required. — Work stoppage during wind speed in excess of 25 miles per hour. — Proper PPE	L

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Stop work and notify the Team Leader if you are not sure how to perform your task safely!	*Stop work and notify the Team Leader if you are not sure how to perform your task safely!*	*Stop work and notify the Team Leader if you are not sure how to perform your task safely!*
Equipment to be Used	**Training Requirements**	**Inspection Requirements**
1. Heavy equipment 2. Dust suppressant <u>Support Zone</u> • Cell phone or radio communication • Eyewash station • Fire extinguishers • First aid kit • Drinking water • 911 air horn • Spill containment supplies • Air monitoring equipment • Emergency decontamination supplies • GFCI • Hand and power tools **PPE: Modified Level D (hardhat, steel toe boots, work gloves, Class 2 high-visibility garment, hearing protection, and safety glasses). If direct contact with soils, boot covers/over boots and Tyvek may be required (SSHO will determine when boot covers and Tyvek are needed).**	• Only qualified operators permitted to operate mobile equipment • Review of Excavation Plan • First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite) • Initial Safety Orientation • Daily Safety Tailgate Meetings • Emergency Response Plan/Procedures • Fire extinguishers **Competent Person: Site Superintendent and/or SSHO** Designated Equipment Operators:	• SSHO daily site inspection • Equipment – Receipt and inspected by SSHO • Competent person will inspect equipment daily prior to each use. No equipment will be placed in service until all deficiencies are corrected • Complete ECC daily equipment inspection form • Weekly inspection of first aid kits • Monthly and annual inspection of fire extinguishers • GFCIs (at least monthly).

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Activity/Work Task: **Equipment Decontamination, Demobilization, and Site Restoration**	Overall Risk Assessment Code (RAC) (Use highest code)	**L**
Project Location: **Redstone Arsenal (RSA), Alabama (AL)**		
Contract Number: **W9124J-18-D-0004/ W9124J-22-F045**		
Date Prepared / Revised: **01 June 2023**		
Prepared by (Name/Title): **Courtney Bigelow, Associate Scientist**		
Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager**		
Competent Person (Name/Title): **Aaron Glad, Site Superintendent**		
Notes: (Field Notes, Review Comments, etc.)		

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

JOB STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS Consider People, Equipment, Materials and Environment *(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHO in accordance with WE SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)*	RAC
Decontamination of equipment Dry Decontamination with hand tools • Use hand tools to remove excess soil or debris from equipment Site Restoration/Demob	Slip and Trip Hazards	General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures and equipment, operational aspects & equipment use, and change(s) in site/work conditions. Daily housekeeping will be implemented at the end of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit w/ eye wash). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples". • Practice good housekeeping. • Use care when walking on surface tarp, especially when wet. • Clean all spills immediately. • Proper PPE to include shoes which allow for good footing. • Be aware of physical hazards – watch for uneven ground, rocks, dirt clods, etc.	L
	Overhead Hazards	• Before work begins, survey the site for overhead power lines. LOOK UP! Equipment will not be used that is able to reach overhead power lines.	L

Decontamination of equipment Dry Decontamination with hand tools • Use hand tools to remove excess soil or debris from equipment Site Restoration/Demob (CONTINUED)	Manual Lifting/Backs/Ergonomic	• Train/Utilize correct lift techniques. • Personnel will not lift more than 50 lb. • Use Buddy System. • Position equipment as to eliminate over stretching/ergonomic concerns.	L
	Splash hazards (skin/eyes / face)	• Avoid direct exposure to potential eye hazards. • Wear ANSI approved safety glasses at all times. • Utilize face shield/goggles if potential for flying debris/splash hazards. • Wear rain suit or poly coated Tyvek, waterproof boots or boot covers	L
	Severe Weather	• Shut down operations during severe electrical storms, heavy rain, high wind and evacuate site/take cover. • Train employees on Emergencies Response. • Monitor weather systems.	L
	Noise	• Wear hearing protective devices (earmuffs/plugs) inside the exclusion zone, when using or near high noise producing equipment, or when directed by ECC's SSHS in response to noise monitoring. • Ensure adequate maintenance on thermal/heavy equipment.	L
	Struck By/Against Heavy Equipment	• Maintain radio/verbal communication. • Eye contact with operators will be made before approaching trucks. • Equipment will not be approached on blind sides. • Personnel will understand and review hand signals. • All machines will be equipped with backup alarms and lighting. • Always set emergency brake on equipment. • Equipment will properly Locked Out prior to decontamination (i.e., key removed from ignition) • Engage all equipment-supplied safety equipment (i.e., locking arms, chocks) on equipment parts that are suspended. DO NOT place yourself between unprotected/unsecured parts of the equipment.	L
	Chemical Exposure	• Protective clothing/PPE (steel toe boots, ANSI approved safety glasses, chemical gloves). • Decontaminate equipment away from intrusive activities and upwind.	L
	Scrapes and cuts	• Wear safety glasses, gloves and long sleeves.	L
	Heat/Cold Stress	• Monitor weather conditions and implement controls in accordance with Heat/Cold Stress Prevention Plan in APP. • Stay hydrated. • Stop and rest in cool shaded area if heat strain symptoms occur, when instructed by SSHO. • Report all signs and symptoms of heat strain immediately to SSHO.	L
Wet Decontamination with use of water • Use hose or pressure washer to remove soil or debris from equipment	High pressure washer operation	• The lance must always be pointed at the work area and away from other site personnel. Non-operators must remain a safe distance from the operator. The distance must be a minimum of 25 feet in every direction • Only trained authorized personnel will be allowed to use the equipment. • The operating pressure should never exceed what is necessary to complete the job. • **The trigger should never be tied down.**	L

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Wet Decontamination with use of water • Use hose or pressure washer to remove soil or debris from equipment (CONTINUED)	Equipment malfunction	• No unauthorized attachment may be connected to the unit. • Equipment should be cleaned after every use to avoid oil or dirt build-up especially around the trigger and guard area. • **Do not modify the lance.** The lance barrel, from trigger block to the tip, should not be less than 48 inches as recommended by manufacturers of hydroblasting equipment. • All users and assistants must be trained in emergency shut down procedures and general equipment maintenance.	L
	Slips, trips, and falls	• Proper PPE to include shoes which allow for good footing.	L

Stop work and notify the Team Leader if you are not sure how to perform your task safely!	***Stop work and notify the Team Leader if you are not sure how to perform your task safely!***	***Stop work and notify the Team Leader if you are not sure how to perform your task safely!***
Equipment to be Used	**Training Requirements/Competent or Qualified Personnel name(s)**	**Inspection Requirements**
1. Hand Tools 2. Skid Steer 3. Pressure washer unit and hoses 4. Support Vehicles <u>Support Zone</u> • Cell phone or Radio communication • Eyewash station • Fire extinguishers • First aid kit • Drinking water • 911 Air horn • Spill containment supplies • Air Monitoring equipment, if needed • Emergency decontamination supplies • GFCI • Hand and Power Tools **PPE: Modified Level D (Face shield, hardhat, steel toe boots, chemical gloves, orange safety vest, safety glasses (face shield if needed) and hearing protection, as needed)**	• Only qualified operators permitted to operate mobile equipment • Operators of forklifts will have recent certification / training in safe forklift operation (20 CFR 1910, Subpart N – Powered Industrial Trucks) • First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite) • Initial Safety Orientation • Daily Safety Tailgate Meetings • Emergency Response Plan/Procedures • Fire extinguishers. **Competent Person: Site Superintendent and/or SSHO**	• SSHO daily site inspection • Equipment – Receipt and inspected by SSHO • Competent person will inspect equipment daily prior to each use. No equipment will be placed in service until all deficiencies are corrected • Complete daily equipment inspection form will be completed by the operator • Weekly inspection of first aid kits • Monthly and annual inspection of fire extinguishers • GFCIs (at least monthly).

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Activity/Work Task: **Excavation, Transportation, and Disposal**	Overall Risk Assessment Code (RAC) (Use highest code) **M**
Project Location: **Redstone Arsenal (RSA), Alabama (AL)**	
Contract Number: **W9124J-18-D-0004/ W9124J-22-F045**	
Date Prepared / Revised: **14 June 2023**	
Prepared by (Name/Title): **Courtney Bigelow, Associate Scientist**	
Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager**	
Competent Person (Name/Title): **Aaron Glad, Site Superintendent**	
Notes: (Field Notes, Review Comments, etc.)	

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

JOB STEPS	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS Consider People, Equipment, Materials and Environment *(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHS in accordance with ECC SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)*	RAC
Location of Underground and Above ground Utilities	Hitting Utilities	General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures, operational aspects & heavy equipment use, and change(s) in site work conditions. Daily housekeeping will be implemented during and at the ends of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples". • Before work begins, survey the site for overhead power lines. LOOK UP! Equipment will not be used that is able to reach overhead power lines. • If work must be conducted closer to utilities than guidelines allow, the utility company must be contacted.	L

Location of Underground Utilities (CONTINUED)	Hitting Utilities (CONTINUED)	• An observer/spotter shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. This shall be the ONLY job the observer is performing when an observer is required. • Keep all personnel well away from the equipment whenever it is close to power lines. • If intrusive activities, Alabama 811 shall be notified prior to with sufficient time allowed for white-lining and utility marking. Additionally, private locating services will be contacted for locations on base. — Excavation Permit Procedure: Mark the area for the requested clearance and then submit an excavation permit with RSA. Alabama 811 is contacted 48 hours prior to activity start. • ECC personnel will "white-line" or otherwise mark the area where the wells are to be installed, prior to utility marking. • Intrusive soil activities conducted within a five foot "Buffer Zone" (horizontal or vertical, as measured from the outside edge of the utility) of any utility (electric, gas, high pressure, chemical storage tanks, pipelines, sewers, etc.) may require the use of non-aggressive excavation methods such as hand excavation using non-conductive hand tools, use of an air spade, hydro-excavation, or similar means (some jurisdictions require more stringent buffer zones). Spotter will assist the operator/workers to identify unknown conditions during drilling. • If a previously unknown utility line is identified, uncovered, or disturbed during intrusive activities, stop immediately and project management notified. Intrusive operations shall not recommence until the line has been evaluated, identified, and the appropriate utility notified. • Most utilities and marking services utilize the American Public Works Association Uniform Color Code for marking out utilities. All personnel involved in excavation projects will be familiar with this code	L
Heavy Equipment Activities (trenching, moving earthwork, T&D)	Struck by equipment and loads	• Only qualified and designated operators will be authorized to operate mobile construction equipment. • Inspect equipment daily before use. • All mobile equipment will have working back up alarms, tested each day. • Stay outside the working radius of the machine. If you need to speak to operator, make eye contact first, use hand signal, and wait until operator stops the machine, grounds the bucket, and takes hands off controls before approaching cab. • Operators will not lift buckets, booms or loads over people. • Operator will immediately stop whenever ground personnel encroach on the working radius.	L
	Roll over into excavation	• There will be no vehicles in the vicinity of the excavations. The only equipment in the area will the equipment directly involved in excavation activities including an excavator and either a front end loader or a dump truck to move the excavated materials from the excavation to the staging area. Areas where the transfer equipment enters or approaches the excavation will be sloped to avoid sharp edges/drops. • Excavators will be positioned at one end of the trench with tracks parallel to the trench and the operator will not undermine the machine.	L

Heavy Equipment Activities (trenching, moving earthwork, T&D) (CONTINUED)	Exposure to Noise	• Operators and workers in the vicinity shall wear hearing protection or when instructed by the SSHO. • Reference USACE EM 385-1-1 Section 5.	L
	Fire and hydraulic fuel spill from heavy equipment	• Daily inspection of all heavy equipment. A fire extinguisher will be located in each piece of equipment. • Spill containment supplies will be readily available at the fueling area. NO SMOKING allowed in the operating equipment or fueling area. • See Fire Protection Plan and Emergency Response Plan in APP.	L
	Heat/Cold Stress (applies to all job steps)	• Monitor weather conditions and implement controls in accordance with Heat/Cold Stress Prevention Plan in APP. • Stay hydrated. • Stop and rest in cool shaded area if heat strain symptoms occur and when instructed by SSHO. • Report all signs and symptoms of heat strain immediately to SSHO	L
	Severe weather (applies to all job steps)	• Shut down operations during severe storms, heavy rain, high wind, and lightning episodes. Evacuate the project site and take shelter at the designated shelter location. • All personnel shall be trained on the project Emergencies Response procedures.	L
Entering/ exiting excavation	Excavation collapse Unauthorized personnel Excavated soils near the excavation	• Entry into excavations only after inspection by a competent person determines there are no cave-in hazards to employees. • Excavation faces will be sloped as determined by competent person. A restricted access zone will established. • Appropriate fencing and warning signs will be implemented on site. • Excavated soil shall be a minimum of 2 ft from the excavation. • Reference Excavation Plan in the APP and SOP ESQ 7.7	M
General Earthwork	Exposure to dust	• Dust control measures will be implemented, as needed, and include some or all of the following: — Visual monitoring for fugitive dust. — Covering soil stockpiles with plastic sheeting or tarps. — Covering loaded dump truck beds with tarps. — Applying magnesium chloride, or similar dust-suppressing agent, for stockpiles and roads to reduce dust emissions. — Spraying potable water on dirt roadways outside the work zone and along dirt access roads. — Spraying the surface of the area to be excavated with water or a dust-suppressing agent, if required. — Work stoppage during wind speed in excess of 25 miles per hour. — Proper PPE	L

Environmental Chemical Corporation
Activity Hazard Analysis (AHA)

Stop work and notify the Team Leader if you are not sure how to perform your task safely!	*Stop work and notify the Team Leader if you are not sure how to perform your task safely!*	*Stop work and notify the Team Leader if you are not sure how to perform your task safely!*
Equipment to be Used	**Training Requirements**	**Inspection Requirements**
1. Heavy equipment 2. Dust suppressant <u>Support Zone</u> • Cell phone or radio communication • Eyewash station • Fire extinguishers • First aid kit • Drinking water • 911 air horn • Spill containment supplies • Air monitoring equipment • Emergency decontamination supplies • GFCI • Hand and power tools **PPE: Modified Level D (hardhat, steel toe boots, work gloves, Class 2 high-visibility garment, hearing protection, and safety glasses). If direct contact with soils, boot covers/over boots and Tyvek may be required (SSHO will determine when boot covers and Tyvek are needed).**	• Only qualified operators permitted to operate mobile equipment • Review of Excavation Plan • First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite) • Initial Safety Orientation • Daily Safety Tailgate Meetings • Emergency Response Plan/Procedures • Fire extinguishers **Competent Person: Site Superintendent and/or SSHO** Designated Equipment Operators:	• SSHO daily site inspection • Equipment – Receipt and inspected by SSHO • Competent person will inspect equipment daily prior to each use. No equipment will be placed in service until all deficiencies are corrected • Complete ECC daily equipment inspection form • Weekly inspection of first aid kits • Monthly and annual inspection of fire extinguishers • GFCIs (at least monthly).

Vision Integrity Results	**ECC**	**DAILY SAFETY MEETING SIGN-IN SHEET**

Date: _____ Project Name/Location: Redstone Arsenal

Company: ECC Person Conducting Briefing: _____

1. AWARENESS (e.g., Hazards, special EHS concerns, pollution prevention, recent incidents, etc.):

2. OTHER ISSUES (HASP changes, new AHAs, attendee comments, etc.):

3. DISCUSSION OF DAILY ACTIVITIES/TASKS AND SAFETY (PPE) MEASURES TO BE USED:

4. Hospital Information

Name: Huntsville Hospital

Address: 101 Sivley Rd SW

Phone: 256 – 265-1000

Directions: Exit Arsenal via Rideout Road. Merge onto -565 East. Take exit 19C for Jefferson St NW towards downtown (0.3 mi). Continue on Jefferson St. North (0.2 mi). Turn Right onto Monroe St NW(0.5 mi). Turn left onto Church St (0.5 mi). Turn left onto Williams Ave SW (0.2 mi). Turn right onto Madison St SE (0.5 mi), Turn Right into Hospital.

5. ATTENDEES (Print Name):

1.	2.
3.	4.
5.	6.
7.	8.
9.	10.

WORKER ACKNOWLEDGEMENT OF THE SITE SAFETY AND HEALTH PLAN AND SITE ORIENTATION

I have read or been trained to the contents of this Site Safety and Health Plan (SSHP). I understand the contents, and I agree to abide by its requirements. I understand that failure to comply with the provisions of this plan can lead to disciplinary action and possible termination from the project. Documentation of worker acknowledgment will be placed in the Project Records.

APP/Site Safety and Health Plan (SSHP)/Site Orientation Acknowledgment Form

Printed Name	Signature	Date

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ATTACHMENT 2A
EMERGENCY ACTION PLAN
AND
ATTACHMENT 2B
FIRE PREVENTION AND PROTECTION PLAN

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ATTACHMENT 2A
EMERGENCY ACTION PLAN

1.0 PROJECT

Contract Number: W9124J-18-D-0004
Delivery Order W9124J-22-F-045
Project Name: Environmental Remediation Services
Location: Redstone Arsenal (RSA), Alabama

2.0 PRE-EMERGENCY PLANNING

This section includes information needed for pre-planning for emergencies.

2.1 Emergency Contact List

Table A2A-1 EMERGENCY CALL LIST AND PROJECT ORGANIZATION

Name or Organization	Title	Phone number(s)
Fire/Ambulance/Police/ Emergency Redstone Arsenal (RSA)		For all emergencies: 911 For non-emergency RSA police/fire: (256) 876-2222
Hospital	Huntsville Hospital	(256) 265-1000
Clinic	Huntsville Hospital Urgent Care	(256) 539-0781
Occupational Medicine	Peter Greaney, MD / WorkCare, or US HealthWorks	(800) 455-6155 (714) 288-8303
Poison Control	Poison Control	(800) 256-9822
Jennifer Graham	Contracting Officer's Representative (COR)	Office: (210) 466-1406
Clint Howard	Army – RSA Branch Chief-Environmental Restoration	Office (256) 8423702
Pam Foti, Certified Hazardous Materials Manager (CHMM) Project Management Professional (PMP)	Project Manager (PM)	Mobile: (508) 274-3084
Carol Canada, Professional Geologist (PG)	Assistant PM	Mobile: (615) 693-9915
Kym Edelman, Certified Safety Professional (CSP), Certified Industrial Hygienist (CIH)	Safety and Health Manager (SHM)	Mobile: (757) 496-5622
Brian Kateley	Site Safety and Health Officer (SSHO) (Primary) (first aid/ Cardiopulmonary Resuscitation [CPR] provider)	Mobile: (410) 671-2970
Aaron Glad	Site Superintendent – alternate (first aid/ CPR provider)	Mobile: (508) 229-2270
First Aid/CPR providers	SSHOs	See above
ECC HOTLINE	ECC	650-347-7512 Ext 111

KEY PROJECT PERSONNEL ARE TO HAVE A COPY OF THIS LIST READILY AVAILABLE AT ALL TIMES

2.2 Coordination with Local Emergency Agencies

Local authorities and emergency services will be contacted prior to initiation of work. The work objectives and on-site capabilities will be explained, as well as the most likely emergencies. Preferred contact procedures will be established and the response capabilities of local responders will be determined. Environmental Chemical Corporation (ECC) will ensure there is good coordination between our emergency plan and local requirements. The Site Safety and Health Officer (SSHO) will document this meeting in the project files.

3.0 PERSONNEL ROLES AND LINES OF AUTHORITY

During all emergencies, the SSHO will serve as the SSHO. He will work to abate and/or contain the emergency.

4.0 EMERGENCY RECOGNITION AND PREVENTION

Conditions that may lead to an emergency situation during field activities will be addressed in specific Activity Hazard Analyses (AHAs) as tasks are identified or the **Attachment 1**. These conditions include:

- Incident involving a serious injury
- Fire
- Environmental release
- Severe weather

Before daily work assignments, regular "tailgate/toolbox" safety meetings should be held. Discussions should include, but not limited to:

- Specific task to be performed (Plan of the Day)
- Weather conditions (if severe weather is anticipated, evacuation routes/rally points will be discussed)
- Time Constraints (e.g. rest breaks, tide restrictions, 24-hour operations)
- Hazards that may be encountered, including their effects, how to recognize symptoms or monitor them, concentration limits, or other danger signals
- Near misses from the previous day's work
- Emergency Procedures

5.0 SAFE DISTANCES AND SAFE ZONES

If severe weather is anticipated, places of refuge and rally points will be discussed at the daily tailgate meeting.

For releases of hazardous material, the SSHO will monitor the rally point to ensure exposure to hazardous materials is not likely to occur. The evacuation routes and rally points during a fire or environmental release may be modified during the response due to wind direction and potential exposure situations. Personnel must remain alert for changes to alternate routes and rally locations.

6.0 SITE SECURITY AND CONTROL

Site control procedures for this project will include the establishment of Work Zones in order to provide site security by avoiding unauthorized access and to secure work locations between shifts. On this project, work zones may be established by using appropriate work area signage in combination with warning or danger tape, barricades, or other measures selected for the sites, if deemed necessary.

The SSHO, as well as employees, will stay alert for any unauthorized entry and take necessary actions to control the work area.

Authorized site visitors may visit the site upon meeting the following conditions:

- Receiving site hazard and safety instructions from the SSHO; to include Emergency Response procedures briefing
- Reviewing and complying with the essential elements of the Accident Prevention Plan (APP)

- Using their own, or provided Personal Protective Equipment (PPE), to enter regulated work areas per the APP
- Reporting any observed unsafe act and/or condition at, or affecting, the work site

Visitors will be evacuated from the incident location, or from the site, during emergency activities.

7.0 EVACUATION ROUTES AND PROCEDURES

Evacuation routes and procedures will be reviewed and discussed regularly during tailgate meetings.

8.0 EMERGENCY MEDICAL TREATMENT (FIRST AID/CPR/AED)

At least two employees certified in both First Aid, Cardiopulmonary Resuscitation (CPR), and Automated External Defibrillator (AED) use be on the project at all times. A First Aid kit must be maintained on site and checked weekly (EM 385-1-1 section 03.B.02). First aid kit will be maintained by the SSHO. A log of First Aid treatment and materials used will also be maintained by SSHO.

If an injury or illness requires more than First Aid, but is not an emergency, the employee will be taken to Huntsville Hospital Urgent Care for examination or observation, after contacting the ECC Corporate Medical Provider, Dr. Greaney, or his alternate at WorkCare (1-800-455-6155). The Huntsville Hospital Urgent Care route can be found in **Figure A2A-1**.

If the injury or illness is considered an emergency, call 911 and an installation ambulance service will be contacted to transport the victim to the Huntsville Hospital. The route can be found in **Figure A2A-2**.

9.0 RESCUE OPERATIONS

Where employees are engaged in one of the following activities or environments, a rescue plan will be incorporated into the AHA or appropriate site-specific plan:

- Working at elevations – not anticipated
- Using personal fall arrest systems – not anticipated
- Working alone – not anticipated
- Confined spaces, or potentially immediately dangerous to life and health atmospheres – not anticipated

10.0 EMERGENCY ALERTING AND RESPONSE NOTIFICATION

An employee alarm system will consist of the use of verbal instructions, either directly or via radio.

Cellphone of telephones will be used to contact emergency responders. **Table A2A-1** of this Plan will be kept in site vehicles. The following information will be communicated:

- Name of the person reporting the emergency
- Telephone number at the location of the person making the call
- Name of the injured person, if known
- Description of the emergency
- Exact location of the emergency
- Actions already taken
- What assistance is needed

Although not anticipated, if an employee is working alone in remote area, he/she will have either two-way radios or cell phones. The employee will be required to check in/check out with the SSHO with an agreed upon frequency before employee leaves for the remote work.

11.0 PERSONAL PROTECTIVE EQUIPMENT AND EMERGENCY EQUIPMENT

Each field team will have quick access to a First Aid kit, cell phone, bloodborne pathogen prevention PPE, and fire extinguisher.

12.0 SITE LAYOUT AND PREVAILING WEATHER CONDITIONS

See **Attachment 3** for hospital and clinic routes; due to the numerous sites for this project, the rally points and procedures will be discussed regularly during the daily tailgate meetings.

13.0 REPORTING PROCEDURES

All emergencies will be immediately communicated to the SSHO who will initiate emergency response procedures and notify the Contracting Officer's Representative (COR) and appropriate response personnel.

After the response, ECC will prepare an Incident Report. It will include such things as a chronological history of the emergency facts, actions taken, personnel present, sample results (if taken), summary of injuries, and possible exposures. For spills and releases it will also include:

- Description of material spilled, including identity, quantity, and a copy of the Safety Data Sheet (SDS) or waste disposal manifest
- Exact time and location of the spill, and the description of the area involved
- Containment procedures utilized
- Description of the cleanup procedure employed at the site, including disposal of spill residue
- Summary of the communications ECC had with other agencies.

This report will be given to the Army within 24 hours of the incident along with immediate verbal notification.

The report will also contain a critique of the response and modifications to this plan will be made if necessary, to adequately address subsequent emergencies.

14.0 TRAINING

The Emergency Response Plan will be discussed during initial site training and discussed regularly during the Daily Tailgate Safety Meetings. Due to the short timeframes of field events drill test will not be necessary.

15.0 PROCEDURES

Emergency Action Procedures - Injury and Medical Emergency

Prevention:

Wear proper PPE at all times. Implement precautions in AHA. Follow standard operating procedures (SOPs). Avoid pinch points, struck by hazards and exposures to falls from elevation. Report all hazards, injuries and illnesses to your supervisor SSHO immediately. Follow instructions on all prescription medications. Stay hydrated.

Recognition and Reporting:

If an injury, illness or medical condition arises, notify your nearest co-worker immediately. Have them call the SSHO or your supervisor.

All First Aid Providers will be contacted immediately and will report to location of the injured person. See **Table 2A1-1** contact list.

Actions:

1. First Aid Providers will do an immediate area and victim assessment in accordance with their training.
2. Call 911 or local emergency notification number immediately if any of the following situations exist:
    a. Unconscious
    b. Severe bleeding
    c. Head or spine injury is suspected
    d. Seizures
    e. No pulse
    f. No breathing
    g. Overdose situation possible
    h. Situation requires rescue/medical evacuation (fire, airborne release, workplace violence, trapped)
    i. Any other situation where the condition of the patient is in question. If in doubt contact 911.
3. Establish clear area or have ambulatory patient move to a safe location.
4. Apply Universal Precautions per Bloodborne Pathogens Exposure Control Plan (Attachment 6 of APP) and training, and don PPE (disposable gloves, CPR mask, etc.).
5. Provide appropriate First Aid/CPR/AED consistent with training and certification.
6. Provide complete information to emergency medical technicians, if necessary.
7. Clean area and contain potentially contaminated materials and articles in labeled bag per Bloodborne Pathogens Exposure Control Plan (Attachment 6 of APP).
8. Participate in incident investigation, provide for and monitor medical follow up if necessary.

Emergency Action Procedures - Fire

Prevention:

See Fire Prevention and Protection Plan, **Attachment 2B**.

Recognition and Reporting:

Call designated base emergency services number upon observation of any uncontrolled fire or smoke.

Actions:

1. Always alert the emergency management system first, regardless of the size of the fire
2. Use fire extinguisher if:
    a. You have been trained
    b. You have an escape route behind you
    c. The fire is small (incipient stage) and can likely be put out with one extinguisher in about 10 seconds.

3. If the fire cannot be controlled with a fire extinguisher:
    a. Notify Site Superintendent or SSHO and initiate evacuation procedure immediately.
    b. The SSHO will notify site personnel and client representatives of evacuation order.
    c. The SSHO will ensure evacuation alarms are sounded, and evacuation proceeds in accordance with Evacuation Plan.
4. If the fire is controlled by a fire extinguisher:
    a. Call for another fire extinguisher for stand by
    b. Remove potential sources of fuel and ignition
    c. Stay at the location until relieved by the SSHO or Fire Department to watch for re-ignition.
5. Participate in incident investigation.

Emergency Action Procedures - Evacuation

Prevention:

Most emergency evacuations can be prevented by following the APP and by practicing safe behaviors. Report all hazards and suspicious activities immediately.

Recognition and Reporting:

Emergency evacuation of the site may be prompted by various situations, including but not limited to the following:

- Fires
- Hazardous material releases
- Sudden severe weather events
- Workplace violence or terrorism
- Utility damage
- Off-site emergency that may impact site operations.

Report potential emergency conditions immediately to your Supervisor or the SSHO. Call 911. See **Table A2A-1** contact list.

Actions:

1. In the event of an emergency, the SSHO may initiate evacuation of the site by sounding the evacuation alert - one long blast on the air horn or make verbal contact
2. Call local 911 or emergency notification number
3. The SSHO will notify and coordinate with client representatives, RSA personnel, and emergency responders
4. Upon arrival of emergency response personnel, the SSHO will report to and assist the Incident Commander (lead from local emergency response team)
5. The SSHO will retrieve the daily sign in logs and proceed to the rally point
6. All personnel, upon hearing the evacuation alert, or receiving verbal instructions to evacuate will immediately proceed along the designated route to the rally point which will be discussed at each daily tailgate meeting
7. In the event of a fire or release of airborne toxic chemical, check local wind indicators. Evacuate in a direction perpendicular to the wind direction if possible
8. Be attentive for instructions on changes in rally location based on site conditions

9. In some cases, a shelter-in-place order may be given. In that case, close doors and windows and shut off ventilation system
10. Report to your Supervisor at the rally point
11. Supervisors will report on the presence of crew members to SSHO for accountability purposes.
12. Look around for friends and co-workers. Report anyone missing to the SSHO
13. Critical plant operations – there are no critical plant operations on this project. Upon hearing the evacuation alert, all personnel will shut off power tools and equipment and proceed immediately to the rally point
14. Rescue procedures are included in the Fall Prevention and Protection Plan or Confined Space Entry Plan, if applicable. Once an evacuation order is given, rescue activities will be turned over to off-site emergency responders
15. Site First Aid Providers will render First Aid and support to injured personnel at the rally point. In an evacuation, the local Emergency Medical Service will be notified and will take charge of medical support
16. The SSHO will report the status of evacuated personnel to the Incident Commander, including the name, description and last known location of any unaccounted for individuals
17. Site(s) may be re-entered when the SSHO gives the "all clear" order. An incident investigation will begin immediately, led by the SSHO.

Emergency Action Procedures - Severe Weather

Prevention:

The SSHO will monitor the weather at least twice daily. Weather monitoring will become continuous when the National Weather Service issues a severe weather Watch or Warning.

Recognition and Reporting:

A Watch means that a weather emergency is possible. It means Be Prepared. On issuance of a Watch, the SSHO will determine what site preparations will be made to secure the site, shut down, evacuate or call off a scheduled work shift.

A Warning means that a weather emergency is in the area. It means Take Action. Upon issuance of a Warning, the SSHO will implement emergency shut down procedures.

Actions:

1. Thunderstorm, Lightning, Tornado
    a. Remove loose or stacked materials from roofs, or open floor decks
    b. Remove from site or secure stacks of materials at ground level
    c. Lightning - Stop outdoor activities involving load handling equipment, roofing, working on elevating platforms and scaffolds, tree trimming, or work in open areas upon hearing thunder or seeing lightning. Seek indoor shelter. Stay indoors for 30 minutes after the last audible thunder or visible flash of light
    d. Proceed to pre-determined tornado shelter upon issuance of a Warning. The SSHO will work with RSA personnel or local emergency agencies to identify shelters during mobilization.

Emergency Action Procedures - Spills and Releases of Hazardous Materials

Prevention:

Supervisors will review the hazards of chemicals with their work crews, and SDS and labels will be maintained in accordance with the Hazard Communication Program.

- **Avoid mixing chemicals**, even common household products. Some combinations, such as ammonia and bleach, can create toxic gases. When in doubt, consult the SDS or the SSHO.
- **Always read and follow the directions** when using a new product. Some products should not be used in small, confined spaces to avoid inhaling dangerous vapors. Other products should not be used without gloves and eye protection to help prevent the chemical from touching your body.
- **Store chemical products properly.** Non-food products should be stored tightly closed in their original containers so you can always identify the contents of each container and how to properly use the product. Containers of flammable and combustible liquids will be stored in flammable liquid storage cabinets or removed from the site at the end of the day. Bulk storage of fuels or other hazardous materials will have secondary containment, and containment around transfer valves, spigots and hoses.
- **Report and Clean up any spills immediately** with some rags, being careful to protect your eyes and skin.
- **Follow operating procedures**. Implement procedures designed to limit open containers, excess pressure, surface area of contaminated environmental media, drum and container handling, etc.
- **Implement the Storm Water Pollution Prevention Plan** if one is required on the site, or general good chemical handling practices to keep materials from flowing off-site with stormwater.

Recognition and Reporting:

Notify your Supervisor or the SSHO of any spill or airborne release of hazardous materials. The SSHO will investigate and determine if an emergency should be declared and will issue an alert to evacuate or shelter-in-place if necessary. The SSHO will call the RSA emergency services if an emergency is declared.

The SSHO will notify the client representative immediately of any spill or release. Where reporting to installation and regulatory agencies is required, the reporting will be done in accordance with the communications plan approved by the Contracting Officer. See Contact List **Table A2A-1**.

Actions:

The actions to be taken will depend on the nature and extent of the release. Only personnel trained in the procedures and PPE required to handle the spill or release should be involved in containing, stabilizing, and cleaning up the material.

1. If a release from an on-site or off-site source results in a shelter-in-place order:
    a. Proceed to the nearest designated shelter
    b. Shut doors and windows
    c. Turn off ventilation system.
    d. If possible, seal gaps around doors and window with tape, wet towels or other items
2. Take immediate measures to control and contain the release (e.g. shut off pumps, close valves).
3. Contact local emergency service providers.
4. Don protective equipment as specified by the SSHO.
5. If exposure to individuals causes injury/health effects, make sure the area is safe before attempting rescue or First Aid. If safe to do so, move them to fresh air and apply appropriate First Aid. Notify the Emergency Medical Service of the nature of injury.
6. Isolate and contain hazardous release areas.
7. Deny entry to the spill area to unauthorized personnel.
8. Do not allow anyone to touch spilled material.
9. Stay upwind, keep out of low areas.

10. Keep combustible materials away from the spilled material.
11. Use water spray or foam to reduce dust or vapors as needed.
12. Collect samples for analysis to determine that cleanup is adequate.
13. If the release is from tanks, prevent the discharge from traveling beyond site boundaries.
14. Containerize materials and arrange for proper disposal.
15. Take caution when handling drums and containers (opening, sampling, and over packing).

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ATTACHMENT 2B
FIRE PREVENTION AND PROTECTION PLAN

1.0 PROJECT

Contract Number:	W9124J-18-D-0004
Delivery Order	W9124J-22-F-045
Project Name:	Environmental Remediation Services
Location:	Redstone Arsenal (RSA), Alabama

2.0 SCOPE

This Plan applies to all activities, including subcontractor activities for the project identified above.

3.0 LIST OF MAJOR WORKPLACE FIRE HAZARDS

On this project, the major workplace fire hazards will include:

- Normal combustibles including transmitter building, trash, construction materials, vegetation and waste piles. Good housekeeping will be maintained. Trash will be collected daily and placed in a designated receptacle.
- Combustible and flammable liquids used as fuels in site vehicles, mobile construction equipment and power tools.
    - Gasoline will be kept in labeled five-gallon metal safety cans with flame arrestor and spring-loaded lid, or in Underwriters Laboratories (UL) approved one to two-gallon plastic cans.
    - Diesel fuel will be kept in labeled UL approved containers.
    - A temporary Diesel fuel tank will be protected with barriers and secondary containment.
    - The refueling area is shown on the Site Layout.

4.0 CONTROL OF IGNITION SOURCES

- Smoking is prohibited inside vehicles and buildings. A designated smoking area will be established during mobilization and supplied with a self-extinguishing ash tray stand.
- Temporary fuel storage tanks will be protected from accidental impact by vehicles and equipment.
- Storage tanks will be double-walled or have other secondary containment measures which will have a capacity of at least the tank volume +10 percent (%). Secondary containment will be inspected regularly and kept free of accumulation of liquids, including rainwater to ensure sufficient free board at all times.
- Tanks, pumps and hoses will be rated/approved and listed for the service and will include appropriate bonding to control static sparks.
- Hose nozzles used to fill equipment from the temporary tank will be automatic closing and will not be equipped with a latch-open device. All filling and transfer operations will be attended.
- Normal combustibles, including high vegetation will be kept at least 25 feet from the refueling area.
- Sources of ignition will be prohibited within 25 feet of the refueling area.
- Equipment with small engines will not be fueled while hot.
- The refueling area will be posted with signs, including “No Smoking”, “No Hot Work”, and “Do not fuel hot equipment.”
- A Fire Extinguisher rated at least 40 B:C will be placed in a fixed and visibly labeled location within 100 feet of the refueling area.
- Tanks will have appropriate hazard warning labels.
- A spill kit suitable for minor spills and leaks of petroleum products will be stationed at the refueling area.

- The refueling area, equipment, and emergency supplies will be inspected as needed.
- Small portable containers of flammable liquids will be stored out of direct sunlight and in a designated location. A Flammable liquid storage cabinet will be used if more than two containers of flammable liquids are stored on site. The cabinet will include a "No Smoking" label.

See **Section 9.0** below for Hot Work requirements.

5.0 TYPES OF FIRE SUPPRESSION EQUIPMENT

Portable fire extinguishers will be selected and distributed as follows:

- Fire extinguishers rated to 1-A:10-B:C or higher, will be in all work vehicles, mobile construction equipment, and in the immediate vicinity of stored flammable materials.
- 40-B:C extinguisher in the refueling area.
- 4-A: 60-B:C (10-pound agent minimum) at each hot work location.
- Not anticipated, but if in buildings under construction, alteration or demolition, at least one 4-A:6-0B:C extinguisher will be located per every 6,000 square feet of floor space, on each floor. Extinguishers shall not require a travel distance of more than 75 feet, and one extinguisher on each floor should be placed close to the stairways. Note: If unusual fire hazards exist, consult National Fire Protection Association (NFPA) 10 for additional selection and distribution information.
- The equipment will not be removed except for inspection and/or use in an emergency.
- The Site Safety and Health Officer (SSHO) will provide training on the use of the fire extinguisher during the pre-entry briefing.
- Fire extinguishers will be visually inspected monthly.

6.0 RESPONSIBILITIES FOR MAINTAINING EQUIPMENT AND SYSTEMS

The SSHO will be responsible for inspection of work areas on a daily basis, and inspection of fire extinguishers on a monthly basis.

Fixed systems in buildings under construction, alteration or demolition will be inspected by, or under the direction of the Authority Having Jurisdiction.

7.0 PERSONNEL RESPONSIBLE FOR CONTROLLING FUEL SOURCE HAZARDS

The SSHO is responsible for controlling fuel source hazards, in accordance with this Plan. This includes regular inspections of areas and equipment, maintaining adequate freeboard in secondary containment, limiting combustibles around fuel storage and dispensing operations, and ensuring control of ignition sources in these areas.

8.0 HOUSEKEEPING PROCEDURES

Trash will not be permitted to accumulate. Receptacles with lids or roll off boxes will be used to contain trash. Work areas will be cleaned up each day, as often as necessary to maintain a safe job site.

Waste piles will be limited in size, segregated and removed from site as soon as possible.

Spills of flammable and combustible materials will be contained and cleaned up as soon as possible. See Emergency Action Plan, **Attachment 2A** of the Site Safety and Health Plan (SSHP).

9.0 HOT WORK PERMITS

Hot work is defined as any process that produces open flames, heat or sparks, including, but not limited to: burning, cutting, welding, soldering, brazing, torch applied roofing, and the use of temporary heating devices involving an open flame or exposed heating elements.

Before any hot work is performed, ECC personnel shall obtain a Hot Work Permit from the U.S. Army local authority. A hot work site will have a designated fire watch. This person's sole responsibility shall be to monitor the hot work and have immediate access to the fire extinguisher located at each hot work site (a portable fire extinguisher [A:B:C] will be readily available). The fire watch shall remain at his/her designated watch for 30 minutes from the conclusion of hot work activities.

It is the responsibility of the SSHO to work with the Army or local authority/permit issuing group to establish the requirements, definitions, and regulations. In general, a hot work permit is required from the local hosting facility when the hot work is being performed on a pre-existing building/structure or new attachment to an existing structure. If the hot work is solely on a new building/structure not connected to a preexisting structure and has not been handed over to client or end user, then an ECC Hot Work permit can be used. This should be communicated prior to the start of any hot work activities.

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ATTACHMENT 3

MEDICAL SUPPORT PLAN

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ATTACHMENT 3
MEDICAL SUPPORT PLAN

1.0 PROJECT

Contract Number:	W9124J-18-D-0004
Delivery Order	W9124J-22-F-045
Project Name:	Environmental Remediation Services
Location:	Redstone Arsenal (RSA), Alabama

2.0 SCOPE

This plan provides information for medical support for all operations at the project identified above.

3.0 COMMUNICATION

The site will have ready communications to medical support facilities via cell phone. Phone numbers are listed on the Emergency Contact List (Emergency Action Plan, **Attachment 2A**, **Table A2A1-1**) and the list will be kept in all site vehicles.

4.0 FIRST AID AND MEDICAL FACILITIES

Minor injuries will be treated on-site by certified First Aid Providers (see Emergency Contact List). If additional care is needed, the local facility, Huntsville Hospital Urgent Care**,** will be used. **Figure A3-1** shows the route map to the facility.

If an incident results in a major injury, call 911 for ambulance. Environmental Chemical Corporation (ECC) will not transport non-ambulatory, unconscious or shock risk patients. **Figure A3-2** is the route map to Huntsville Hospital. Copies of the route maps will be kept in all site vehicles.

Medical consultation can be obtained from ECC's occupational medical consultant, Dr. Greaney or his associates at WorkCare, Inc. WorkCare should be called before transporting any minor injury to the local clinic or emergency room.

At least one First Aid kit for every 25 employees will be kept on-site. The First Aid kits will comply with American National Standards Institute (ANSI) Z308.1. All kits will contain bloodborne pathogen prevention personal protective equipment (PPE) including surgical gloves and resuscitator mask or shield.

At least two individuals with current certification in First Aid and Cardiopulmonary Resuscitation (CPR) will available on each shift.

Each will have current certification in First Aid and CPR from the American Red Cross, the American Heart Association, or from an organization whose training adheres to the standards of the International Liaison Committee on Resuscitation (as stated in writing), or from a Licensed Physician. Certification courses will have hands-on component that cannot be taken on-line. Retraining will occur every two years.

First Aid Providers on this project include the Site Safety and Health Officers (SSHOs) Mr. Brian Kateley and Mr. Aaron Glad. They are First Aid and CPR trained; are qualified to administer First Aid and CPR; and have completed Bloodborne Pathogen training in accordance with 29 Code of Federal Regulations (CFR) 1910.1030. Their duties are to provide First Aid/CPR in accordance with their training.

DIRECTIONS (6.9 mi, 10 min)

1. Turn right onto Market St SW (200 ft)
2. Turn right onto Redstone Gatway SW (0.1 mi)
3. Use the right lane to turn left onto Rideout Rd (0.3 mi)
4. Use the right lane to take the ramp onto I-565 E (0.7 mi)
5. Merge onto I-565 E (3.8 mi)
6. Take exit 19A to merge onto US-231 S/US-431 S/ Memorial Pkwy SW toward Memorial Pkwy (1.2 mi)
7. Take the exit toward Bob Wallace Ave (300 ft)
8. Merge onto AL-53 S (0.3 mi)
9. Keep right to continue on US-231 Frontage Rd (0.2 mi)
10. Turn left onto Bob Wallace Ave SW (0.2 mi)
11. Turn left onto Commerce Ct (200 ft)
12. Destination will be on the right.

Huntsville Hospital Urgent Care
900 Bob Wallace Ave SW #104
Huntsville, AL 35801
(256) 539-0781
Mon-Fri: 8:00 am - 8:00 pm
Sat: 9:00 am - 5:00 pm
Sun: 1:00 pm - 5:00 pm

START
Main Gate 9
Visitors Center

END
Huntsville Hospital Urgent Care

LEGEND

- Clinic Route
- Redstone Arsenal



NOTES
1. Coordinate System: NAD83 State Plane Alabama East, US Feet (FIPS 0101)
2. Basemap data from IGI&S Office at Redstone Arsenal
3. Map Size: B-size (17" x11")
4. Revision Date: 2/8/2021

Figure A3-1

Clinic Route Map
Redstone Arsenal
Madison County, Alabama

0 3,500 7,000 Feet

1 inch = 2,778 feet

Mission & Installation Contracting Command (MICC)
U.S. Army Garrison-Redstone

DISCLAIMER- The data represent the results of data collection/processing for a specific Redstone Arsenal activity and indicates the general existing conditions. As such, it is only valid for its intended use, content, time, and accuracy specifications. The user is responsible for the results of any application of the data for other than its intended purpose.

ECC GIS Server: E:\Projects\Redstone\MapDocument\APP\FigA3-1_RSA_APP_ClinicMap.mxd

DIRECTIONS (7.4 mi, 12 min)

1. Turn right onto Market St SW (200 ft)
2. Turn right onto Redstone Gateway SW (0.1 mi)
3. Use the right lane to turn left onto Rideout Rd (0.3 mi)
4. Use the right lane to take the ramp onto I-565 E (0.7 mi)
5. Merge onto I-565 E (4.4 mi)
6. Use the right lane to take exit 19C for Jefferson St toward Downtown (0.3 mi)
7. Continue onto Jefferson St N (0.2 mi)
8. Turn right onto Monroe St NW (0.5 mi)
9. Turn left onto Church St NW (0.5 mi)
10. Turn left onto Williams Ave SW (0.2 mi)
11. Turn right onto Madison St SE (0.5 mi)
12. Turn right (70 ft)
13. Destination will be on the right

Huntsville Hospital
101 Sivley Rd SW
Huntsville, AL 35801
(256) 265-1000

START
Main Gate 9
Visitors Center

END
Huntsville
Hospital

LEGEND

- Hospital Route
- Redstone Arsenal



NOTES
1. Coordinate System: NAD83 State Plane Alabama East, US Feet (FIPS 0101)
2. Basemap data from IGI&S Office at Redstone Arsenal
3. Map Size: B-size (17" x11")
4. Revision Date: 2/8/2021

Figure A3-2

Hospital Route Map
Redstone Arsenal
Madison County, Alabama

0 4,000 8,000 Feet

1 inch = 3,045 feet

Mission & Installation Contracting Command (MICC)
U.S. Army Garrison-Redstone

DISCLAIMER- The data represent the results of data collection/processing for a specific Redstone Arsenal activity and indicates the general existing conditions. As such, it is only valid for its intended use, content, time, and accuracy specifications. The user is responsible for the results of any application of the data for other than its intended purpose.

ECC GIS Server: E:\Projects\Redstone\MapDocument\APP\FigA3-2_RSA_APP_HospitalMap.mxd

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ATTACHMENT 4A
HEAT STRESS MONITORING PLAN
AND
ATTACHMENT 4B
COLD STRESS MONITORING PLAN

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ATTACHMENT 4A
HEAT STRESS MONITORING PLAN

1.0 PROJECT

Contract Number: W9124J-18-D-0004
Delivery Order W9124J-22-F-045
Project Name: Environmental Remediation Services
Location: Redstone Arsenal (RSA), Alabama

2.0 SCOPE

This Plan applies to the project identified above and will be incorporated into the Site Safety and Health Plan (SSHP). Subcontractors are required to comply with this program by virtual of their coverage under the Accident Prevention Plan (APP).

3.0 PROCEDURES

3.1 Heat Stress And Heat Strain

Heat stress is the net heat load to which a worker may be exposed from the combined contributions of metabolic cost of work, environmental factors and clothing requirements. Heat stress is a hazard during warm weather or when personnel are wearing Personal Protective Equipment (PPE) that aggravates the heat stress hazard. Heat stress can occur even when temperatures are moderate if the body's physiological processes fail to maintain a normal body temperature.

Heat strain is the overall physiological response resulting from heat stress. The resulting physical reactions that occur are fatigue, irritability, anxiety, and a decrease in concentration, dexterity, and/or movement. Onset of signs and symptoms of exposure can occur rapidly, and may progress to a medical emergency (i.e., heat stroke) without intervention. In extreme cases, death can result if the patient is not given immediate treatment.

3.1.1 Symptoms of Heat Exhaustion

Heat exhaustion occurs when your body cannot sweat enough to cool you off. It generally happens when you are working or exercising in hot weather. Symptoms include:

- Fatigue, weakness, dizziness, or nausea
- Cool, clammy, pale, red, or flushed skin
- Heavy sweating

First Aid for Heat Exhaustion

- Get the person out of the sun and into a shady or air-conditioned location
- Lay the person down and elevate the legs and feet slightly
- Loosen or remove the person's clothing
- Have the person drink cool water, not iced, or a sports drink containing electrolytes
- Cool the person by spraying or sponging him or her with cool water and fanning
- Monitor the person carefully. Heat exhaustion can quickly become heatstroke. If fever greater than 102 degrees Fahrenheit (ºF), fainting, confusion or seizures occur, call for emergency medical assistance.

3.1.2 Symptoms of Heat Stoke

Heat exhaustion can sometimes lead to a heat stroke. Heat stoke requires emergency treatment. It happens when your body stops sweating but the body temperature continues to rise, often to 105°F or higher. Symptoms include the following:

- Cessation of sweating
- Confusion, delirium, or unconsciousness
- Hot, dry, red or flushed skin, even under the arm pits
- Rapid and shallow breathing
- Chills
- Irritability
- Malaise
- Disorientation or confusion

First Aid for Heat Stroke

- It is vital to lower a heat stroke victim's body temperature. Seconds count.
- Call emergency medical assistance and get an ambulance on the way as soon as possible.
- Move the person out of the sun and into a shady or air-conditioned space.
- Pour water on them, fan them, apply cold packs.

3.2 CONTROL MEASURES

Where monitoring indicates a possible heat stress hazard the following safety procedures shall be implemented:

General Controls

- Review signs and symptoms of heat strain, as well as controls and First Aid measures with site personnel.
- Encourage employees to eat a normal diet and get proper rest.
- Encourage employees to refrain from consuming diuretics, including caffeine from coffee and tea beverages, or any form of alcohol. (*Note: Consumption of alcohol is prohibited during working hours*). Counsel and monitor workers on medications that may affect blood pressure, sweating, body temperature regulation, or kidney function.
- Adjust expectations of those returning to work after absence from heat exposure situations and encourage them to eat salty foods (with approval of physician for those on salt-restricted diets).
- Provide potable drinking water and encourage workers to about one cup every 20 minutes.
- Permit self-limitation of exposures and plan frequent rest breaks.
- Encourage workers to report signs and symptoms of heat strain and not to try to work through it.
- Encourage the buddy system to detect signs and symptoms in co-workers.
- Provide shade (i.e., fixed or portable canopy) and/or cool rest areas.

Job-Specific Controls

Where the screening or physiological monitoring discussed below exceed the criteria, the job-specific controls for this project will include the following:

- Engineering controls to reduce workload, (e.g., mechanical vs. manual material handling where possible).
- Mobile construction equipment will have functioning air conditions and be operated with the doors/windows closed.
- Office trailer and vehicles will have functional air conditioning to provide cool rest locations during breaks.
- Wear breathable polypropylene disposable coveralls over modesty clothing for activities requiring Modified Level C.
- Use heat reducing PPE, such as cool vests, head bands, wrist bands, etc.
- Modify work schedule to take advantage of the cooler parts of the day.
- Establish work/rest regimens to reduce exposure times, when physiological monitoring indicates heat strain conditions.

3.3 Heat Stress and Heat Strain Monitoring

Heat stress and heat strain monitoring shall begin when ambient conditions exceed 85°F when working in Level D and 70°F when working in Modified Level C and above. For clear weather conditions (i.e., 100 percent [%] sunshine) ambient temperatures shall be decreased by 5°F (i.e., 65°F and 80°F, respectively) to determine when to begin monitoring. Ambient conditions shall be determined by maintaining a properly calibrated outdoor thermometer in the shade at each workstation, or by monitoring local weather reports throughout each work shift.

3.3.1 Environmental Monitoring

Use a Wet Bulb – Globe Temperature (WBGT) monitor to perform heat stress screening in accordance with the **Tables A4A-1** (Acclimatized Workers) and **Table A4A2-2** (Unacclimatized Workers) below. Clothing adjustment factors are included in **Table A4A-3**.

If the WBGT levels (corrected for clothing ensemble) for the particular workload and work/rest cycle are exceeded, then implement the General Controls and either perform physiological monitoring as described below or implement Job Specific Controls such as those listed in **Section 3.2**.

Table A4A-1 - WBGT Screening Criteria for Acclimatized Workers

Allocation of Work in a Cycle of Work and Recovery	Light	Moderate	Heavy	Very Heavy
75% - 100%	88°F 31°C	82.5°F 28°C	-	-
50% - 75%	88°F 31°C	84°F 29°C	81.5°F 27.5°C	-
25% - 50%	89.5°F 32°C	86°F 30°C	84°F 29°C	82.5°F 28°C
0%-25%	90.5°F 32.5°C	88.5°F 31.5°C	87°F 30.5°C	86°F 30°C

From ACGIH Threshold Limit Values (TLVs)® and BEIs® 2014.
Note: Light moderate work includes operating heavy equipment. Heavy work includes hand shoveling or other manual labor activities.
°C – degrees Celsius °F – degrees Fahrenheit

Table A4A-2 - WBGT Screening Criteria for Unacclimatized Workers

Allocation of Work in a Cycle of Work and Recovery	Light	Moderate	Heavy	Very Heavy
75% - 100%	86°F 28°C	77°F 25°C	-	-
50% - 75%	83.5°F 28.5°C	79°F 26°C	75°F 24°C	-
25% - 50%	85°F 29.5°C	80.5°F 27°C	78°F 25.5°C	76.1°F 24.5°C
0%-25%	86°F 30°C	84°F 29°C	82°F 28°C	80.5°F 27°C

From ACGIH TLVs® and BEIs® 2015.
°C – degrees Celsius °F – degrees Fahrenheit

Table A4A-3 – Clothing-Adjustment Factors for Some Clothing Ensembles*

Clothing Type	Addition to WBGT (°C)
Work clothes (long sleeve shirt and pants)	0
Cloth (woven material) coveralls	0
Double-layer woven clothing	3
SMS polypropylene coveralls	0.5
Polyolefin coveralls	1
Limited-use vapor barrier coveralls	11

*These values must not be used for completely encapsulating suits, often called Level A. Clothing Adjustment Factors cannot be added for multiple layers. The coveralls assume that only modesty clothing is worn underneath, not a second layer of clothing.
From ACGIH TLVs® and BEIs® 2014.
°C – degrees Celsius

3.3.2 Alternate Environmental Monitoring Procedures

Where permitted by the client, ECC may use the Occupational Safety and Health Administration (OSHA) Heat Tool mobile app for monitoring environmental conditions based on the HEAT INDEX. Precautions recommended for the different Heat Index levels should be followed and are consistent with the General Controls and Job Specific Controls listed above. Where the HEAT INDEX level falls in the High or Very High to Extreme categories, implement physiological monitoring in addition to Job Specific Controls. The Heat Tool app can be accessed in OSHA's Heat Stress prevention topic section at https://www.osha.gov/SLTC/heatillness/heat_index/heat_app.html

3.3.3 Physiological Monitoring

For site personnel wearing vapor barrier clothing and for site personnel where Job-Specific Controls may not be sufficient to control heat strain, physiological monitoring will be performed. Physiological monitoring will also be performed when workers report signs and symptoms of heat strain.

Select workers whose exposure is most extreme or who are probably the least heat tolerant. Heat tolerance may be affected by acclimatization, body size, general health and physical fitness, medications, and age.

Heat strain should be evaluated by monitoring the heart rate and temperature.

Where an individual's pulse rate or temperature exceeds the criteria below, action should be taken to limit the individual's heat exposure. However, where a pattern develops among workers of exceeding the criteria, then additional Job-Specific Controls shall be implemented for the work group.

Pulse Rate

The radial pulse should be taken for 30 seconds one minute after beginning to rest (i.e., at the beginning of a rest break). This rate is multiplied by two to determine the heart rate at initial rest. This rest should not exceed 110 beats per minute (bpm). If the resting heart rate exceeds 110 bpm, then modify the work rest schedule for the individual by decreasing the work period and increasing the rest period.

Heart rate monitoring should be recorded on an Exposure Monitoring Log. Monitoring should begin at the first break. The first rest break should be taken within the first hour of work when ambient conditions exceed the screening criteria of **Table A4A-1**if working in Level D, and within the first 30 minutes if ambient conditions exceed 70°F if working in Modified Level C.

Oral Temperature

Use a digital oral thermometer with disposal plastic sleeves or similar device (e.g. aural thermometer) to measure the oral temperature at the end of the work period (before drinking).

If an individual's temperature exceeds 99.6°F (or 37.6 degrees Celsius [°C]), adjust the work rest cycle.

Do not permit a worker to wear semipermeable or impermeable clothing when his/her oral temperature exceeds 100.6 °F (or 38.1 °C).

- Never ignore signs and symptoms of heat-related disorders -

4.0 TRAINING

Workers on project sites will be trained by the SSHO at site orientation, or during special tailgate meetings. The training will include the elements of this program, and in particular:

- Heat related disorders and First Aid measures
- Environmental factors and workload impacts on heat strain
- Personal factors impacting heat strain including health status, caffeine, alcohol and drugs
- Reporting Signs and Symptoms of exposure
- Monitoring measures to be employed on the project
- General and Job-Specific Controls to reduce exposure
- Emergency Response

5.0 DOCUMENTATION

The SSHO will record periodic environmental monitoring results in the Logbook, if needed. Physiological monitoring will be recorded on the Physiological Monitoring Form, if needed. Records will be maintained on the job site and will be archived with the project files at the end of the job.

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ATTACHMENT 4B
COLD STRESS MONITORING PLAN

1.0 PROJECT

Contract Number:	W9124J-18-D-0004
Delivery Order	W9124J-22-F-045
Project Name:	Environmental Remediation Services
Location:	Redstone Arsenal (RSA), Alabama

2.0 COLD STRESS

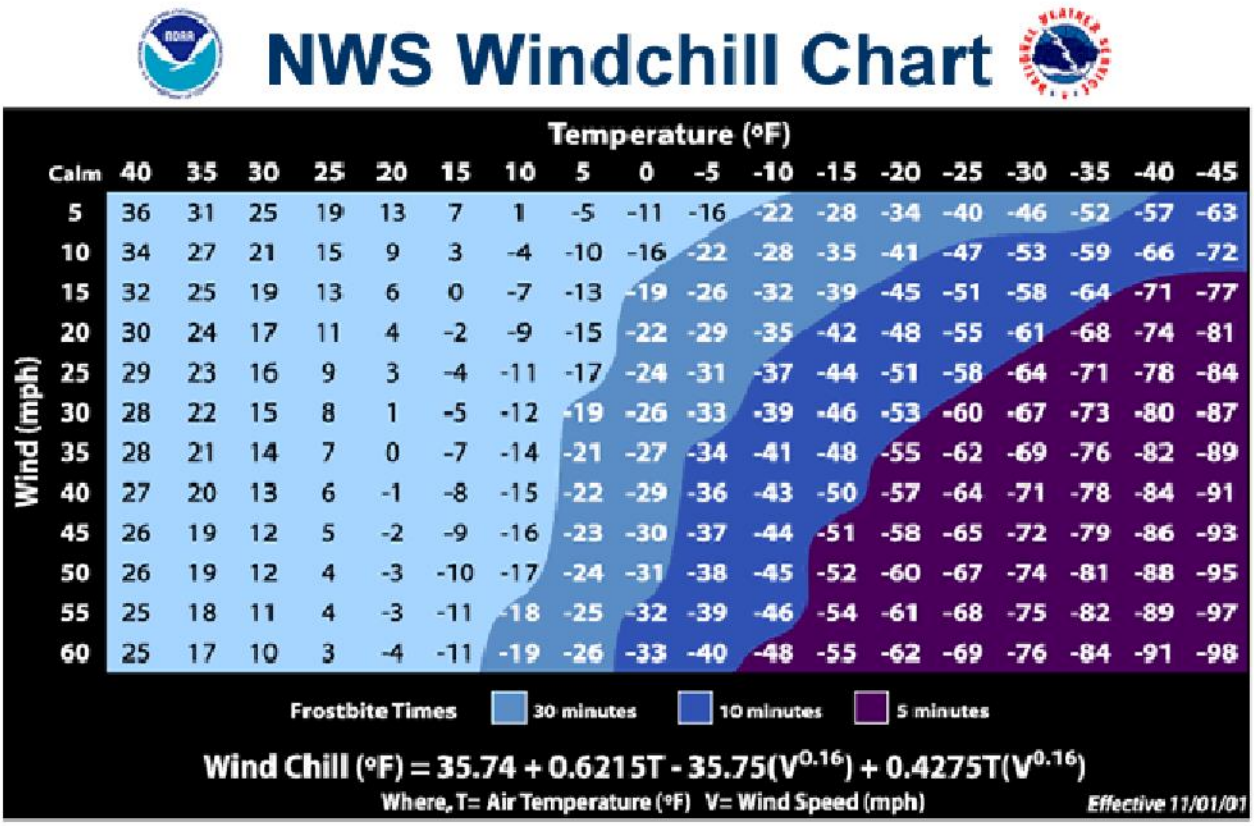
Cold stress hazards are most likely to occur at low temperatures or low wind chill factors, with wet, windy conditions contributing to risk. Where cold stress is a potential hazard (temperatures less than 40 degrees Fahrenheit [ºF]) workers will be trained on the information in the attached Cold Weather Fact Sheet.

As a precautionary measure, employees will wear layers of loose-fitting clothing including insulated coveralls, head cover (perhaps a liner beneath a hard hat), and boots when temperatures fall below 40°F, including wind chill. Protection of the hands, feet, and head is particularly important because these are likely to be injured first by cold. However, actual injury to hands, feet, and head is not likely to occur without prior development of early signs of hypothermia, such as numbing and shivering. Bare skin contact with cold surfaces (below 32°F) will be avoided.

The wind chill factor is the cooling effect of any combination of temperature and wind velocity or air movement. An anemometer can be used to measure wind velocity. The wind chill index (below) should be consulted when planning for exposure to low temperatures and wind. The Site Safety and Health Officer (SSHO) will monitor weather forecasts and determine wind chills at least every four hours when the temperature drops below 20ºF. The wind chill index does not take into account the specific part of the body exposed to cold, the level of activity that affects body heat production, or the amount of clothing being worn.

Like with heat strain, employees are permitted and encouraged to self-limit outdoor work activities when symptoms of cold stress are experienced. The buddy system is also encouraged to ensure that employees frequently check on co-workers in temperature extremes. A temperature-dependent work regimen limiting lengthy periods of outdoor activity may be necessary. If required, this will be developed by the SSHO in coordination with the Project Safety and Health Manager (SHM).

Wind Chill Index



NWS Windchill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes | 10 minutes | 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph) *Effective 11/01/01*

3.0 REFERENCES

National Weather Service http://www.nws.noaa.gov/om/winter/windchill.shtml

OSHA's Campaign to Prevent Heat Illness in Outdoor Workers.
https://www.osha.gov/SLTC/heatillness/index.html

USAPHC

Injury Prevention: Fact vs Fiction

Cold Weather Injuries

FACT SHEET 12-004-0415

What causes Cold Weather Injuries?

Cold weather injuries (CWIs) can occur due to an imbalance of body temperature regulation, where heat loss is greater in an area of the body (or the body core) than heat production. There are 4 primary types of cold injuries: hypothermia, frostbite, non-freezing cold injuries, and injuries related to cold exposure. **Tables 1-4** provide details on these injuries.[1]

Why are CWIs a concern to the Army?



CWIs are preventable, yet if early signs and symptoms go unrecognized or preventive measures are not taken, these injuries may result in permanent injury and even death. A typical CWI casualty is a 20 year-old male at the rank of E-4 and below and often from a warm climate. However, anyone can become a CWI casualty.[2]

How can Soldiers protect themselves from a CWI?

Soldiers should be aware of risk factors and increase resilience by consuming a healthy diet with plenty of fluids, maintaining fitness levels according to Army standards, and getting quality sleep each night. Dressing properly for the weather conditions in a way to easily adjust (layers), and balancing the time and amount of activity spent in cold weather conditions will reduce risks.[1,3,4,5]

Prevention of Cold Weather Injuries

Clothing
- ❖ Wear uniform properly (layers worn loosely).
- ❖ Keep socks & clothes dry (use sock liners and foot powder).
- ❖ Remember the acronym C-O-L-D
  - Keep it CLEAN
  - Avoid OVERHEATING
  - Wear clothing LOOSE and in LAYERS
  - Keep clothing DRY

Eyes
- ❖ Wear dark UV protective glasses
- ❖ If no sun glasses – improvise with cut slits in cardboard/cloth; or use tape over regular eyeglasses

Skin
- ❖ Keep your skin clean, covered, & dry
- ❖ Use sunscreen and lip balm
- ❖ Use gloves to handle all equipment and fuel products

Hydration
- ❖ Drink warm liquids
- ❖ Monitor urine color for dehydration

Environment
- ❖ Use warming tents when needed
- ❖ Monitor conditions, especially the wind chill index
- ❖ Use anti-slip shoe gear if outside extensively

Other
- Conduct NCO checks and look after your battle buddy

What factors increase the risk of having a CWI?

All Soldiers regardless of rank are susceptible to a CWI in the right conditions. However, surveillance data from the Army and other Services indicate that rates of cold injuries appear higher among African Americans, women, Service members under 20 years old, and enlisted personnel.[2] Additional risk factors are discussed below[1-7]:

✚ *Prior cold injury or medical conditions*

Soldiers who have had a cold injury in the past are much more likely to develop a new cold injury sooner or one of more severe nature in the future. Existing medical conditions may predispose an individual to a CWI. For example, Raynaud's Disease is a disorder that causes blood vessel constriction in cold temperatures or during emotional distress, resulting in reduced blood flow to the extremities (e.g., fingers & toes).[6] Other conditions, such as anemia, diabetes, sickle cell disease, hypotension, and atherosclerosis, may also increase susceptibility to frostbite and injuries related to cold exposure.[1]

✚ *Dehydration*

Inadequate fluid intake affects the body's ability to sustain physical activity, which in turn affects thermoregulation (i.e., the balance between heat production and loss). In cold environments sensitivity to thirst declines, which can increase the risk of dehydration during strenuous activity, where fluid loss often exceeds intake.[1, 4, 5]

✚ *Over- and Under- Activity*

Vigorous exercise/activity induces sweating, which leads to wet clothing and subsequent increased heat loss. Conversely, under-activity results in low heat production, which may lower the body's core temperature.[1, 4, 5]

✚ *Tight clothing*

Close-fitting clothing reduces insulation and may restrict movement, resulting in heat loss. Clothing should be worn loosely and layered to allow adjustments as physical activity levels and environmental conditions change.[1, 4, 5]

✚ *Inadequate nutrition*

Underfeeding can cause low blood sugar (hypoglycemia) which impairs shivering, thereby making it difficult to generate body heat. Low carbohydrates stores also limit the ability to maintain physical activity.

✚ *Alcohol & nicotine*

Alcohol imparts a sense of warmth and causes dilation of skin blood vessels which increases heat loss to the environment. It may also impair the senses and judgment, making it difficult for a Soldier to detect signs and symptoms of a CWI. Tobacco use (smoking or chewing) causes increased constriction of skin blood vessels, which increases the risk for frostbite.[1, 4, 5]

✚ *Medications*

Some medications may affect thermoregulation by impairing vasoconstriction. These include benzodiazepines, tricyclic antidepressants, barbiturates, and general anesthetics.[1, 4, 5]

U.S. Army Public Health Command - Injury Prevention Program
usarmy.apg.medcom-phc.mbx.injuryprevention@mail.mil ***410-436-4655/DSN 584-4655***
5158 Blackhawk Road, APG, MD 21010-5403
Approved for Public Release, Distribution Unlimited

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ATTACHMENT 5

EXCAVATION AND TRENCHING PLAN

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1.0 PROJECT/ TASK ORDER DESCRIPTION

Contract Number:	W9124J-18-D-0004
Delivery Order	W9124J21F0020
Project Name:	Environmental Remediation Services
Location:	Redstone Arsenal (RSA), Alabama

2.0 SCOPE AND APPLICATION

The Activity Hazard Analysis (AHA) for excavation related activities is included in Appendix A of the Accident Prevention Plan (APP).

(a) Excavations that may exceed 4 feet in depth, and therefore, Environmental Chemical Corporation (ECC) and sub-contractor personnel will adhere to the requirements of EM 385 1-1 and 29 Code of Federal Regulations (CFR) 1926. Additionally, prior to conducting any excavation activities, utility locates must be conducted.

(b) Ramps or ladders will be placed to allow access/egress of employees if working in excavations is necessary. Egress points must be within 25 feet of personnel, so at least every 50 feet. Ladders must extend from bottom of excavation to three feet above surface. Ramps for personnel access must be a minimum of four feet wide and have standard guardrails – see Section 21.F.01 of EM 385-1-1. Ramps for equipment must be at least 12 feet wide and curbs of not less than eight by eight-inch timbers. Equipment ramps must be designed and constructed in accordance with accepted engineering practice. In addition to the access/egress the AHA must provide the proper Perimeter Protection Class per definitions in Appendix Q of EM 385-1-1 and provide the acceptable controls according to Section 25.B of EM 385-1-1]

(c) Competent Person (CP) must be able to demonstrate:
  (1) Training, experience, and knowledge of soil analysis, use of protective systems, and requirements of this Section and 29 CFR 1926 Subpart P;
  (2) Ability to detect conditions that could result in cave-ins, failures in protective systems, hazardous atmospheres, and other hazards including those associated with confined spaces; and
  (3) The authority to take prompt corrective measures to eliminate existing and predictable hazards and stop work when required.

(d) The CP will conduct inspections daily, and as conditions change, and provide documentation that examination of the ground by the CP provides no indication of a potential cave-in. Daily inspections by CP will be recorded on ECC Form Environment, Safety and Quality (ESQ)-7.7.01.

3.0 RESCUE PLAN

A rescue plan will be provided, as applicable, for each separate location.

3.1 Diagram of Excavation Area

As applicable diagrams will be provided (at later date or in an applicable work plan), for each location, and will provide the following:

- Location and extent of excavation
- Structures or trees within excavation to be removed
- Structures, trees or other features adjacent to excavation to be protected and preserved
- Expected Underground utility locations and locations of shut offs
- Nearby Overhead power lines

- Access to excavation area, and protective systems around perimeter of excavation
- Access/egress points to excavation
- Expected depths of excavation

3.2 Projected Maximum Depth(s)

If depths exceed that 4 feet, additional measures will be implemented in accordance with EM 385 1-1.

4.0 PROJECTED SOIL TYPE AND METHOD OF TESTING TO DETERMINE SOIL TYPE

Soil shall be evaluated and classified by the CP. The classifications will in accordance with Occupational Safety and Health Administration (OSHA) 1926 Subpart P, App. A as stable rock, type A, B, or C soil. Classifications shall be made using at least one visual and one manual analysis identified in 1926 Subpart P, App. A.

It is anticipated all soil will be classified as Type C.

In layered soil systems, the system shall be classified according to its weakest layer. However, each layer may be classified individually where a more stable layer exists under a weaker layer.

In the event the properties, factors, or conditions affecting classification change, the system shall be reevaluated by the CP. Reclassify as necessary to reflect the changed circumstances.

Soil Classification will be documented using the Soil Classification Form.

5.0 PROTECTIVE SYSTEMS

It is anticipated excavations will be sloped. In the event sloping is not possible, alternate methods including shoring or trench boxes, will be utilized.

6.0 PLANNED METHOD FOR CONFINED SPACE ENTRY, TRENCH ACCESS AND EGRESS AND ATMOSPHERIC MONITORING PROCESSES

6.1 Entry into Excavations

Each excavation will be evaluated by the Safety and Health Manager (SHM) to determine the anticipated potential hazards and if confined space regulations apply. In the event it is necessary to treat an excavation as a confined space, this plan will be updated accordingly.

6.2 Trench Access and Egress

Trenches in excess of four feet deep require a minimum of two means of egress. The AHA and drawing for each location, where applicable, will address locations.

6.3 Atmospheric Monitoring

In the event there is potential for sources of toxic gases, such as exhaust from nearby combustion engines, to the enter the excavation, monitoring will be conducted. Monitoring in general would consist of a multi-gas detector, to check for oxygen, Carbon monoxide (CO), and explosive gases. Action levels are as follows:

- Oxygen: less than (<) 20.8 or greater than (>) 21.0 percent (%) = stop work, contact SHM for evaluation
- Lower explosive limit (LEL): > 10% = stop work, ventilate, and contact SHM

- CO: > 25 ppm, stop work, ventilate, and contact SHM

7.0 LOCATION OF UTILITY SHUT OFFS

Utilities connected to drainage lines will be blocked and locked out. Other utilities that may affect work will be evaluated at each location and measures will be taken to control associated hazardous energy.

8.0 DAMAGE PREVENTION

For all adjacent structures that pose a hazard to workers or potential damage incidents, precautions shall be established per OSHA 29 CFR 1926.651(i). Sidewalks, pavements and appurtenant structure shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

9.0 MANAGEMENT OF EXCAVATED SOIL

Excavated materials will be kept a minimum of two feet from the edge of all excavations to avoid falling into excavation or creating a hazardous surcharge on excavation faces.

10.0 TRAFFIC CONTROL PLAN

In areas where activities are adjacent to roadways, traffic controls will be implemented accordingly, based on the requirements of EM 385 1-1. Additionally, traffic control is addressed in the work plan.

11.0 DIGGING PERMITS

Prior to excavation work being performed, utilities must be located in accordance with Standard Operating Procedure ESQ-7.6 – Underground Utilities. All utility locates shall be performed a minimum of two days in advance of any excavation work being performed. Private locating services will be utilized as well.

A "Digging Permit" processed through the Contracting Officer's Representative must be obtained from the base authority having jurisdiction.

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ATTACHMENT 6

RESUMES

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Kym Edelman, CIH, CSP *757-435-5384*
EHS Manager

Experience Summary

Highly accomplished Certified Industrial Hygienist and Certified Safety Professional with over 27 years of on-site and project management expertise to provide oversight, review, reporting, training, and control of employee H&S processes on multiple construction/environmental sites.
Comprehensive knowledge of regulatory compliance requirements under OSHA, DOE, CERCLA, RCRA, USACE, EPA, and other federal/state regulatory programs.
Hands-on experience in compliance monitoring, development and implementation of policies and procedures, accident investigation, and worker's compensation issues.
Proven record of retaining minute detail with excellent recall regarding safety regulations and contractual language to make on-the-spot independent decisions.
Well respected with reputation for using excellent interpersonal communication skills to collaborate with staff, all levels of management, and clients.
Consistently commended for outstanding leadership skills, producing quality work product, developing proactive initiatives, and commitment to achieving optimum project safety expectations to ensure client satisfaction while adhering to corporate policy and procedures.

Education

BS (Bachelor of Science), Environmental Health, Industrial Hygiene Concentration, Old Dominion University, Norfolk, VA

Registrations/Certifications

Certified Industrial Hygienist
Certified Safety Professional

Training

40-Hour OSHA Hazardous Waste Health and Safety Training – 1989
40-Hour EM 385 1-1 Awareness Course- 2018
30-Hour OSHA Construction Safety Course- 2004
Shipyard Competent Person- 2019

Experience

Program Health and Safety Manager, April 2020-Present
ECC, Jacksonville, NC

Responsible for assisting in overall management of the safety programs for ECC.

- Monitor overall safety compliance, assistance, and oversight of multiple task orders for Federal as well as commercial client project sites:
- Assist in preparation and review of project work plans in relation to site specific safety program documents.
- Assist in implementation of safety processes on active project sites.
- Provided technical guidance to project and program employees as well as clients.
- Revise and develop programs and procedures

EHS Manager, September 2018-April 2020
APTIM, Norfolk, VA
Responsible for assisting the EHS Lead in overall management of safety programs for APTIM's Government operations.

- Monitor overall safety compliance, assistance, and oversight of multiple task orders for Federal as well as commercial client project sites:
- Assist in preparation and review of project work plans in relation to site specific safety program documents.
- Assist in implementation of safety processes and manage safety staffing on active project sites.
- Provided technical guidance to project and program employees as well as clients.
- Manage injuries and illnesses, and related worker's compensation claims.
- Assist in safety council, award programs, and employee involvement initiatives.
- Conduct periodic reviews and audits of project sites to determine compliance with applicable regulations, standards, and internal procedures.

Director, EHS June 2018-September 2018
Tetra Tech EC, Inc., Virginia Beach, VA
Responsible for overall management of environmental health and safety programs and employees for Tt EC operations.

- Serves as program Certified Industrial Hygienist for the Atlantic Division Remedial Activities Contract, Naval Facilities Engineering Command.
- Provides technical support for programs and projects, including proposal review and support.
- Manages site safety and health professionals on projects and ensures safety staff assignments to meet project and client needs.
- Injury case management and worker's compensation claim management.
- Writes or reviews and approves site-specific health and safety plans.
- Conduct program reviews and audits for compliance and continual improvement.

EHS Manager of Eastern Operations, September 2015-June 2018
Tetra Tech EC, Inc., Virginia Beach, Virginia
Responsible for assisting the Tetra Tech EC Director in overall management of safety programs for Tt EC's operations.

- Monitor overall safety compliance, assistance, and oversight of multiple task orders for Federal as well as commercial client project sites:
- Assist in preparation and review of project work plans in relation to site specific safety program documents.
- Assist in implementation of safety processes and manage safety staffing on active project sites.
- Provided technical guidance to project and program employees as well as clients.
- Manage injuries and illnesses, and related worker's compensation claims.
- Facilitated implementation of LANT RAC program safety council, award programs, and employee involvement initiatives.
- Conduct periodic reviews and audits of project sites to determine compliance with applicable regulations, standards, and internal procedures.

- Program CIH for LANT RAC VI Navy contract.

ES&H Manager, August 2012 – September 2015
CB&I AREVA MOX Project, DOE, CB&I (formerly Shaw) Project Services Group, Aiken, SC
Manage all safety aspects of the project, including sub-contractors. The project has exceeded 21 million man-hours without a lost work day case.
Responsible for management of the on-site medical clinic, fitness center, production facility safety staff, and all field safety engineers.
Interface between high level construction management, client, and filed construction employees, to ensure clear communication of expectations to continue to promote a positive safety environment that has yielded exemplary employee safety performance.
Technical resource for all project staff, as well as client.

August 2002 – August 2012, SHAW E&I, Norfolk, VA
Ten years of progressive experience and achievement as safety project management/site safety coordinator

Program Safety Manger, May 2008 – August 2011
IHNC, USACE, New Orleans,
Accountable for establishment and initial/continued implementation of project safety programs for this high profile $1.1B project involving design and construction of the New Orleans Hurricane and Storm Damage Risk Reduction System.
Successfully managed the safety program for the largest civil works design-build project ever undertaken by the USACE. The project, during this timeframe, concluded with "no lost work days" for Shaw.
Staffed project, developed project safety initiatives, organized the Accident Prevention and Hurricane Preparedness Plans, coordinated training, conducted subcontractor reviews, and acted as overall technical consultant regarding project safety issues, and compliance monitoring of the safety process.

Program Safety Manager, November 2007 – August 2012
Global Contingency and Construction Contract (GCCC), NAVFAC (Naval Facilities) Worldwide
Serves as Health and Safety Manager for this $335M US Navy contract. Directed safety programs for all construction projects under the GCCC contract. Implemented safety processes, managed staffing, developed H&S and Accident Prevention Plans, managed worker's compensation claims, and provided technical oversight to staff and management on all projects.Developed documents and programs to ensure training, programs, and procedures were translated into local languages and worked with third country nationals to establish safety cultures where previously non-existent.Monitored and ensured the implementation of corporate policies and procedures, conducted incident investigations, and maintained proactive safety programs.Ensured compliance with applicable laws/regulations, and provided safety support/consultation to Shaw management, as well as client companies and governmental entities.

Program Safety Manager, May 2008 – 2012
LANTDIV RAC V Program, NAVFAC Atlantic Division, Norfolk, VA
Directed overall program safety on this $150M Navy contract, including safety program implementation and oversight of multiple task orders under the contract.

- Instrumental in team accomplishing 4,000 days with a record of "no lost work days."
- Implemented safety processes, managed staffing, developed health and safety, and accident prevention plans.
- Provided technical guidance to project and program employees as well as clients.
- Managed injuries and illnesses, and related worker's compensation claims.
- Facilitated program safety council, award programs, and employee involvement initiatives.

Program Safety Manager, December 2002 – August 2012
Served as Program Safety Manager leading a staff of field safety professionals in the development and implementation of safe work practices on multiple individual task orders. Also, functioned as Site Safety Coordinator for several individual projects at multiple locations conducted under the LANTDIV RAC IV program.

These projects included UXO demilling activities, active range clearance activities, "Clean" site closures, installation of treatment systems, storage tank removals, bio-remediation, landfill excavation/repairs/capping, soils excavation and removal of hazardous materials.

- 2000 Day President's Award for no lost work days on one project.
- Target Zero achieved for 2 Project Sites.
- RAC Program achieved Zero Lost Work Days, Recordable Incidents or Chargeable Vehicle Incidents within Fiscal Year 2008.
- Successfully adapted to EHS organizational changes, and positioned to advance within group.

Environmental Health and Safety Manager, October 2000 – April 2002
Flextronics Enclosures, Kingston, PA
Responsible for the development, implementation, and monitoring of Flextronics Enclosures, Inc. Environmental Health and Safety program.

- Conducted initial audits, assessments, and industrial hygiene sampling, to determine environmental, safety, and industrial hygiene compliance issues.
- Developed plans and procedures necessary to attain compliance with water permitting, waste disposal, safety and industrial hygiene issues.
- Developed programs to decrease employee injuries as well as reduce incident rates and worker's compensation costs.
- Worked with local occupational health clinic to better manage accidents and injuries, to keep employees at work, and ensure best care possible.
- Responsible for maintaining OSHA 200 logs.
- Conducted and facilitated training sessions for managers and technicians to ensure understand and compliance with new company safety programs.
- Monitored effectiveness of new EHS Program and continually improved upon programs implemented.
- Developed and implemented an Environmental Management System to be compliant with ISO-14001.

Environmental Scientist, January 1996 – April 1997
Maxim Technologies (formerly Huntingdon Chen-Northern), Denver, CO
Assigned to USEPA Superfund Technical Assistance and Response Team, sub-contracted to the primary USEPA contractor.

- Conducted hazardous waste and emergency response operations, including delineation of contamination, site control, and contamination monitoring and reporting.
- Provided on-site technical support to EPA and oversight of contractors for EPA.
- Provided assistance to EPA regarding sampling, management, and disposal of hazardous and mixed wastes.
- Conducted preliminary site investigations to determine presence and extent of contamination on sites.

- Assisted in development of work plans and provided assistance to EPA for subsequent remediation of contaminated sites and abandoned industrial facilities.
- Conducted hazardous materials training as required by OSHA for hazardous waste site work and emergency response, as well as the hazard communication standard.
- Assisted EPA in conducting public information meetings pertaining to remedial sites.

Health and Safety Manager, August 1994 – January 1996
Maxim Technologies (formerly Huntingdon Chen-Northern), Denver, CO
Responsible for the overall management of Maxim's regional health and safety program.

- Developed and implemented corporate health and safety procedures throughout the Northwest Region.
- Managed accidents and injuries as well as required documentation on OSHA 200 logs.
- Responsible for compliance, documentation, and disposal of hazardous materials generated by the regional offices.
- Assisted environmental groups in conducting Phase I site assessments.
- Conducted training for Hazardous Waste Site Work, Hazard Communication, Asbestos Awareness, Instrumentation, and Air Monitoring.
- Conducted accident investigations and management of workers' compensation claims.
- Developed site specific health and safety plans for hazardous waste site work.
- Provided technical support in the areas of industrial hygiene and health and safety.

Site Safety Supervisor, October 1992 – June 1994
OHM Corporation, Findlay, OH
Responsible for the implementation, and management of site specific environmental, industrial hygiene, health, and safety programs, in accordance with site specific health and safety plans.

- Conducted initial site hazard assessments.
- Assisted in completing and maintaining documentation related to hazardous waste storage and disposal.
- Monitored compliance of site operations with respect to OSHA, EPA, and state regulations, such as, RCRA, TSCA, AHERA, HAZWOPER, and HAZCOM.
- Implemented appropriate means to control hazardous materials exposure.
- Monitored the effectiveness of on-site industrial hygiene and safety programs.
- Initiated safety awareness programs.
- Conducted training as required by 29 CFR 1910.120 and the Hazard Communication Standard.
- Liaison between client representatives and OHM in regard to environmental, industrial hygiene, and health and safety issues.

Division Safety Coordinator, October 1989 – October 1992
MAECORP Inc., Columbus, OH
Responsible for the implementation and compliance monitoring of company safety policies in addition to Federal and State OSHA and EPA regulations, on hazardous waste project sites in USEPA Region V.

- Conducted site safety audits and prepared appropriate reports.
- Conducted air monitoring for personal exposures in addition to environmental air sampling.
- Conducted annual refresher training for hazardous waste site operation.
- Developed site specific health and safety plans in accordance with the requirements 29 CFR 1910.120.

- Conducted building inspections for asbestos.
- Maintained appropriate documentation in regard to medical monitoring requirements, training certificates, and hazard communication.
- Conducted accident investigations.
- Managed work related injuries.

References available upon request



HST

CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Kym Mohrman

has successfully completed 40 hours of instruction in

WASTE SITE WORKER PROTECTION

Prepared and conducted by
Hygiene, Safety and Training Inc.
to comply with OSHA 1910.120(e)(2)

Jack M. Peterson
Jack M. Peterson
CSP, CIH

November 10, 1989
Date of Completion

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OSHA 000266501

U.S. Department of Labor
Occupational Safety and Health Administration

Kym Edelman

has successfully completed a 10-hour Occupational Safety and Health Training Course in

Construction Safety & Health

John H. DeFrees 11/30/04
(Trainer) (Date)

OSHA 600047764

U.S. Department of Labor
Occupational Safety and Health Administration

Kym Edelman

has successfully completed a 30-hour Occupational Safety and Health Training Course in

Construction Safety & Health

John H. DeFrees 11/15/04
(Trainer) (Date)

OSHA Occupational Safety and Health Administration WK 0007986

This acknowledges that

KYM EDELMAN

has successfully completed

Course # 7600 - Disaster Site Worker (16- Hour)

This course emphasizes awareness of the safety and health hazards that may be encountered at natural or man-made disaster sites, as well as the importance of personal protective equipment, decontamination, and incident command organization.

Dimitri R. Crisp June 29, 2006
Trainer Completion Date



BOARD OF CERTIFIED SAFETY PROFESSIONALS

affirms that

Kym Y Edelman

Has applied for, met qualifications, and passed required examination(s) and is hereby authorized to use the designation

Certified Safety Professional®

in Comprehensive Practice

So long as this certificate is not suspended or revoked and the certificant renews this authorization annually and meets Continuance of Certification requirements.

Board of Examiners in witness whereof we have here unto set our hands and affixed the Seal of the Board this 21st Day of December, 2006

Larry W. Jones — President

Glenn D. Ward — Secretary

19423 — CSP No.

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November 02, 2016

Kym Y. Edelman, CIH
4900 Fennell Lane
Suffolk VA 23435

Dear Ms. Edelman,

It is my pleasure to congratulate you. With the combination of education, experience and your performance on the CIH® examination, the American Board of Industrial Hygiene® finds you qualified for professional certification in the Comprehensive Practice of Industrial Hygiene. You may now use the designation "Certified Industrial Hygienist®" and the corresponding "CIH®".

This is a significant career milestone. Many industrial hygienists strive for the CIH® certification but it's attained by only a few. Your certification says a lot about you as a professional. It is a mark of distinction that indicates not only your knowledge and skills but also your personal motivation to successfully undertake the challenge. This is recognized by peers, employers and clients.

We will be publishing your name on the ABIH® website so that everyone may see this great accomplishment.

Now that you've attained the CIH®, you'll want to make every effort to retain it. The best place to start is with the CM Primer which is available in the Documents Library section of the ABIH website. It provides an easy-to-read summary of the basic program along with some useful tips. As you review the CM Primer, note that you are on a 60 month CM Cycle that runs from January 1, 2017 to December 31, 2021.

Please use the ID Number listed below to access the My Account section of the ABIH website where you can update your contact information, pay fees and locate other CIHs in the private roster.

ID Number: **11689**

On behalf of ABIH®, I personally congratulate you on your achievement. Welcome to an elite group of professionals!

Ron Drafta

Ron Drafta, CIH
Certification Program Manager, ABIH
rdrafta@abih.org

Enclosure

Certificate Of Completion

American Safety Council

KYM EDELMAN

Has diligently and with merit completed the

40-Hour EM 385-1-1 on 7/6/2018

Director: **Jeff Pairan**

ABIH®

american board of industrial hygiene®

organized to improve the practice of industrial hygiene
proclaims that

Kym Y. Edelman

having met all requirements of
education, experience and examination,
is hereby certified in the

COMPREHENSIVE PRACTICE
of
INDUSTRIAL HYGIENE

and has the right to use the designations

CERTIFIED INDUSTRIAL HYGIENIST

CIH

Certificate Number	**11090 CP**
Awarded:	**October 26, 2016**
Expiration Date:	**June 1, 2022**



Chair, ABIH

Chief Executive Officer, ABIH

The Compliance Edge Online Institute

Certificate of Completion

Kym Edelman

has met the online course completion requirements for

HAZWOPER 8-Hour Refresher

in accordance with 29 CFR 1910.120 and 1926.65

Certificate ID 1724619-328
Continuing Education Units 0.8
AdvanceOnline Solutions, Inc. offers 0.8 CEUs for this program.

AdvanceOnline, Inc. is authorized to issue the ICSR CEU.

ICSR CEU

Date 7/28/2020 8:09:00 AM
Time Online 08:38:52
AdvanceOnline Solutions, Inc.
1811 Bering Drive, Suite 430
Houston, Texas 77057
www.advanceonline.com
(713) 621-1100

AdvanceOnline SOLUTIONS

BRIAN KATELEY

Years' Experience: 17

With Current Firm: 9.5

Current Professional Registration:

Security Clearance:

Aberdeen Proving Ground

Education:

- BS, Environmental Science & Policy Program, University of Maryland, 2003
- Environmental Technology Certificate, Harford Community College, 1999

Other Professional Qualifications/Training:

- OSHA 40-hour HAZWOPER, 1999 and 2006; 8-hr HAZWOPER Refresher, 2021
- OSHA 8-hour Excavation Safety; 2006
- OSHA 8-hr Supervisor, 2008
- OSHA 30-hour Construction Safety and Health, 2011 – renewal in progress
- First Aid/CPR/AED/BBP, 2017 – renewal in progress

Summary of Experience:

Mr. Kateley is experienced in environmental characterization techniques such as groundwater sampling, soil sampling, lithologic characterization, surface media sampling, direct-push technology, investigations, and monitoring well installation. He is also skilled in groundwater remediation system implementation and operation and maintenance, including monitored natural attenuation, pump and treat systems, in situ bioremediation, and product recovery systems.

Mr. Kateley has been in a Site Supervisor and SSHO role since March of 2014. His responsibilities have included assisting with managing project safety and health programs. Providing safety consultation to the project management team in the planning and execution of project tasks. Providing site orientation for new employees, subcontractors, vendors, and visitors. Performing multi-media sampling to determine appropriate levels of PPE and assigning PPE to team members. Conducting daily safety and workplan tailgate meetings. Conducting daily, weekly, monthly, and annual site inspections. Ensured all employees, including subcontractors, performed daily activities safely and assured compliance with APP/SSHP, AHAs, and workplans while enforcing all site safety and health procedures.

Roles & Responsibilities: Environmental Scientist, Site Supervisor and SSHO since 03/14.

ECC Project Experience

Project Title and Location: Aberdeen Proving Ground Remedial Action (Optimization), Maryland

Dates on Project Start/End: 11/11 to present

Project Start/End Dates: 06/11 to present

Roles & Responsibilities: Environmental Scientist, Site Supervisor and SSHO

Mr. Kateley currently serves as the Site Supervisor and SSHO for the operations, maintenance, and performance monitoring of enhanced in-situ bioremediation systems for the remediation of chlorinated solvents in groundwater at six sites within the Aberdeen Area of APG, Buildings 3327, 525, M600, 361, 507 and Defense Reutilization and Marketing Office Metal Scrap Yard. Systems include active groundwater recirculation systems for the addition of groundwater amendments and passive biobarriers for the treatment of downgradient areas. He is responsible for operations and technical support, including:

tracking weekly groundwater elevation data to determine the status of hydraulic containment; scheduling and overseeing long-term monitoring (LTM) groundwater sampling on a semi-annual schedule; maintaining the project groundwater analytical database; managing and interpreting all of the groundwater elevation and chemical sampling data; and, preparation of quarterly performance and annual operations and performance monitoring technical reports. Mr. Kateley also assists the Project Manager in the oversight of field lab pack technicians and the inventory, tracking, and disposal of solid and liquids wastes generated from the project activities.

Mr. Kateley also supports operations at the Canal Creek and O-Field Groundwater Treatment Facilities under this project and has held an Operator in Training Industrial Wastewater License with the Maryland Department of the Environment (MDE).

Project Title and Location: Site Delineation and Characterization of Phillips Landfill, Western Boundary OU2, Ecological Soil Removal at Fire Training Area, and Achieve Site Closure at CCAPG04031, Aberdeen Proving Ground, Maryland

Dates on Project Start/End: 09/14 to 09/19

Project Start/End Dates: 09/14 to 09/19

Roles & Responsibilities: Environmental Scientist, Site Supervisor and SSHO

Mr. Kateley directed environmental sampling in support of a data-gap investigation at six landfill areas identified within the Phillips Army Airfield Landfill (PAALF) to evaluate potential Feasibility Study response actions for the areas under CERCLA. Specific tasks included the delineation of the presence/absence and horizontal extent of fill material within each landfill area through the use of 171 test pits; existing soil cover thickness assessments of each area, soil and solid waste sampling to characterization of contaminates and waste streams; groundwater sampling of the entire PAALF monitoring well network. Mr. Kateley assisted the Project Manager in the implementation of a non-time-critical removal action (NTCRA) at the Aberdeen Fire Training Area (AFTA), located in the Western Boundary Study Area (WBSA) of the Aberdeen Area of APG involving shallow soil excavation/removal of polycyclic aromatic hydrocarbons (PAHs) and metals-contaminated soil; achieving negotiated cleanup levels. He also supported the implementation of the Closure Plan for the former Aberdeen Area Building 4031 Underground Storage Tank (UST) Site regulated under the State of Maryland's Oil Control Program. Mr. Kateley was responsible for the oversight of well abandonments, decommissioning of the in-active SVE system, construction and operation of an on-site treatment cell for DRO/GRO contaminated soils, excavation and treatment of DRO/GRO contaminated soil from the footprint of the former 4031 Building, liquid phase hydrocarbons (LPH) recovery and groundwater treatment, confirmation sampling and analysis, excavation backfilling, and site restoration. He also supervised lab pack technicians in the performance of post-closure monthly gauging of water levels and removal of free-product from two wells, as well as quarterly groundwater sampling of the well field at the former Building 4031 UST site. Supported preparation of the site project workplans, health safety plans, and closure documentation and coordinated with the DPW Environmental Division Hazardous Waste Branch to provide all documentation necessary to remove waste and IDW from APG. Responsibilities for all project work included oversight of the field sampling teams; inventory and tracking of chemical data and waste generated from investigation and remediation activities; data reporting; and maintaining strict adherence to the health and safety plans and compliance with associated federal, state, local, and APG regulations and guidance governing all CERCLA and RCRA work at APG.

Project Title and Location: Canal Creek Study Area Sites RI/FS PBA, Aberdeen Proving Ground, Maryland

Dates on Project Start/End: 03/14 to 09/17

Project Start/End Dates: 03/14 to 09/19

Role & Responsibilities: Environmental Scientist, Site Supervisor and SSHO

Mr. Kateley supported the environmental sampling tasks associated with the RI work at the Canal Creek Study Area (CCSA) at APG as part of the Installation Restoration Program under CERCLA. This contract covered the completion of the remedial investigations (RIs) (including risk assessments and final RI Reports) for 10 East and 12 West CCSA sites, plus an investigation of the Buried Legacy Chemical Sewer Lines throughout the CCSA. The remedial investigations include site inspections, test digs, and media sampling (i.e., soil, sediment, sludge, and groundwater). Responsibilities included development and production of RI Work Plans, field activity reports, and final RI Reports, overseeing team subcontractors, field sampling events, evaluation of analytical data, inventory and tracking of waste generated from RI activities, and maintaining strict adherence to the health and safety plans and standard operating procedures (SOPs) governing all CERCLA work at APG.

Project Title and Location: Other Miscellaneous DoD and Former DoD Sites in the United States Mid-Atlantic area.

Dates on Project Start/End: 01/12 to present

Role & Responsibilities: Environmental Scientist, Site Supervisor and SSHO

Mr. Kateley has supported other similar projects in the Mid-Atlantic on shorter terms including:

- Joint Base McGuire-Dix-Lakehurst – Burlington County, NJ
- Atlantic City Air National Guard Site – Atlantic County, NJ
- Fort Meade – Anne Arundel County, MD
- Picatinny Arsenal – Morris County, NJ
- Former Griffiss Air Force Base – Oneida County, NY

Work Prior to ECC

Scientist II, EA Engineering, Science, and Technology, Inc. (01/06-10/11).
Project Manager, Aberdeen Proving Ground Edgewood Area Munitions Response Site Remedial Investigation, Aberdeen Proving Ground; Army Environmental Command (2011). Fixed price remedial investigation assessment for munitions and explosives of concern and munitions constituents for 12 Munitions Response Sites at Aberdeen Proving Ground, which total 3,500 acres. Responsible for Technical Project Planning and Restoration Advisory Board support, munitions constituents assessments, providing Unexploded Ordnance Quality Control Officer and Unexploded Ordnance Safety Officer support, Geographic Information System database management, DGM support to include brush clearing, ERIS uploads, and document support. Project includes the re-acquirement and evaluation of over 20 years of Installation Restoration Program data (including geophysics and Installation Restoration Program chemical sampling) to support the Military Munitions Response Site remedial investigation efforts.

Environmental Scientist, Suburban Propane, Reisterstown, Maryland (2010). Responsible for field activities during DPT chemical-oxidation injections including assurance of proper injection depths, volumes, and geochemical sampling from surrounding monitoring wells.

Environmental Scientist, Department of Public Works Parcel B, C, D Remedial Action Plan, National Aquarium of Baltimore, Baltimore, Maryland (2010). Responsible for construction quality assurance and air monitoring of perimeter and work zone at site utilizing dust and mercury vapor meters. Also responsible for the creation of an environmental monitoring plan for environmental hazards during the voluntary cleanup program remedial action plan implementation.

Environmental Scientist, New O-Field Groundwater Remediation; Aberdeen Proving Ground (2009-2010). Performed field activities required to determine contaminant distribution and hydraulic properties for the remedial system design. Responsible for design, installation, and implementation of a bio-barrier injection and monitoring well network to treat chlorinated solvents and metals in groundwater at the site.

Environmental Scientist, Constellation Power Generation Oil Control Program Compliance Support, Perryman and C. P. Crane Generating Stations (2008). Responsible for coordination and performance of field activities including site wide groundwater gauging and sampling events and light non-aqueous phase liquid recovery.

Environmental Scientist, Site 2 Old Dump at Swan Creek Soil, Aberdeen Proving Ground, Aberdeen, Maryland (2009). Conducted site clearing activities and the installation of geotextile for the reestablishment of landfill cap.

Environmental Scientist, Compliance Cleanup of 13 Sites, Aberdeen, Maryland; Aberdeen Proving Ground; Environmental Scientist (2008). Tasks include operation and maintenance of product recovery systems, groundwater monitoring, and reporting.

Environmental Scientist, Enhanced In Situ Bioremediation Systems, Buildings 3327, 525, M600, 361, 507 and Defense Reutilization and Marketing Office Metal Scrap Yard, Aberdeen Proving Ground, Maryland, Aberdeen Proving Ground (2006). Involved in the installation and responsible for the operation, maintenance, and performance monitoring for enhanced bioremediation systems for the remediation of chlorinated solvents in groundwater at six sites in the Aberdeen Area. Systems include active groundwater recirculation systems for the addition of groundwater amendments and passive biobarriers for the treatment of down gradient areas.

Environmental Scientist, Operations and Maintenance Soil Vapor Extraction/Free Product Recovery System, Building 4025, Aberdeen Proving Ground, Maryland (2006-2007). Responsible for operations and maintenance of the Building 4025 soil vapor extraction remediation system, which consists of a soil vapor extraction system that is designed to enhance the recovery of light non-aqueous phase liquids and biodegrade residual hydrocarbons. Also responsible for collection of monthly air sample for submission to laboratory for benzene, toluene, ethylbenzene, and xylene analysis, to ensure that air emissions for the system are in compliance with the Maryland Department of the Environment regulations. Additional responsibilities include preparation of comprehensive monthly progress reports for the system.

Environmental Scientist, Operation and Maintenance Soil Vapor Extraction System, Building 4031, Aberdeen Proving Ground, Maryland (2006-2007). Responsible for operations and maintenance of the Building 4031 soil vapor extraction/free product recovery system. Also responsible for collection of monthly air sample, for submission to laboratory for benzene, toluene, ethylbenzene, and xylene analysis, to ensure that air emissions for the system are in compliance with the Maryland Department of the

Environment regulations. Additional responsibilities include preparation of comprehensive monthly progress reports for the system.

Inspector/Technician, Monitoring and Maintenance 5 Installation Restoration Program Sites; Edgewood Area, Aberdeen Proving Ground, Maryland (2006). Responsible for quarterly inspections and subsequent maintenance of 5 Installation Restoration Program sites; Nike SW landfill, Cluster 5 test area, Old Bush River Road Dump, Graces Quarters, and Carroll Island. Monitoring tasks include sampling of monitoring wells and surface media (soil and sediment), maintenance inspection of landfill sites to ensure site stability and inspection of shoreline stabilization measures with unexploded ordnance sweeps at Grace's Quarters and Carroll Island. Maintenance tasks involve removal of unwanted vegetation, fence repair, and carbon filter replacements.

Environmental Scientist, Millsboro Groundwater Investigation (Trichloroethene); Millsboro, Delaware; Department of Natural Resources and Environmental Control (2006). Collected groundwater samples using direct-push technology in order to delineate the plume size of known trichloroethene contamination. Also collected soil, soil gas vapor, and air samples to define possible volatile organic compound occurrences outside of the groundwater.

Environmental Scientist, Uncle Ted's Trading Post, Millsboro, Delaware, Department of Natural Resources and Environmental Control (2006). Performed operations and maintenance on soil vapor extraction system. Installed upgraded aquifer air sparge and soil vapor extraction system. Sampled monitoring wells and potable wells surrounding the site.

Scientist, Absecon Island Shore Protection Project, Atlantic City, New Jersey; US Army Corps of Engineers (01/04-11/04). Employed on the dune restoration phase of the US Army Corp of Engineers Absecon Island Shore Protection Project. Project focus included sand fence and dune grass installation from Atlantic City to Ventnor City, New Jersey. Responsibilities included fence and planting layout, material storage, equipment maintenance, and communication with contractors. Gained experience in coastal ecology, winter field conditions and operating light machinery. Other projects with this firm included native species reforestation jobs for the Maryland State Highway Administration.

Carpenter's Assistant, Potts & Callahan Inc., Baltimore, Maryland (06/99-09/00). Assisted carpenters in the layout, building, and setting of concrete forms for stormwater management structures. Gained experience in reading blueprints and using instrument levels for grading and excavation. Learned heavy equipment safety procedures and the use of industrial power tools.

Intern/Scientist, Radford Army Ammunition Plant, Radford, Virginia (07/98-04/99). Worked on the environmental remedial investigation. Responsibilities included air, soil, surface water, and sediment sampling along with sampling documentation and transportation. Assisted in the compilation of the collective measures study by processing sampling results, preparing data spreadsheets and producing sampling maps from Global Positioning System data. Team involvement included site management during remediation phases.



ALL AMERICAN ENVIRONMENTAL SERVICES, INC.

This is to certify that

BRIAN D. KATELEY

has successfully completed

"HAZARDOUS WASTE SITE WORKER" 40-HOUR COURSE
SATISFYING OSHA 29 CFR 1910.120 (e) (3) (i)

at

ALL AMERICAN SCHOOL OF OCCUPATIONAL SAFETY AND HEALTH
COLUMBIA, MARYLAND

January 9-13, 2006
40S-0601A

School Director

EA Engineering, Science, And Technology, Inc.

Certificate of Training

PRESENTED TO

Brian Kateley

FOR COMPLETION OF

8-Hour HAZWOPER
Supervisor Training
Per 29 CFR 1910.120

25 April 2008

Peter Garger, CIH

OSHA Occupational Safety and Health Administration

14-600541403

This card acknowledges that the recipient has successfully completed a 30-hour Occupational Safety and Health Training Course in

Construction Safety and Health

Brian Kateley

Peter Garger CIH, CSP (Trainer name – print or type)

5/24/2011 (Course end date)

OSHA recommends Outreach Training Courses as an orientation to occupational safety and health for workers. Participation is voluntary. Workers must receive additional training on specific hazards of their job. This course completion card does not expire.

Use or distribution of this card for fraudulent purposes, including false claims of having received training, may result in prosecution under 18 U.S.C. 1001. Potential penalties include substantial criminal fines, imprisonment up to five years, or both.

For OSHA Outreach Training Program go to "Training" at www.osha.gov

Rev. 12/2009

CLICKSAFETY®

certifies that

BRIAN KATELEY

has successfully completed ClickSafety's web-based training course:

HAZWOPER 2021 Refresher (8-Hour)

In accordance with the requirements of 29 CFR 1910.120(e)
This course was developed and presented by ClickSafety.com, Inc.

CLICKSAFETY
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I confirm that I personally took the course listed above.

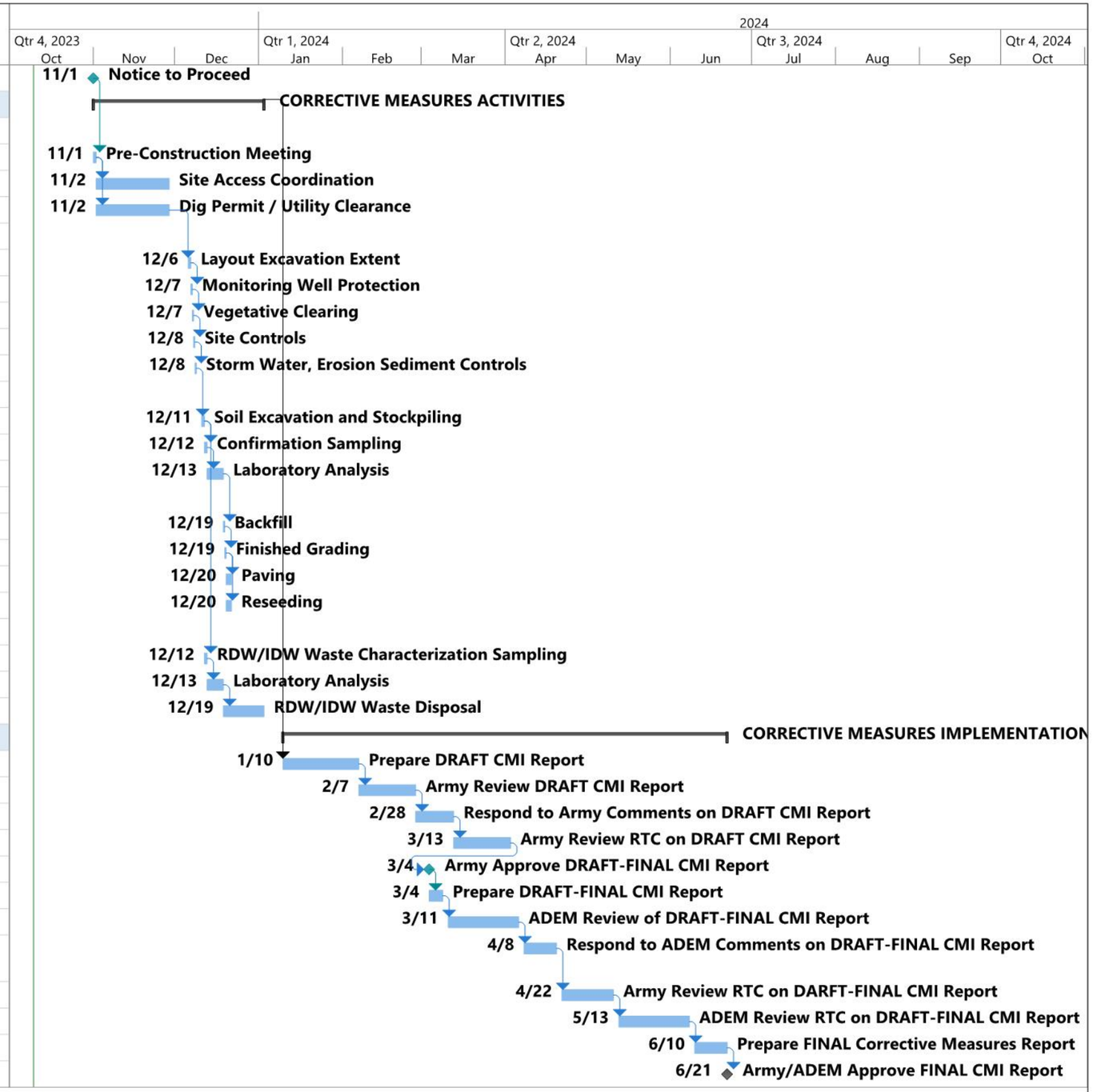
31533408	1/27/2021	8 HOURS	
SERIAL NUMBER	COMPLETION DATE	COURSE DURATION	STUDENT SIGNATURE

APPENDIX B

Corrective Measure Implementation Schedule

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ID	Outlin Numb	Task Name	Duration	Start
1	1	Notice to Proceed	0 days	Wed 11/1/23
2	**2**	**CORRECTIVE MEASURES ACTIVITIES**	**45 days**	**Wed 11/1/23**
3	**2.1**	**Mobilization Activities**	**20 days**	**Wed 11/1/23**
4	2.1.1	Pre-Construction Meeting	1 day	Wed 11/1/23
5	2.1.2	Site Access Coordination	19 days	Thu 11/2/23
6	2.1.3	Dig Permit / Utility Clearance	19 days	Thu 11/2/23
7	**2.2**	**Site Preparation**	**3 days**	**Wed 12/6/23**
8	2.2.1	Layout Excavation Extent	1 day	Wed 12/6/23
9	2.2.2	Monitoring Well Protection	0.5 days	Thu 12/7/23
10	2.2.3	Vegetative Clearing	0.5 days	Thu 12/7/23
11	2.2.4	Site Controls	0.5 days	Fri 12/8/23
12	2.2.5	Storm Water, Erosion Sediment Controls	0.5 days	Fri 12/8/23
13	**2.3**	**Remedial Activities**	**6 days**	**Mon 12/11/23**
14	2.3.1	Soil Excavation and Stockpiling	1 day	Mon 12/11/23
15	2.3.2	Confirmation Sampling	1 day	Tue 12/12/23
16	2.3.3	Laboratory Analysis	4 days	Wed 12/13/23
17	**2.4**	**Site Restoration**	**3 days**	**Tue 12/19/23**
18	2.4.1	Backfill	0.5 days	Tue 12/19/23
19	2.4.2	Finished Grading	0.5 days	Tue 12/19/23
20	2.4.3	Paving	2 days	Wed 12/20/23
21	2.4.4	Reseeding	2 days	Wed 12/20/23
22	**2.5**	**RDW/IDW Waste Management**	**16 days**	**Tue 12/12/23**
23	2.5.1	RDW/IDW Waste Characterization Sampling	1 day	Tue 12/12/23
24	2.5.2	Laboratory Analysis	4 days	Wed 12/13/23
25	2.5.3	RDW/IDW Waste Disposal	11 days	Tue 12/19/23
26	**3**	**CORRECTIVE MEASURES IMPLEMENTATION REPORT**	**118 days**	**Wed 1/10/24**
27	3.1	Prepare DRAFT CMI Report	20 days	Wed 1/10/24
28	3.2	Army Review DRAFT CMI Report	15 days	Wed 2/7/24
29	3.3	Respond to Army Comments on DRAFT CMI Report	10 days	Wed 2/28/24
30	3.4	Army Review RTC on DRAFT CMI Report	15 days	Wed 3/13/24
31	3.5	Army Approve DRAFT-FINAL CMI Report	0 days	Mon 3/4/24
32	3.6	Prepare DRAFT-FINAL CMI Report	5 days	Mon 3/4/24
33	3.7	ADEM Review of DRAFT-FINAL CMI Report	20 days	Mon 3/11/24
34	3.8	Respond to ADEM Comments on DRAFT-FINAL CMI Report	10 days	Mon 4/8/24
35	3.9	Army Review RTC on DARFT-FINAL CMI Report	15 days	Mon 4/22/24
36	3.10	ADEM Review RTC on DRAFT-FINAL CMI Report	20 days	Mon 5/13/24
37	3.11	Prepare FINAL Corrective Measures Report	10 days	Mon 6/10/24
38	3.12	Army/ADEM Approve FINAL CMI Report	0 days	Fri 6/21/24



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APPENDIX C

Construction Quality Assurance Plan

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RSA-217 PROJECT QUALITY CONTROL PLAN

ENVIRONMENTAL REMEDIATION SERVICES

REDSTONE ARSENAL

June 2023

Prepared for:

U.S. ARMY ENVIRONMENTAL COMMAND
Southeast-Environmental Service and Support Division
2455 Connell Road, Building 2266
Fort Sam Houston, TX 78234-7664

Contract No.: W9124J-18-D-0004, Delivery Order W9124J21F0045

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RSA-217 PROJECT QUALITY CONTROL PLAN

ENVIRONMENTAL REMEDIATION SERVICES REDSTONE ARSENAL

June 2023

Prepared for:

U.S. ARMY ENVIRONMENTAL COMMAND
Southeast-Environmental Service and Support Division
2455 Connell Road, Building 2266
Fort Sam Houston, TX 78234-7664

Prepared by:

ECC
9200 Church St
Suite 305
Manassas, VA 20110

Contract No.: W9124J-18-D-0004, Delivery Order W9124J21F0045

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QUALITY CONTROL PLAN

ENVIRONMENTAL REMEDIATION SERVICES AT

REDSTONE ARSENAL

W9124J-18-D-0004

I hereby certify that the enclosed Quality Control Plan (QCP) is in compliance with contract specifications and is submitted for Army approval. Once approved, the QCP will be implemented during the project W9124J-18-D-0004 execution of "*Environmental Remediation Services at Redstone Arsenal, Alabama".*

Approvals

Pamela Foti

Date: 6/29/2023

Deputy Program Manager,
Pam Foti, Certified Hazardous Materials Manager (CHMM), Project Management Professional (PMP)

Date: 06/22/2023

Quality Assurance/Quality Control Manager (QCM),
Leili Arjomand, Professional Engineer (PE), PMP, Certified Manager of Quality/Organizational Excellence (CMQ/OE)

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Figure 2-1 Project Quality Control Plan Organizational Structure

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Appendix A Quality Control Plan Forms

Appendix B ECC Causal Analysis System

ACRONYMS AND ABBREVIATIONS

AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
CHHM	Certified Hazardous Materials Manager
COC	Chain of Custody
COR	Contracting Officer's Representative
CMI	Corrective Measures Implementation
CMQ/OE	Certified Manager of Quality/Organizational Excellence
DoD	Department of Defense
DFW	Definable Feature of Work
DQCR	Daily Quality Control Report
ECC	Environmental Chemical Corporation
ERMA	Environmental Remediation Multiple Award
IDW	Investigative Derived Waste
LNAPL	Light Non-Aqueous Phase Liquid
LSP	Licensed Site Professional
LUC	Land Use Control
MEC	Munitions and Explosives of Concern
NCR	Nonconformance Report
PE	Professional Engineer
PG	Professional Geologist
PGM	Program Manager
PM	Project Manager
PMP	Project Management Professional
POD	Plan of the Day
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QCM	Quality Control Manager
QCP	Quality Control Plan
QMS	Quality Management System
RSA	Redstone Arsenal
SSHP	Site Safety and Health Plan
SSHO	Site Safety and Health Officer
USAEC	United States Army Environmental Command
USEPA	United States Environmental Protection Agency

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1.0 INTRODUCTION

Environmental Chemical Corporation (ECC) will implement a Quality Management System (QMS) to ensure all activities, products, information, data, and decisions resulting from quality-affecting activities are technically sound and defensible. The quality system and implementing procedures form the basis of ECC's QMS. The System was developed and is maintained per applicable State and Federal laws, rules, standards, guidance, contractual requirements and sound risk management practices.

The project consists of environmental services at Redstone Arsenal (RSA). The following are the definable features of work (DFWs) identified for RSA-217:

- Procurement and Subcontracting
- Mobilization/Demobilization
- Utility Marking / Dig Permits
- Vegetation Clearing
- Removal of Contaminated Soil
- Confirmation Soil Sampling/Waste Characterization Soil Sampling
- Offsite Disposal of Contaminated Soil
- Backfill and Site Restoration
- Record Keeping
- Decontamination
- Corrective Measures Implementation (CMI) Reporting

1.1 Quality Control Objectives

ECC's QMS consist of plans, procedures, and an organization that will produce an end product that complies with the requirements of the contract. The QMS covers all environmental operations, both on-site and off-site.

This Quality Control Plan (QCP) defines the procedures to manage and control activities of ECC personnel, subcontractors, and suppliers and to ensure that the completed project complies with all contract documents.

ECC will maintain responsibility for its work and the work of its subcontractors. To ensure compliance with contract requirements and maintain responsibility of all work performed under this deliverable, ECC will provide a continuous Three Phase Control inspection program to examine the quality of work, maintain standards of workmanship, ensure environmental quality standards of excellence, evaluate performances, identify and correct deficiencies, and provide finished work products which meet or exceed the requirements, while maintaining qualified personnel and equipment, and facilities which are necessary for the completion of the project.

The objective of this QCP is to ensure that the project activities are conducted and documented in an organized, efficient, and safe manner. This plan will define the management structure, organization, responsibilities, and authorities necessary for successful completion of the project. Performing quality work, implementing an effective quality control (QC) system and to ensure project compliance is the responsibility of all ECC staff members and subcontractors and can be achieved through a cooperative effort and commitment to quality by all program personnel.

All QC and quality assurance (QA) procedures related to sampling and analytical methods are included in the *Revision 4 Installation-Wide Quality Assurance Program Plan* , *U.S. Army Garrison Redstone, Madison County, Alabama*, completed by HydroGeoLogic, Inc. in 2019, and the site-specific work plans being prepared by ECC, as needed.

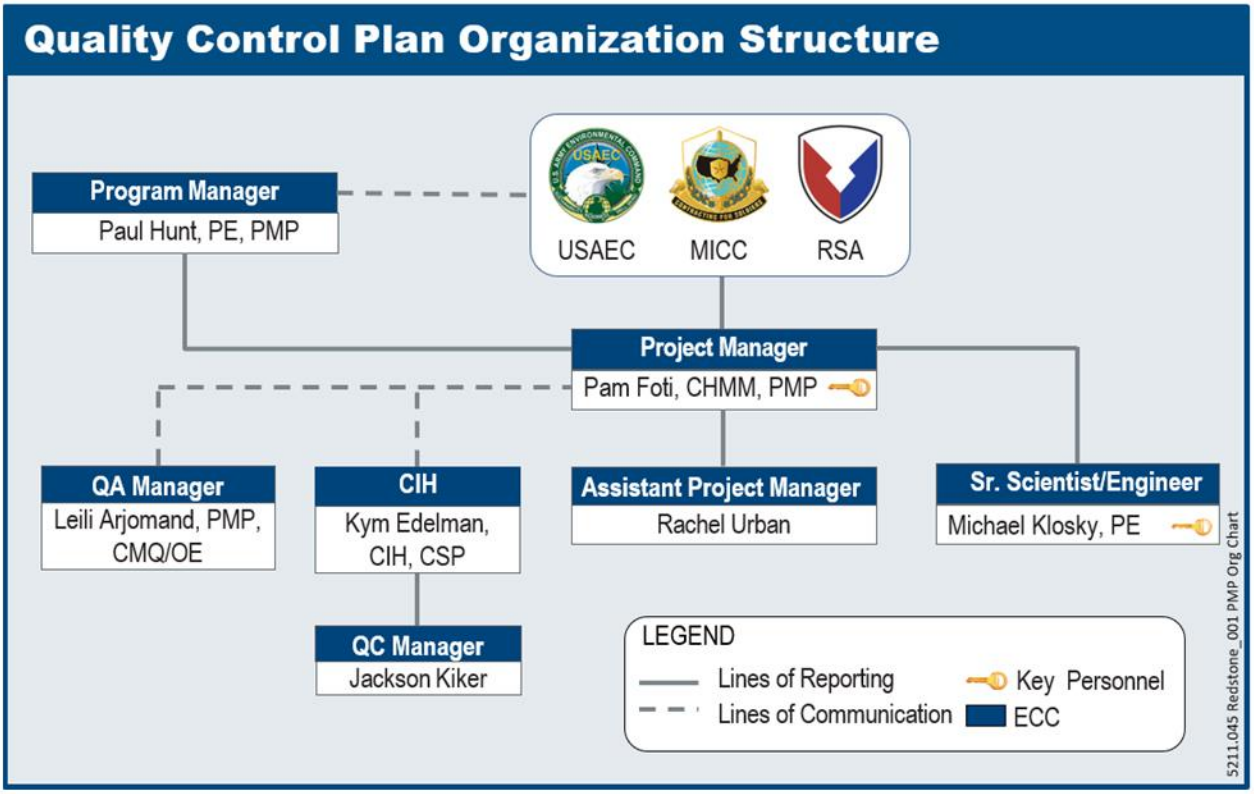
2.0 QUALITY CONTROL ORGANIZATION

The functions of the QC staff are to describe, integrate, monitor, evaluate, and document all QC practices of ECC and its subcontractors, and to ensure safety and contract compliance. The quality staff has the full support of management and has independent and delegated authority to accomplish assigned tasks, including stop work authority. The ECC quality control organizational structure, functional responsibilities, level of authority, lines of communication, and interfaces for activities affecting quality are identified and documented for assigned work tasks in the following sections.

Changes to ECC's QC staff organization requires the Army's Contracting Officer acceptance. Changes will be submitted in writing prior to the proposed change. Requests will include the names, qualifications, duties, and responsibilities of each proposed replacement.

Figure 2-1 shows the project organization chart identifying key personnel, responsibilities, and lines of authority for the QC personnel.

Figure 2-1: Quality Control Plan Organization Structure



2.1 Program Manager

The Environmental Remediation Multiple Award (ERMA) Program Manager (PGM), Mr. Paul Hunt, Professional Engineer (PE), Project Management Professional (PMP), Licensed Site Professional (LSP), is responsible for the quality of work performed by the assigned project staff. He is responsible for all operations associated with the implementation of the project and will ensure quality and schedule compliance. He will also be responsible for addressing all customer complaints and/or feedback.

2.2 Project Manger

The Project Manager (PM), Ms. Pam Foti, Certified Hazardous Materials Manager (CHMM), PMP, controls the budget and schedule with the concurrence of the PGM, ensuring the contract requirements are met. The PM is responsible for all environmental services related to the requirements of the contract and specifications, including subcontractors. The PM reports directly to the PGM and is responsible for ensuring that all project activities conform to requirements and specifications. The PM's duties also include the assignment of responsibilities for the preparation of various reports and the review of each form/report for accuracy and content. In addition to monitoring and appraising performance of staff and subcontractors, the PM has the primary responsibility of tracking any proposed changes to the contract and for the overall project and will report any proposed changes to the PGM.

2.3 Program Quality Assurance/Quality Control Manager

The Program QA/QC Manager, Ms. Leili Arjomand, Professional Engineer (PE), Certified Manager of Quality/Organizational Excellence (CMQ/OE), PMP, will have overall responsibility for the control and implementation of the approved QC program. She will be responsible for the management, training, and performance of all QC personnel and will serve as a technical resource to the QC officer and QC staff. All project QC records and activities are subject to review by the QA/QC Manger.

2.4 Quality Control Manager

The QC Manager (QCM), Mr. Jackson Kiker, is responsible for supervising all QC aspects of the project to ensure compliance with contract plans and specifications. The QCM has indirect reporting responsibilities to the PM so that the required authority and organizational freedom is provided, including sufficient independence from cost and schedule implications. The QCM has the authority to act in all QC matters for ECC. The QCM has overall responsibility and authority for the administration of all QC Program-related activities. The QCM will conduct QC project surveillances throughout the life of the project and ensure that the reporting requirements as defined in this QCP are implemented.

2.5 Site Superintendent

The Site Superintendent, Mr. Aaron Glad, reports to the PM. He will manage field operations and monitor and oversee field personnel, subcontractors, QC, and safety activities to ensure compliant work. He will host the plan of the day (POD) meetings and participate in preconstruction meetings, preparatory meetings, initial inspections, final acceptance inspections, and ensure that substandard work is corrected as soon as possible.

2.6 Field Personnel and Subcontractor

All field personnel and subcontractors will be required to adhere to the procedures set forth in this QCP. The Site Superintendent will be responsible for overall management and coordination of field personnel and subcontractors and ensuring they perform all aspects of the work in accordance with the Work Plans, the Site Safety and Health Plan (SSHP), and this QCP. The QCM will be responsible for ensuring the field personnel and subcontractors perform all aspects of the work in accordance with this QCP. The Site Safety and Health Officer (SSHO) will be responsible for ensuring the field personnel and subcontractors perform all aspects of the work in compliance with the SSHP.

3.0 MEETINGS

While performing work, ECC will take part in various meetings during which they will update the client, and when applicable, other stakeholders, on the progress, results, deviations or modifications, and recommendations for the fulfillment of the scope of work.

3.1 Coordination and Mutual Understanding Meeting

If needed, and in addition to the meetings specified in the Project Management Plan, the QCM shall meet with the Contracting Officer's Representative (COR) and/or RSA Army Environmental Coordinator or designated representative prior to the start of the site work to discuss the QC Project Plan required by this project.

During the meeting, a mutual understanding of the system details will be developed, including the forms for recording the QC operations, administration of the system for both on-site and off-site work, coordination of ECC's management, and the interrelationship of ECC's management and control with the Army's QA, production, and the QCM's duties with the COR.

As a minimum, ECC's personnel required to attend will include the PM, Site Manager, and QCM.

3.2 On-site Meetings

When field activities are being performed, meetings may take place, whether planned or unplanned, at the site to discuss specific issues or concerns. The QCM or her designated representative will be responsible for documenting discussions and decisions made at the meeting on the Daily Quality Control Report (DQCR).

3.3 Meeting Minutes

Minutes of all meetings will be prepared describing the general discussion, decisions, changes in approach, and action items. If requested, ECC will submit the meeting minutes to participants.

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4.0 QUALITY CONTROL REQUIREMENTS

4.1 Definable Features of Work

To ensure quality, ECC will implement the QC program, including the Three Phase Control Process for each DFW. A DFW is any task, which is separate and distinct from other tasks, has separate control requirements, or is identified by different disciplines. There may be more than one DFW in each activity. The Three Phase Control Process is used to ensure that all project activities comply with the approved plans and procedures. The DFWs for this project are included in **Section 1**.

4.2 Three-Phase Control System

The Three Phases of Control process assures control of work at every stage of an activity, from planning through execution and completion. The process includes the preparatory, initial, and follow-up phases. Work will only begin on a DFW when successful preparatory and initial phases are completed.

Additional preparatory and/or initial phases may be conducted on the same DFW if new crews or subcontractors are added to a DFW, when acceptable levels of quality are not being met, if there are changes in the applicable QC organization, if work on a DFW is resumed after a substantial period of inactivity, or if other problems develop.

4.2.1 Preparatory Phase

The preparatory phase will be performed prior to the beginning of work on each DFW after all required submittals have been approved and is typically conducted by the SSHO with other applicable site personnel in attendance (e.g., field personnel, subcontractors, etc.). The United States Army Environmental Command (USAEC) COR and Army Environmental Coordinator will also be invited to attend the meeting. Any subcontractors involved in the DFW will participate in this review as well. The QCM or designated representative will give the Army 48-hours' notice prior to the preparatory phase meeting. The results of the preparatory phase actions will be documented in the DQCR.

During this phase, it is imperative to review the specifications and drawings to ensure all preparatory steps have been taken, to verify that submittals have been prepared and reviewed, qualified manpower is assigned, and safety issues have been identified and addressed. Specifically, this phase will include, if applicable:

- Review each paragraph of applicable specifications and drawings
- Review of the applicable work plans, etc. including discussion of procedures for controlling quality of the work and how deficiencies are corrected
- Review provisions that have been made to provide required control testing and inspection
- Concurrence that required project training and qualifications are complete (QC, health and safety, technical, etc.)
- Review to ensure that all materials and/or equipment have been tested, submitted, and approved
- Review of applicable permit status and requirements
- Examine the work area to ensure that all required preliminary work has been completed and is in compliance with the contract
- Review the appropriate activity hazard analysis (AHA) to ensure safety requirements are met
- Discuss sampling methods, applicable standard operating procedures, and the testing facility

- Check to ensure the portion of the plan for the work to be performed has been accepted by the client
- Discuss the initial control phase

4.2.2 Initial Phase

This phase of inspection will document the completeness and acceptability of the particular items at the beginning of the work activity after a representative portion of the items has been completed is typically conducted by the SSHO or Site Superintendent.

This is the time to ensure that ECC's and our subcontractor's personnel/workers understand, through immediate inspection, the contract standards, and the standards of workmanship desired. If there is a difference of opinion in the interpretation of contract requirements, this is the time to settle the issue. The initial inspection phase is a practical method of performing preventive inspection and resolving conflicts. The following will be accomplished during this phase, if applicable:

- Review minutes of the preparatory meeting for open items
- Check the work to ensure it is in full compliance with the project requirements
- Establish level of workmanship and verify it meets the desired acceptable workmanship standards.
- Resolve all differences between personnel and subcontractors
- Check safety to include compliance with and upgrading (if necessary) of the Accident Prevention Plan (APP)/SSHP and AHA. Review the AHA with each worker, if deemed necessary.
- Prepare documentation of the initial phase inspection, including a narrative description of detailed inspection procedures, minutes of meetings, inspection results, corrective measures, etc., using forms presented in **Appendix A** of this QCP or included in field book.
- The initial phase will be repeated for each new crew member arriving to work on-site or any time acceptable specified quality standards are not being met.

4.2.3 Follow-up Phase

Follow-up inspection is geared toward a level of effort to verify the continuation of project compliance and standards of workmanship established during the previous two phases. This inspection is typically conducted periodically by the SSHO, or Site Superintendent to ensure a continuation of satisfactory quality standards. Follow-up inspections will be made a matter of record in the DQCR. The QCM will verify proper procedure technique, sample handling, and Chain of Custody (COC), if required. The SSHO or Site Superintendent will monitor testing results and compare them with the project requirements, and if acceptable, document the results and provide a timely authorization to proceed with subsequent work. If the QCM determines the work is otherwise, not acceptable, he will notify the PM for stopping work and initiating a conformance action. Final follow-up checks will be conducted, and all deficiencies will be corrected before the start of additional DFWs.

4.3 Additional Preparatory and Initial Phases

Additional preparatory and initial phases will be conducted on the same DFW if the quality of ongoing work is unacceptable; if there are changes in the applicable QC staff, on-site supervision, or work crew; if work on a DFW is resumed after a substantial period of inactivity; or if other problems develop.

4.4 Control for Off-Post Work

When necessary to complete the objectives required in the PWS and as acknowledged in Table 1-1 of the Project Management Plan, work may take place off-post (laboratory analysis). To the extent practicable, ECC will monitor the quality and workmanship of products developed off-site by implementing the same control measures as work that takes place at a project site to ensure the products and/or materials meet the overall quality and technical standards (i.e., Work Plans or equivalent documents with Quality Assurance Project Plan [QAPP]-like requirements). Should any off-Post work be of a complexity that would warrant an effort beyond these measures (and those referenced in **Section 5.1** below), it would be discussed and agreed to by the ECC PM and the Army COR.

4.5 Deficiency Management

The ECC quality program evaluates the effectiveness of our QC program and ensures continuous improvement in the quality of our work. The primary goals of our quality program are to prevent non-conformances and to facilitate continual process improvement. If the first goal is not achieved, the identified deficiencies or non-conformances will be corrected in a timely and cost-effective manner in order to prevent their recurrence. This QCP includes provisions for preventing quality issues, facilitating process improvements, as well as identifying, documenting, and tracking deficiencies until corrective actions have been verified.

4.5.1 Preventive Measures

While the entire QC program is directed toward problem prevention, certain elements of the program have greater potential to be pro-active. The primary tools for preventing problems include:

- Employee qualification and training
- Preparatory, initial, and follow-up inspections
- Equipment calibration and maintenance.

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5.0 TESTING AND INSPECTION

5.1 Analytical Testing

ECC will procure the services of an independent analytical laboratory with DoD Environmental Laboratory Accreditation Program certification to perform analytical testing required by this project. The testing laboratory will have an established and documented quality system in compliance with the DoD Quality Systems Manual for Environmental Laboratories.

Laboratories must possess any required state or host nation certification and/or be accredited for each applicable method by a nationally recognized laboratory accreditation body.

Changes to the Laboratory Accreditation Status will be notified in writing to the Army within 30 calendar days of the change.

Chemical analysis will be performed using current USEPA procedures and in conformance with DoD Quality Systems Manual for Environmental Laboratories and State agency requirements unless otherwise specified in the project Performance Work Statement.

ECC will provide the analytical results citing applicable contract requirements or test procedures used. Analytical results will also provide a statement indicated if the analysis performed "conforms" or "does not conform" to the requirements.

5.2 Inspection

Inspection activities involve the evaluation of a characteristic as it relates to a specific requirement. ECC may perform the following inspections below, as appropriate to the DFW.

5.2.1 Punch-Out Inspection

A "punch list" of items that do not conform to the approved work plan, specifications, etc. will be prepared and included in the QC documentation. The list of deficiencies will include the estimated date by which the deficiencies will be corrected. The QCM or staff will make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, ECC will notify the Army that the item(s) is ready for their pre-final inspection.

5.2.2 Pre-Final Inspection

ECC will notify the Army when all of the items from the Punch-Out Inspection have been corrected and a Pre-Final Inspection will be scheduled. The Army will conduct the Pre-Final Inspection and a Pre-Final punch list may be developed if deficiencies are noted. The punch list will include estimated dates of completion that will ensure the deficiencies are completed timely and within the contract dates. When the punch list items are completed and verified by the QCM (or designee), the Army will be notified that a final inspection can be scheduled.

5.2.3 Final Acceptance Inspection

ECC will notify the Army 14 days prior to the Final Acceptance Inspection and the Army will formally schedule this inspection. The notification will include assurance that all items previously identified as being unacceptable along with all remaining work performed under the project will be complete and acceptable by the date scheduled for the final acceptance inspection. The QCM, Site Manager, or other primary

management person will represent ECC at the final acceptance inspection. Army personnel will be present as required.

5.3 Instrumentation/Equipment Testing, Inspection, and Maintenance

All equipment used at a project site shall be manufacturer-calibrated to national standards. Each time the instrument is about to be used, the calibration shall be verified and tested for functionality in accordance with *Final Revision 1 Installation-Wide QAPP* completed by Shaw Environmental, Inc. in 2013. Equipment found to be damaged, inoperable, or out of calibration shall not be used until the discrepancy is corrected and verified by the QCM (or designated representative). As necessary, a detector sensitivity or test grid may be used to test the functionality prior to daily use and results documented in the field logbook. Once equipment has been used, it shall be maintained following manufacturer's recommendations. The QCM, SSHO or Site Manager will make periodic verification/audits of the logs and procedures and report the findings in the DQCR.

6.0 QUALITY CONTROL DOCUMENTATION

The QCM serves a critical role in documenting, reporting, and storing data in support of the QC process and its effectiveness in attaining a high-quality work product.

6.1 Reporting Requirements

The QCM will complete and maintain the QC records to provide factual evidence of compliance with project requirements and to document all QC activities, including maintaining a record of all tests and inspections performed. These records include all work performed by subcontractors and suppliers. The QCM will sign each report and provide copies to the PM and USAEC, if requested. The primary QC reports are listed below.

6.1.1 Daily Reports

During field operations, DQCRs will be prepared describing QC and operations activities performed each day as well as the resources on-site and activities performed, including work performed by subcontractors. The reports will present an accurate and complete picture of QC and operations activities and site management. The report will include both conforming and deficient conditions in a precise, factual, legible, and objective manner. Copies of supporting documentation such as checklists and test reports will be attached as required, if requested. Work will be reported by terminology consistent with the work schedule.

The DQCR will be prepared, signed, and dated by the QCM (or her designated representative) and maintained on ECC's project SharePoint site. A copy of the DQCR will be submitted to RSA and the COR on a daily basis.

6.1.2 Monthly Summary Report

When field activities are being performed, the PM will submit a monthly summary report electronically to the client.

6.1.3 Quality Control Meeting Minutes

The QCM shall submit one copy of the meeting minutes within seven calendar days of the meeting.

6.1.4 Safety and Health Deficiency Tracking

6.1.5 Field Logbook

The QCM (or designee) shall be assigned a QC logbook for documenting details of field activities during QC monitoring activities. The logbook will be a bound manuscript with pre-printed page numbers. The QCM (or designated representative) will document his/her daily duties, summarize field activities, including arrival and departure time, note QC tests and results, depict the site layout, and other data. The information in the QC logbook will serve as a detailed description of events to aid in the preparation of the DQCR and in addressing follow-up questions that may arise.

All entries made in the QC logbook shall be made in ink. Any changes shall be made by a single strike through the error and initials. At the beginning of each day, notes will begin on the following page in the logbook. Descriptions shall be made in coherent English and in a manner, that would allow others to

recreate the daily events in the absence of the QCM. At the end of each day, the QCM (or designee) will mark the remainder of the page with a single line and sign across or under it.

6.2 Records Management

Records are considered completed documents, validated data, and other materials that provide objective evidence of the quality of items or activities. A document that contains objective information can become a record once it is complete and identified as a record. Records include, but are not limited to:

- Work plans, technical proposals, and other work assignment planning documents
- Field plans and procedures
- Training records
- Project reports, including letter reports
- Field logbooks and project notebooks
- Three phase inspection records
- DQCR and Production Reports
- COC records
- Audit, surveillance, and independent project self-assessment reports
- Field change notices
- Laboratory data

The PM will define work assignment documents that are expected to become records.

Records will be maintained in the project office in a manner that prevents deterioration and provides for the safeguarding of the records. A record indexing system that allows for easy retrieval and provides sufficient information to permit the correlation of records with the items or activities to which they apply will be used. Inactive records will be stored for the mutually agreed upon time after which they are either archived or properly disposed

Disposition of records is controlled and documented. Records are destroyed only after the proper notification to USAEC and the approval of the ERMA PGM.

7.0 SUBMITTALS

Preparation of submittals is the responsibility of the PM at the project level using project staff resources. For preparation of technical submittals, the appropriate staff will be chosen; those who have the background and knowledge required for assuring the technical submittal is complete and accurate. Additionally, the PM will perform a separate technical peer review for highly technical submittals.

The QCM will review submittals for acceptance with QC requirements before transmitting to the client or other required approval authorities. Submittals requiring modifications or changes will be returned to the originator, subcontractor, or vendor for correction and resubmission. Submittals from subcontractors and vendors will be reviewed for technical content and accepted as a part of this submittal preparation procedure.

7.1 Transmittal Form

Transmittals by ECC to the Army will be documented via email correspondence and/or Project Portal upload (with corresponding email to notify the parties of document availability). The transmittal and distribution of documents to Regulators will be managed directly by RSA and supported by ECC as discussed in Section 3.4.2.3 of the Project Management Plan.

7.2 Comment Response Matrix

Upon receiving comments from Army, regulatory, or other outside reviewers, ECC will prepare a comment response matrix to document each reviewer's comment along with a response describing how the comment will be resolved, incorporated, or addressed. To expedite reviews of the comment responses, ECC may request that the Army schedule a conference call or meeting with reviewers to discuss their comments. The completed comment response matrix will then be submitted to the client for review and approval prior to submitting elsewhere, as appropriate and applicable. At such a time when all responses are accepted, ECC will incorporate changes into the document.

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8.0 NONCONFORMANCE REPORTING

8.1 Nonconformance Definition

The definition of a nonconforming condition can be a deviation from product, process, procedure or compliance specifications. All items determined to be nonconforming must be corrected through systematic corrective actions. Any time a condition exists not in compliance with drawings, specifications, codes, workmanship standards, facility requirements, or Army requirements, the nonconformity must be documented, corrected, and closed-out through the following means. All personnel are responsible for identifying deficiencies and the QCM is responsible for ensuring the proper tracking and documentation of deficiencies, including those identified by the Army. ECC will implement the ECC Causal Analysis System (see **Appendix B**) to determine the root causes of quality related incidents and non-conformances. We will perform trend analyses at least annually by reviewing all incidents and identifying common basic causes that need to be addressed to prevent similar occurrences.

8.2 Deficiency Identification

The QCM (or designee) will be responsible for managing the nonconformance process. All nonconforming items must be reported to the QA/QC Manager. Anyone finding a deficient item is responsible for reporting it to the appropriate management staff.

8.3 Nonconformance Determination

During routine site activities, the majority of corrective actions can be implemented immediately (within 48 hours) by the field personnel and documented in field logbook. If the condition is not quickly corrected, the individual initiates a Nonconformance Report (NCR) as shown in **Appendix A** and submits it to the QCM (or designee). The QCM (or designee will notify the PM and identify the person responsible for implementing corrective action (often the Site Superintendent), sets a date on which the response is due, and distributes the NCR.

8.4 Planning and Implementing the Corrective Action

The responsible person to initiate corrective actions should identify the cause of the problem, if known or suspected, on the NCR. The responsible person will develop a Corrective Action Plan, identify the date the corrective action has been or will be accomplished, describe the action taken on the form, and return the form to QCM (or designee) by the response due date. If possible, objective evidence that the corrective action has been completed should be included with the NCR response. If this is not possible, the responsible person should return the NCR by the due date and provide the evidence as soon as possible.

8.5 Accepting Corrective Action

The QCM (or designee) will review the NCR response to determine the adequacy of the corrective action. If the stated corrective action is unacceptable, the NCR will be returned to the responsible person for further discussion and corrective action.

8.6 Verifying Corrective Action

If the evidence provided to the QCM (or designee) concerning completed corrective action is acceptable, the NCR will be signed and dated. If evidence is obtained through an audit, surveillance, or follow-up

review, the individual conducting the follow-up will sign and date the form once the corrective action has been verified.

A distribution list for NCRs will be determined at the initial project-planning meeting. At a minimum, distribution will include the USAEC Representative, QCM, PGM, QA/QC Manager, PM, Site Superintendent, and any other applicable client-related individuals.

9.0 AUDITS AND ASSESSMENTS

Assessments are a learning process intended to increase the user's understanding of the program or system being assessed and to provide a basis for improving such programs or systems. The purpose of assessments is to improve the quality of work by comparing the system or element to the specified requirements. Assessments are conducted at all levels: corporate, contract, project, and activity. Response refers to the actions taken by the assessed organization as a result of the assessment. Typically, responses involve corrective actions to rectify the deficiencies identified in the assessment.

Project assignments will be monitored and assessed as deemed appropriate by the QCM (or designee) and QA/QC Manager. The following sections identify and describe many assessment types. Not all types may be applicable for this project. The requirement to conduct applicable assessment types may be further defined in the work plans and field plans. The ERMA PGM, PM, or the QA/QC Manager may specify additional assessments, as necessary, to ensure that the quality of work meets the Army and ECC's expectations. Assessment reports generated under this project will be made available to the Army, upon request.

9.1 Management System Reviews

Management systems reviews are self-assessments conducted annually, or as determined appropriate by the QA/QC Manager, to establish whether the quality management structure, policies, and procedures are adequate to ensure quality data. Management systems reviews may cover multiple contracts and quality plans. The primary focus of the management systems review is performance improvement through:

- Fostering individual ownership of the quality program by increasing employee involvement in quality
- Encouraging employees to routinely identify opportunities for quality improvement
- Meeting with management, technical, and QA staff to solicit specific suggestions to improve quality, such as more practical implementation methods, procedural modifications, etc.
- Training the management, technical, and QC staff on quality plan requirements
- Communicating lessons learned from other management systems reviews
- Checking on implementation and effectiveness of the quality program within the office.

9.2 Project Audits

Project audits may be conducted on ECC and subcontractor work activities by QC staff independent of the work activities or the appropriate staff appointed by RSA or the USAEC. The implementation and use of appropriate quality measures identified in this QCP, work plans, field plans, specifications, procedures, and any other applicable document specifying requirements can be used for checking during the audit. The auditor will also ensure that obsolete documentation has been removed from project work areas and check briefly on preparation of required deliverables and the condition of project files.

Project auditors will be trained in auditing procedures and authorized by the QA/QC Manager.

9.3 Project Self-Assessments

Project self-assessments are evaluations of work activities conducted by project personnel who are knowledgeable in the project requirements to determine if the technical requirements are being met. They are intended to provide rapid feedback to the project staff to facilitate timely corrective action.

The ERMA PGM makes the selection of project assignments or activities for project self-assessment and the personnel to conduct them with the assistance of the QA/QC Manger or QCM. Project self-assessments are conducted using a standardized or customized checklist.

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Appendix A

QCP Forms

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DAILY SITE REPORT

Project Title: Redstone Arsenal
Date: _____
Activity Name: _____
Location: _____
Contract No.: W9124J-18-D-0004, DO W9124J21F0045

Weather	Sunny	Clear	Overcast	Rain	Snow
Temperature	< 32	32 – 50	50 – 70	70-85	> 85
Wind	Still	Moderate	High		
Humidity	Dry	Moderate	Humid		

Personnel On Site:

Name	Hrs.	Affiliation	Location/ Description of Work

Field Changes: YES _____ NO _____

If yes, filed Nonconformance and Corrective Action Report number (NCR No.):_____

Work Performed:	
Equipment Used:	
Health & Safety (Briefing held, PPE, injuries, near misses, etc.):	
Samples Collected/ Shipped:	
IDW Generated and Disposition:	
Verbal Instructions Received/Given:	
Changed Conditions/ Delays/ Conflicts Encountered or Resolved:	
Other Comments or Additional Information:	
Next Day's Planned Activities:	

Contractor Verification: On behalf of the contractor, ECC, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as may be noted above.

_____ _____ _____ _____
Signature Date Reviewer Signature Date

INSTRUMENT CALIBRATION LOG

Project: Redstone Arsenal **Site:** **Date**

Calibrated By Instrument Serial Number

Weather:

Parameters	Calibration	Calibration Temp	Post Calibration	Comments
Conductivity (mS/cm^c)				
pH (7)				
pH (4)				
pH (10)				
ORP (mV)				
Dissolved Oxygen (%)				
Barometric Pressure (mmHg)				
Turbidity	**<0.10 NTU**	**15.0 NTU**	**100 NTU**	**750 NTU**
PID		**Isobutylene / 100ppm**		

	Environmental Chemical Corporation	EQUIPMENT DAILY CHECK LIST

Equipment Name /Number _____ **Date** _____

Engine Hrs/Mileage _____ **Project Name** _____

BRAKES	COOLING WATER
AIR SYSTEM	OPERATING CONTROLS
TIRES/TRACKS	LIGHTS/REFLECTORS
HORN	WINDSHIELD WIPERS
SAFETY DEVICES	FIRE EXTINGUISHER
GLASS	BACKUP ALARM
MIRRORS	ENGINE OIL Add/Check
DEFROSTER	EXHAUST SYSTEM
STEERING SYSTEM	FLUID LEVELS
WIRE ROPE	ELECTRICAL SYSTEM
APPEARANCE	BREATHING AIR BOTTLES

These items are to be checked each shift before operating this piece of equipment.
Report ALL items requiring repair to supervisor prior to operation of equipment.

Note:

_____

_____

_____

_____

_____

_____

_____

_____

_____

OPERATOR'S NAME	
	(Please Print Name)

	Environmental Chemical Corporation	**FIELD WORK VARIANCE**

Project Name _____ Variance No _____

Project No _____ Page ___ of ___

Contract No. _____ CTO No. _____ Date: _____

Variance (include justification and present requirements) Requested by: _____

Proposed Change

Technical Justification

Cost/Schedule Impact

Reason for Change ☐ Addition ☐ Deletion

Change Order Required ☐ No ☐ Yes Change Order No. _____

Applicable Document

Approved By		
	Project Manager	**Date**
Approved By		
	CQC Manager	**Date**
Approved By		
	Contracting Officer	**Date**

	Environmental Chemical Corporation	MATERIALS DELIVERIES STORAGE CHECKLIST

Project Name:	Date:	Serial No.

Building Name:		Control #	
Specified Location:		Reference #	
Drawing Reference:			

Description of Activities	Disposition			Inspection Date (Initials)
	ACCEPT	REJECT	HOLD	
1 Material: _____	☐	☐	☐	
2 Date of Delivery _____	☐	☐	☐	
3 Handling method _____	☐	☐	☐	
4 Storage method _____	☐	☐	☐	
5 Protection _____	☐	☐	☐	

Remarks:

Checked By:	Inspected By:	Witnessed By:
Contractor Representative	Q.C. Inspector, Contractor	Prime Contractor Representative
Date:	Date:	Date:

	Environmental Chemical Corporation	NON-CONFORMANCE REPORT TRACKING

Contract _____ **Project No** _____

CTO No _____ **NCR Number** _____

Nonconformance Description (include specific requirement violated):	
Identified By	**Date**

Root Cause of Nonconforming Action:

Corrective Action(s) to be Taken (include date when action(s) will be complete):	
To Be Performed By	**Date**

Action(s) to be Taken to Preclude Recurrence:	
To Be Performed By	**Date**

Acceptance By		
	Project Manager	**Date**
	CQC Manager	**Date**

Corrective Action(s) Completed by and Date:	Verification Completed by and Date:

	Environmental Chemical Corporation	NON-CONFORMANCE REPORT TRACKING LOG

Contract _____ Project Name _____

CTO No _____ Page ____ Of ____

NCR No.	Orig. Date	Initiated By	Nonconformance Description			Status	
Project No.	Close Date	Close By		Resp. Party	C/A Due	C/A Recommended And Approved	Re-inspection Results

	Environmental Chemical Corporation	RECORD OF TESTING ON -OR- OFF SITE

To: _____

Testing To Be Carried Out By: _____

Contract Number: _____ Contractor: _____

Item or Work for Test: _____

_____

Location of Test: _____

Proposed Date & Time of Test: _____

Specified Testing Requirements: _____

_____

Notified By: _____ Date: _____

To Be Inspected By: _____ ☐ _____ ☐ _____ ☐

_____ ☐ _____ ☐ _____ ☐

Test Record

Date of Test: _____ Location or Grid Ref. _____

Type of Test: _____

Test Conditions Maintained: Start ☐ Finish ☐

Accepted ☐ Rejected ☐

Test Result

Comments/Observations: _____

_____

_____

_____

Test Witnessed By:

_____ _____

QC Inspector (Signature) Supplier (Signature)

_____ _____

Contractor Repr (Signature) Prime Contractor Repr (Signature)

	Environmental Chemical Corporation	REWORK ITEMS LIST

Contract _____ **Project No** _____

CTO No _____

Item	Date Identified	Date Corrected
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
20. 21.		
22.		
23.		
24.		

	Environmental Chemical Corporation	STATUS SUMMARY ON NON-CONFORMANCE NOTICES

PROJECT: _____ DATE: _____

SEQUENTIAL SERIAL NO.	DATE OF ISSUE	DESCRIPTION	DATE RECEIVED BY CONTRACTOR	DATE RETURNED BY CONTRACTOR	Q.C. ENGINEER		COMMENTS
					ACCEPTED DATE	REJECTED DATE	

	Environmental Chemical Corporation	STOP WORK ORDER

Project Name		**Date**	
SWO No.		**Page**	
Contract No.		**CTO Number**	

1. Written Notice			
Issued to:		P.O. # or Activity:	
Name:		Location:	
Title:		Issued by (name):	
Origination:		Issued by (title):	
2. Verbal Notice			
Issued to:		Date:	
Title:		Time	

3. Associated NCR No.	**4. Associated CAR No.**

5. Stop Work Order Condition Description

6. Remedial Action Required:			
By Whom		By When	

7. Required Remedial Action Determined by:	
Project Manager	Date
CQC Manager	Date

8. Follow-up of Remedial Action Taken:

Verbal Notice to Resume Operations Given to:

Name	Title	Date	Time

Stop Work Order Cancellation Authorized by:

Program CQC Manager:	Date

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Appendix B

ECC Causal Analysis System

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ECC CAUSAL ANALYSIS SYSTEM

Step 1. Incident Description

Type of incident:

- Quality
- Vehicle/property loss >$500
- Environmental release or permit exceedance
- Injury or illness
- UXO-related
- Security
- High loss potential (HiPo)

Describe what happened:

_____

Evaluation of future risk if not controlled:

Probability of Recurrence	*Severity of Loss Potential*		
	Minor	*Serious*	*Major*
Will probably occur soon	Medium	High	High
Reasonable likelihood in future	Low	Medium	High
Unlikely	Low	Low	Medium

Step 2. Select Event Type

• Fall from elevation • Fall on same level • Struck by vehicle, equipment, load or moving object • Struck against or bump into • Caught in, between or under • Caught on, snagged or hung • Contact with harmful agent (chemical, biological, radiological, noise, temperature extreme, vibration)	• Ergonomic, overexertion, stress, strain, sprain • Overpressurization, excessive temperature • Equipment failure • Environmental release • Permit exceedence • Product or process non-conformity • Customer/stakeholder complaint, poor project performance rating • Cost/schedule overrun

ECC Core Values

Service

Prosperity

People

Friendship

Safety

Step 3. Identify the Immediate Cause(s)

Identify those behaviors or conditions that directly resulted in the event or loss.

Substandard Acts or Behaviors	
• Failure to follow established procedure • Operating equipment without authority • Exceeding the boundaries of the task envelope • Operating at improper speed • Failure to warn or secure • Failure to control hazardous energy (de-energize, secure, lockout) • Making safety devices inoperable (including jumpering interlocks) • Using wrong or defective tools or equipment • Poor lifting, pulling, turning technique	• Poor body positioning • Using tools or equipment improperly • Substance abuse or working under influence of prescription medication • Inappropriate behavior • Failure to check/monitor • Failure to coordinate work activity • Failure to identify customer/stakeholder expectations • Failure to identify and reject non-conforming parts, materials or workmanship

Substandard Conditions	
• Exposure to chemical, physical or biological agents • Inadequate engineering controls • Inadequate administrative controls • Inadequate PPE • Inadequate warning system or barricade • Inadequate site layout or design • Defective tools or equipment • Congestion/restricted action • Housekeeping/disorder	• Fire or explosion hazard • Hazardous weather conditions • Improper maintenance of infrastructure or plant facilities • Failure to comply with designs, stakeholder expectations • Inadequate resources on project • Inadequate identification of regulations, codes, standards, specifications, permits to operate • Inadequate communications equipment, software or process controls

Step 4. Identification of Root Cause(s)

Identify the system or personal factors that caused or permitted the immediate causes to be present.

System Factors

1. Leadership and Management

- Management commitment
  - to processes, policies and procedures
  - lead by example
- Management involvement
  - in ESQ activities (meetings, inspections, audits)
  - visible leadership
- Supervision
  - employee tasking, direction, follow-up
  - subcontractor oversight
- Line management accountability
- Adequate budgeting
- Assessment of risks and hazards
- Qualifications of supervisors and managers
- Performance evaluations and feedback
- Reporting relationships
- Employee involvement/inclusion in hazard evaluation and decision making

2. Communications and Training

- Training
  - Formal
  - OJT
- Evaluation of training effectiveness
  - Testing
  - Demonstration
  - OJE
- Competency determination
- Communications with client
- Communications with stakeholders
- Communications with employees
- Communications between organizations
- Communications between work groups or shifts
- Communications between individuals
- Communications with subcontractors

3. Project Development and Planning *(Plan)*

- Project Development
  - Understand SOW
  - Understand contract
  - Understand client and stakeholder relationships
  - Understand client and stakeholder expectations
- Risk analysis and management plan
  - PIP
  - Bid analysis
  - Process Safety Reviews
- Identification of codes, standards, specifications, SOPs
- Engineering and task planning
  - Multi-disciplinary, SME involvement
  - Review procedures
  - Value engineering
  - Site layout
  - Work task planning
- Project plans
- AHAs/JSAs
- Submittal process
- Hazardous work permits
- Regulatory permits
- Procurement
  - Subcontractor evaluation and selection
  - Requirements in RFP/SOW
  - Material specifications

4. Project or Work Task Execution *(Do)*

- Implementation of plan/procedure
- Schedule/work sequence
- Tools/equipment/PPE
  - Tools
  - Construction equipment
  - Infrastructure
  - Facilities
  - Process equipment
- Qualified personnel
- Compliance with codes/standards
- Documentation
- Document control
- Incident identification, notification, investigation and reporting

5. Measuring and Monitoring of Work Activities and Products *(Check)*

- Document reviews
- Design reviews
- Readiness reviews
- Four phase process
- Subcontractor oversight
- Exposure monitoring procedures
- Testing
  - Materials
  - Process equipment
  - Alarms and interlocks
  - Commissioning
  - Pilot and bench scale
  - Weights and measures
  - Calibration
- Inspections
  - Tools
  - Equipment
  - PPE
  - Competent person
  - Hazardous work activities
  - Materials receipt
  - Workmanship
  - Superintendent weekly safety
  - PM monthly safety
- Audits
- Customer feedback solicitation
- Employee feedback solicitation
- Internal Project Management Reviews
- Change identification, notification and impact assessment

6. Follow Through and Improvement *(Act/React)*

- Corrective action follow up
- Lessons learned
  - Develop
  - Communicate
  - Consult
  - Implement
- Response to client, user and employee feedback
- Emergency response
- Change management/risk management

Personal Factors

7. Capabilities

- Size, strength, reach
- Pre-existing physical limitations or medical conditions
- Sensory deficiency
- Intelligence
- Aptitude
- Memory
- Emotional disturbance
- Mental illness
- Fears/phobias

8. Stress

- Fatigue due to task load, duration or repetition
- Fatigue due to extended work schedule/ lack of rest
- Boredom
- Sensory overload
- Emotional overload
- Conflicting demands/confusion
- Frustration

9. Knowledge or Skills

- Experience
- Training
- Orientation
- Infrequent activity/lack of practice
- Coaching, evaluation and feedback

10. Motivation

- Convenience – save time or effort
- Improper behavior is approved, allowed, condoned or rewarded
- Proper behavior is ignored or punished by intended or unintended consequences
- Inadequate reinforcement of proper behavior
- Peer pressure
- Inadequate discipline
- Resistance to change

11. Abuse or Misuse

- Intended
- Unintended

Step 5. Corrective Action Plan

Development of an Action Plan to correct the root cause(s). Consider various systems, and whether or not 1) we have a process [P]; 2) our process consists of adequate standards [S]; and 3) whether we have sufficient compliance with our standards [C].

Improvement Action Guide

1. Leadership (P S C)

Core values
Mission
Policies
Balanced score card
Client alignment
Business processes
Visible leadership
Lead by example

2. Management, Supervision, and Employee Involvement (P S C)

Operations management responsibilities and accountability
Project management procedures
Qualified supervision
Adequate resources
Involvement of SMEs
Employee involvement activities
Standard operating procedures

3. Risk Evaluation (P S C)

PIP
Incorporation of PIP/RMP into project plans
Hazard identification and evaluation
Environmental impact assessment
Customers and stakeholders expectations and change probability
Process risk or hazard analysis
Activity hazard analysis

4. Project Development (P S C)

Understanding requirements
Understanding the contract
Estimating procedures
Bid/proposal review procedures
Inclusion of SMEs

5. Planning (P S C)

Understanding requirements
Understanding the contract
Handoff and tasking
Integration of risk management plans
Identification of requirements
Project plans and plan reviews
Client alignment meetings
Kickoff, MUM, pre-construction meetings
Schedule procedures
Engineering design and review procedures
Submittal development and review
Site layout, facility arrangement and task design
Means and methods
Communication of plans and procedures

6. Procurement and Subcontractor Management (P S C)

Subcontractor pre-qualification
RFP/SOW
Materials and equipment specifications
Selection
Integration
Oversight
Evaluation

7. Risk Controls (P S C)

Risk management plans
Standard operating procedures
Quality control system
Engineering controls
Administrative controls
PPE procedures
Permit procedures
Environmental policies, procedures and controls
Process controls
Accident prevention signs, tags and barricades
Hazardous work permits
Preventive maintenance
Rules
Security controls

8. Human Resources (P S C)

Hiring
Placement/assignment
Training
Competency
Evaluation and feedback
Incentive plans
Level of effort requirements and resource allocation

9. Emergency Procedures (P S C)

Analysis
Plans
Communication and training
Drills and tests
Critique and follow-up
Dedicated supplies
Warnings and alarm systems

10. Communications and Promotions (P S C)

ECCONET postings
Meetings
Tailgates
Orientation, new employee and site-specific
Postings
Promotion campaigns

11. Monitoring and Measuring (P S C)

Progress meetings and reporting
Four-phase process
Inspections
Audits and surveillances
Testing
Exposure monitoring
BSC progress reporting
Client feedback solicitation
Employee perception surveys
Hotline and reporting mechanisms
ECCOSLIPS
PMRs

12. Continuous Improvement (P S C)

Incident reporting
Lessons learned
Action item tracking
Client and stakeholder feedback and follow-through
Employee feedback system
Consultation of LL and incident databases
Change management procedures

13. Management Reviews (P S C)

PMR process
Audit tracking
BSC progress monitoring
Client reporting

Never Compromising Safety

Never Compromising Quality

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APPENDIX D

Data Quality Collection Plan

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DATA COLLECTION QUALITY ASSURANCE PLAN

RSA-217, Inert Storage Warehouse Facilities, Operable Unit 12 Revision 0

ENVIRONMENTAL REMEDIATION SERVICES REDSTONE ARSENAL

July 2023

Prepared for:

U.S. ARMY ENVIRONMENTAL COMMAND
Southeast-Environmental Service and Support Division
2455 Connell Road, Building 2266
Fort Sam Houston, TX 78234-7664

Contract No.: W9124J-18-D-0004, Delivery Order W9124J22F0045

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ACRONYMS AND ABBREVIATIONS

ADEM	Alabama Department of Environmental Management
AERIG	Alabama Environmental Investigation and Remediation Guidance
CMI	Corrective Measures Implementation
DCQAP	Data Collection Quality Assurance Plan
HGL	Hydrogeologic, Inc.
IW	Installation-Wide
QAPP	Quality Assurance Project Plan
RSA	Redstone Arsenal
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan

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1.0 INTRODUCTION

This data collection quality assurance plan (DCQAP) has been developed as a standard document in support of corrective measures implementation (CMI) at RSA-217. This document provides procedures, guidelines, and practices for the control of equipment, materials, and services anticipated to be used during the field sampling phase of the soil confirmation sampling following the excavations at the site.

1.1 Purpose

The purpose of this DCQAP is to define the methodology and practices that control the quality of work performed during implementation of the corrective measures at RSA-217. The objective of this DCQAP is to ensure that the data collected are of sufficient quality to verify that corrective measures have been accomplished. This DCQAP is intended for use in conjunction with the Redstone Arsenal (RSA) installation-wide (IW) Quality Assurance Project Plan (QAPP) (Hydrogeologic, Inc [HGL], 2019). The work guidance documents that will govern the quality practices for this task will include the following:

- The CMI work plan and the associated appendices
- The IW QAPP (HGL, 2019)
- The standard operating project procedures (IW QAPP Volume II) (HGL, 2019)
    - SOP 1.0 – Field Documentation
    - SOP 2.0 – Collection and Field Screening of Soil Samples
    - SOP 4.0 – Investigation-Derived Waste
    - SOP 5.0 – Surface Soil Sampling

Data collection will be in accordance with Alabama Department of Environmental Management (ADEM) Alabama Environmental Investigation and Remediation Guidance (AEIRG) guidance (ADEM, 2017).

1.2 Document Organization

This document has been organized to present the DCQAP in the following format:

- Introduction – Chapter 1.0
- References – Chapter 2.0
- Uniform Federal Policy (UFP) QAPP Worksheets – Chapter 3.0.

Chapter 1.0 provides a brief overview of this DCQAP and introduces the UFP QAPP worksheets. References are included in Chapter 2.0. The worksheets provided in Chapter 3.0 present a description of the proposed work in compliance with the UFP-QAPP format.

2.0 References

Alabama Department of Environmental Management (ADEM). 2017. *Alabama Environmental Investigation and Remediation Guidance, Revision 4.* February.

Hydrogeologic, Inc. (HGL). 2019. *Installation-Wide Uniform Federal Policy Quality Assurance Program Plan, U.S. Army Garrison-Redstone*. December.

3.0 Uniform Federal Policy Quality Assurance Project Plan Worksheets

The quality assurance requirements needed to support the sampling and data collection activities in this work plan were adopted under the UFP for QAPPs and implemented in a graded approach.

For the CMI work plan, the supplemental worksheets include the following:

- Worksheet #12 – Measurement Performance Criteria
- Worksheet #15 – Preliminary Screening Values and Laboratory Specific Limits
- Worksheet #17 – Sampling Design and Rationale
- Worksheet #18 – Sample Locations, Analytical, and SOPP Requirements
- Worksheet #19 & 30 – Sample Containers, Preservation and Hold Times
- Worksheet #20 – Field Quality Control Sample Summary
- Worksheet #23 – Analytical Standard Operating Procedures
- Worksheet #24 – Analytical Instrument Calibration
- Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing and Inspection
- Worksheet #26 – Sample Handling, Custody and Disposal
- Worksheet #28 – Analytical Quality Control and Corrective Action
- Worksheet #36 – Data Validation Procedures

The purpose of this DCQAP is to ensure that the data collected are of sufficient quality to achieve the remedial action goals during the excavation of contaminated soil at RSA-217. The objective of the work plan is to present the sampling rationale and provide the details required to complete the field efforts. The work plan is intended for use in conjunction with the CMI work plan and the IW QAPP.

Worksheet #12: Measurement Performance Criteria

Analytical Method & SOP	DQIs	MPC	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for S, A or both (S&A)
EPA SW 3005B/3010A/ 6020A & MET-002/ MET-004/MET-016	Precision	RPD from **Worksheet #28**	Lab duplicates and LCS/LCSD	A
	Precision	Sampling per QAPP/SOP	Field duplicates and MS/MSD	S&A
	Accuracy/Bias	% Rec. from **Worksheet #28**	LCS	A
	Accuracy/Bias (contamination)	Acceptable Blanks Levels	MB	A
	Accuracy/Bias (contamination)	Sampling per QAP/SOP	Field Blanks and/or Equipment Blanks	S&A
	Completeness	Laboratory Analysis	> 90%	S&A
	Representativeness	Sampling per QAP/SOP	Field Notes	S
	Comparability	Use of promulgated Methodology	QAPP compliance, data review	A
	Sensitivity	PQL/EDL to meet project objectives	ICAL level acceptable, MB acceptable, MRL acceptable	A
EPA SW 3510C/3550B/8270D-SIM & SVOC-001/SVOC-002/SVOC-028	Precision	RPD from Worksheet #28	Lab duplicates and LCS/LCSD	A
	Precision	Sampling per QAP/SOP	Field duplicates and MS/MSD	S&A
	Accuracy/Bias	% Rec. from Worksheet #28	LCS	A
	Accuracy/Bias (contamination)	Acceptable Blanks Levels	MB	A
	Accuracy/Bias (contamination)	Sampling per QAP/SOP	Field Blanks and/or Equipment Blanks	S&A
	Completeness	Laboratory Analysis	> 90%	S&A
	Representativeness	Sampling per QAP/SOP	Field Notes	S
	Comparability	Use of promulgated Methodology	QAPP compliance, data review	A
	Sensitivity	PQL/EDL to meet project objectives	ICAL level acceptable, MB acceptable	A

Notes:
> – Greater Than
% – Percent
% Rec. – Percent Recovery
A – Analytical
DQI – Data Quality Indicator
EB – Equipment Blank
EDL – Estimated Detection Limit
ICAL – Initial Calibration
LCS – Laboratory Control Sample

LCSD – Laboratory Control Sample Duplicate
MB – Method Blank
MET – Metals
MPC – Measurement Performance Criteria
MRL – Modified Reporting Limit
MS – Matrix Spike
MSD – Matrix Spike Duplicate
PQL – Practical Quantification Limits
QAPP – Quality Assurance Project Plan
QC – Quality Control
RPD – Relative Percent Difference
S – Sampling
SOP – Standard Operating Procedure
SW – Solid Waste 846
SVOC – Semivolatile Organic Compound
USEPA – United States Environmental Protection Agency

Worksheet #15: Preliminary Screening Values and Laboratory Specific Limits

Hazardous Constituent	CAS Number	CG	Reference for CG	Laboratory Specific LOQ	Laboratory Specific LOD	Laboratory Specific DL
Soil and IDW						
Arsenic by SW6020A (mg/kg) (Soil and IDW)						
Arsenic	7440-38-2	15	2x background	0.1	0.05	0.025
PAHs by SW 8270D-SIM (µg/kg) (Soil and IDW)						
Benzo(a)pyrene	50-32-8	0.92	Total equivalent benzo(a)pyrene	16	8	4
Dibenz(a,h)anthracene	53-70-3			16	8	4
Aqueous – Equipment Rinsate						
Arsenic by SW6020A (µg/L) (Equipment Rinsate)						
Arsenic	7440-38-2	NA		1.00	0.50	0.25
PAHs by SW8270D-SIM (µg/L) (Equipment Rinsate)						
Benzo(a)pyrene	50-32-8	NA		0.4	0.2	0.1
Dibenz(a,h)anthracene	53-70-3	NA		0.4	0.2	0.1

Notes:

µg/L – micrograms per liter
mg/kg – milligrams per kilogram
CAS – Chemical Abstract System
CG – Cleanup Goal
DL – Detection limit
IDW – Investigative Derived Waste
LOD – Limit of Detection
LOQ – Limit of Quantitation
NA – Not Applicable
PAH – Polycyclic Aromatic Hydrocarbons
PSV – Preliminary Screening Value
SW – Solid Waste 846

Worksheet #17: Sampling Design and Rationale

Sample Location	Sample Media	Sample Location Rationale
Confirmatory Samples		
217-SB002	Surface Soil	Five confirmatory samples will be taken from the five walls of the excavation area (5 foot (ft) x 10 ft x 1 ft). If the initial confirmatory sample results exceed CGs, the excavation will be expanded along the walls or floor where the CG is exceeded.
Borrow Samples		
TBD	Soil	A borrow sample for the fill soil is required if a new, not previously approved, soil source is used for the fill soil. See **Worksheet #18**, **19/30**, and **20** for requirements.

Worksheet #18: Sample Locations, Analytical, and SOP Requirements

Sample Location	Sample Name [a]	Sample Depth (ft bgs)	QC Sample Designation [b]		Analytical Suite	Field SOP
			FD	MS/MSD		
RSA-217 Soil Sample Locations						
217-SB002-N01	217-SB002-N01-SS-ABW4000-REG	0.5			Metals, PAHs	SOP 2.0
217-SB002-E01	217-SB002-E01-SS-ABW4001-REG	0.5	217-SB002-E01-SS-ABW4002-FD			
217-SB002-S01	217-SB002-S01-SS-ABW4003-REG	0.5				
217-SB002-W01	217-SB002-W01-SS-ABW4004-REG	0.5		217-SB002-W01-SS-ABW4004-MS/MSD		
217-SB002-F01	217-SB002-F01-SS-ABW4005-REG	0.5				
If the initial confirmatory sample results exceed CGs, the excavation will be expanded along the walls or floor where the CG is exceeded.						
RSA-217 Borrow Soil Sample [c]						
217-BORROW01	217-BORROW01-SO-ABW5000-REG	NA	217-BORROW01-SO-ABW5001-FDREG	217-BORROW01-SO-ABW5000-MS/MSD	TCL VOCs, TCL SVOCs, TCL Pesticides/PCBs, TAL Metals	SOP 2.0
217-BORROW02	217-BORROW01-SO-ABW5002-REG	NA				

Notes
[a] Sample names will be determined at the time of sampling.
[b] The MS/MSD and FD locations are subject to change due to field conditions. Final FD/MS/MSD designations to be made in the field.
[c] A borrow sample for the fill soil is required if a new, not previously approved, soil source is used for the fill soil.

bgs – Below Ground Surface
CG – Cleanup Goal
FD – Field Duplicate
ft – Feet
MS – Matrix Spike
MSD –Matrix Spike Duplicate
QC – Quality Control
RSA – Redstone Arsenal
SOP – Standard Operating Procedure
SS –Surface Soil

Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times

Analyte/ Analyte Group [b]	Matrix	Analytical Method	Accreditation Expiration Date	Sample Container/ Preservation Requirements [a]	Holding Time	Data Package Turnaround [c]
Soil Samples						
Metals	Soil	SW6020A	4 August 2023	1 – 8oz glass or plastic jar	Preparation – 180 days Analysis – 180 days	15 days
PAHs	Soil	SW8270D-SIM	4 August 2023	1 – 8oz glass jar with Teflon lid	Preparation – 14 days Analysis – 40 days	15 days
ERB Sample						
Metals	Water	SW6020A	4 August 2023	1 – 500 mL poly, HNO_3 to pH < 2	Preparation – 180 days Analysis – 180 days	15 days
PAHs	Water	SW8270D-SIM	4 August 2023	2 – 1 Liter amber glass	Preparation – 7 days Analysis – 40 days	15 days
IDW Soil						
Metals	Soil	SW6020A	4 August 2023	1 – 8oz glass or plastic jar	Preparation – 180 days Analysis – 180 days	15 days
PAHs	Soil	SW8270D-SIM	4 August 2023	1 – 8oz glass jar with Teflon lid	Preparation – 14 days Analysis – 40 days	15 days
Borrow Pit Samples						
TCL VOCs	Soil	SW8260C	4 August 2023	3 –TerraCores in Methanol/sodium bisulfate	Analysis – 14 days	15 days
TCL SVOCs	Soil	SW8270D	4 August 2023	1 – 4 oz jar	Preparation – 14 days Analysis – 40 days	15 days
TAL Metals	Soil	SW6010C/7471B	4 August 2023	1 – 4 oz jar	Preparation – 180 days; Hg 28 days Analysis – 180 days; Hg 28 days	15 days
Pesticides	Soil	SW8081B	4 August 2023	1 – 4 oz jar	Preparation – 14 days Analysis – 40 days	15 days
PCBs	Soil	SW8082A	4 August 2023	1 – 4 oz jar	Preparation – 14 days Analysis – 40 days	15 days

Notes:

a) All samples should be cooled to 4 ± 2°C in conjunction with preservation requirements noted prior to shipment to the laboratory.
b) See **Worksheet #15** for the analyte list per method.
c) Sample deliverables should include a Level IV, Contract Laboratory Program (CLP)-like data package and Electronic Data Deliverable (EDD) for all samples with the exception of IDW samples that require certificates of analysis and EDD only.

< – Less Than
°C – Degrees Celsius
ERB – Equipment Rinsate Blank
HDPE – High-density Polyethylene
HNO_3 – Nitric Acid
IDW – Investigative-derived waste
mL – Milliliter
PAH – Polycyclic Aromatic Hydrocarbons
SW – Solid Waste
USEPA – United States Environmental Protection Agency
VOC – Volatile Organic Compound

Worksheet #20: Field Quality Control Sample Summary

Parameters [c]	Analytical Method	Total # of Samples	FD	MS	MSD	ER (1/event)	TB (1/cooler)	TAT Needed [a]	Sample Container/ Preservation Requirements [b]	Holding Time	Total # of Containers
Soil Samples											
Metals	SW6020A	5	1	1	1	0	0	Normal	1 – 8oz glass or plastic jar	180 days	8
PAHs	SW8270D-SIM	5	1	1	1	0	0	Normal	1 – 8oz glass	Preparation – 14 days Analysis – 40 days	8
Equipment Rinsate Blank											
Metals	SW6020A	0	0	0	0	1	0	Normal	1 – 500 mL HDPE with HNO_3	180 days	1
PAHs	SW8270D-SIM	0	0	0	0	1	0	Normal	1 – 250 mL amber glass	Preparation – 7 days Analysis – 40 days	1
IDW Soil Samples											
Metals	SW6020A	1	0	0	0	0	0	Normal	1 – 8oz glass or plastic jar	180 days	1
PAHs	SW8270D-SIM	1	0	0	0	0	0	Normal	1 – 8oz glass	Preparation – 14 days Analysis – 40 days	1
Borrow Pit Samples											
TCL VOCs	SW8260C	1	1	1	1	0	0	Normal	3 –TerraCores in Methanol/sodium bisulfate	Analysis – 14 days	4
TCL SVOCs	SW8270D	1	1	1	1	0	0	Normal	1 – 4 oz jar	Preparation – 14 days Analysis – 40 days	4
TAL Metals	SW6010C/7471B	1	1	1	1	0	0	Normal	1 – 4 oz jar	Preparation – 180 days; Hg 28 days Analysis – 180 days; Hg 28 days	4
Pesticides	SW8081B	1	1	1	1	0	0	Normal	1 – 4 oz jar	Preparation – 14 days Analysis – 40 days	4
PCBs	SW8082A	1	1	1	1	0	0	Normal	1 – 4 oz jar	Preparation – 14 days Analysis – 40 days	4

Notes:

a) Sample deliverables should include a Level IV, Contract Laboratory Program (CLP)-like data package and Electronic Data Deliverable (EDD) for all samples.

b) All samples should be cooled to 4 plus or minus (±) 2 degrees Celsius (°C) in conjunction with preservation requirements noted prior to shipment to the laboratory.

c) See **Worksheet #15** for the analyte list per method.

< – less than
ER – equipment rinsate
FD – field duplicate
HPDE – high-density polyethylene
HNO_3 – nitric acid
mL – milliliter
MS – matrix spike
MSD – matrix spike duplicate
SW – Solid Waste
TAT – turnaround time

Worksheet #23: Analytical Laboratory Standard Operating Procedures

Analyte Group	Laboratory SOP #	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work (Y/N)
Metals	MET-002	Method USEPA SW3010A: Acid digestion of aqueous samples and extracts, Rev. 17, Eff. 2023-03-03	Definitive	Metals Aqueous Sample Preparation	NA	AEL	N
	MET-004	Acid Digestion of Sediments, Sludges, and Soils, Rev. 15, Eff. 2021-02-12	Definitive	Metals Solids Sample Preparation	NA	AEL	N
	MET-016	Method SW 6020A and B: Determination of Trace Elements in Waters and Wastes by ICP-MS, Rev. 14, Eff. 2021-02-12	Definitive	Metals Aqueous Sample Analysis	ICP-MS	AEL	N
PAHs	SVOC-001	Method 3510C: Separatory Funnel Liquid-Liquid Extraction, Rev. 07, Eff. 2020-03-27	Definitive	PAH Aqueous Sample Preparation	NA	AEL	N
	SVOC-002	Method 3550B and 3550C, Rev. 08, Eff. 2023-02-07	Definitive	PAH Solid Sample Preparation	NA	AEL	N
	SVOC-028	Method 8270C/D/E SIM: SVOCs by GC/MS in SIM, Rev. 12, Eff. 2020-12-22	Definitive	SIM PAH Sample Analysis	GC/MS	AEL	N

Notes:

AEL – Advanced Environmental Laboratories
Eff – Effective
GC/MS – Gas Chromatography-Mass Spectrometry
ICP-MS – Inductively Coupled Plasma-Mass Spectrometry
NA – not applicable
PAH – Polycyclic Aromatic Hydrocarbons
Rev – Revision
SIM – Selected Ion Monitoring
SOP – Standard Operating Procedure
USEPA – United States Environmental Protection Agency

Laboratory Point of Contact and Addresses

Laboratory Point of Contact:

Advanced Environmental Laboratories, Inc. (AEL) will perform the analysis for all samples.
Craig Meyers (AEL Client Services Manager)
Voice: 904-363-9350 Ext. 202
FAX: 904-363-9354
After Hours/Emergency: 904-710-7158 cmyers@aellab.com

Laboratory Addresses:

For shipments Monday through Thursday, ship to:

Attn: Sample Receiving
Advanced Environmental Laboratories, Inc. 6681 Southpoint Parkway
Jacksonville, Florida 32216
904-363-9350

For shipments for Friday or Saturday delivery, there are specific instructions, they will be shipped and held for pickup at the following FedEx location across the street from the lab:

Attn: AEL
FedEx Shipping Center
3736 N Salisbury Road
Jacksonville, Florida 32216
800-463-3339

Worksheet #24: Analytical Instrument Calibration

Instrument	Calibration Procedure	Calibration Range	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
ICP-MS	LDR	High standard(s) at the upper limit of the range	At initial setup and every six months	To establish an upper limit where TV ± 10%	Data cannot be reported above upper limit within qualification or running a higher passing standard	Analyst	MET-016, Sections 13
	Tune Check	N/A	Daily before ICAL	Mass Calibration Less than or equal to 0.1 amu from the true value; Resolution < 0.9 amu full width at 10% peak height.	Retune Instrument	Analyst	
	IS	All QC and Samples	All QC and Samples	30-120% of Intensity in ICAL Blank	All samples out of range are to be diluted and rerun until IS returns to calibration range.	Analyst	MET-016, Sections 12, 13
	ICAL	Low point Varied per Analyte. Pb and Fe are at 10000, 20000, and 100000 ppb. Remaining Analytes are at 10, 20, and 100 ppb.	Daily	Linear least squares regression for each analyte ≥0.99	Correct problem, rerun ICAL.	Analyst	MET-016, Sections 12, 13
	ICV	Pb and Fe at 50,000 ppb. All other analytes at 50 ppb.	Daily after ICAL.	All target elements ± 10% of true value	Correct problem, rerun ICV. If that fails, repeat ICAL.	Analyst	

Instrument	Calibration Procedure	Calibration Range	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
	CCV	Pb and Fe at 20,000 ppb. All other analytes at 20 ppb.	Every 10 field samples	All target elements ± 10% of true value	Immediately analyze two additional CCVs. If both pass, samples can be reported. If either fails, repair problem, rerun samples with new passing CCV. May require new ICAL. If reanalysis not possible, data must be qualified with case narration.	Analyst	
	LLCCV	Varied per Element.	Daily after ICAL.	All target elements ± 20% of true value	Correct problem, rerun ICAL.	Analyst	
GC/MS	Tune Check	Ion ratio verified	Every 12 hours and beginning of the analytical batch.	Specific ion abundance criteria for DFTPP tune solution.	Retune Instrument	Analyst	SVOC-028, Sections 12, 13, 24
	Tailing and Degradation Check	50 µg/mL	Every 12 hours and beginning of the analytical batch.	Degradation of DDT ≤ 20%, Benzidine and pentachlorophenol tailing factor < 2	Correct problem (Change liner and/or trim column)	Analyst	SVOC-028, Sections 12, 13, 24
	Resolution Check	20 µg/mL	Every 12 hours and beginning of the analytical batch.	Resolution Criteria - The height of the valley between the 2 isomers (benzo(b) and benzo(k)) must be less 50% of the average height of the 2 peak heights. Correct problem and re-analyze all QC and project	Correct problem (Change liner and/or trim column)	Analyst	SVOC-028, Sections 14, 24
	Initial Calibration	For PAH analytes, 0.025 to 100 mg/L on instrument. All other analytes, 5 to 100 mg/L.	At instrument set-up and after ICV or CCV failure, prior to sample analysis	Either RSD for each analyte ≤15%; linear or quadratic least squares regression for each analyte ≥0.99	Correct problem then repeat ICAL	Analyst	SVOC-028, Sections 10, 13, 16, 24

Instrument	Calibration Procedure	Calibration Range	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
	Initial Calibration Verification (ICV)	At concentration level ± 25-50% of curve range	Once after ICAL	All target analytes within ± 20% of true value	Correct problem. Rerun ICV. If fails, repeat ICAL	Analyst	SVOC-028, Sections 10, 13, 16, 24
	Retention Time (RT) Windows Verification	NA	At ICAL at midpoint and daily at beginning CCV	Internal Standards shift ≤ 10 seconds otherwise reset. Analytes reported within ± 0.06 RRT	NA	Analyst	SVOC-028, Sections 12, 14, 16, 24
GC/MS	Continuing Calibration Verification (CCV)	At concentration level ± 25-50% of curve range	Daily before sample analysis, every 12 hours thereafter, and close of analysis	All target analytes within ± 20% of true value. Closing CCV ± 50%	Immediately analyze two additional CCVs. If both pass, samples can be reported. If either fails, repair problem, rerun samples with new passing CCV. May require new ICAL. If reanalysis not possible, data must be qualified with case narration.	Analyst	SVOC-028, Sections 10, 13, 24
	Internal Standards (IS)	All QC and Samples	All QC and Samples	Retention Time within ± 10 seconds at ICAL midpoint or first daily CCV. Area Counts -50% to +100% midpoint standard	Correct problem, reanalyze samples.	Analyst	SVOC-028, Sections 16, 24

Notes:

± – Plus or Minus
< – Less Than
≤ – Less than or Equal to
≥ – Greater than or Equal to
% – Percent
µg/mL – Microgram per Milliliter
amu – Atomic Mass Unit
CA – Corrective Action
CCB – Continuing Calibration Blank
CCV – Continuing Calibration Verification
DDT – Dichlorodiphenyltrichloroethane
DFTPP – Decafluorotriphenylphosphine
Fe – Iron
GC/MS – Gas Chromatography/Mass Spectrometry
ICAL – Initial Calibration
ICV – Initial Calibration Verification
IS – Internal Standard
LDR – Linear Dynamic Range
MET – metals
LLCCV – Low Level Calibration Check Standard
MET – Metals
PAH – Polycyclic Aromatic Hydrocarbons
Pb – Lead
ppb – Parts per Billion
QC – Quality Control
RPD – Relative Percent Difference
RSD – Relative Standard Deviation
RT – Retention Time
SOP – Standard Operating Procedure
SVOC – Semivolatile Organic Compound
TV – True Value

Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity/Preventive Maintenance	Frequency	Acceptance Criteria	CA	Title/ Position Responsible for CA	Reference
ICP-MS	Pump/tubing	Initial and Continuing Calibration Verifications (ICV and CCV)	• Checked daily • Replaced every 2 to 3 days	As Listed with Inspection	Method blanks < DL, ICAL, ICV, CCV, peak shape, & LCS, Area Counts, surrogate limits as seen on **Worksheet #28**	Normal replacement	Analyst	MET-016
	Sample introduction		• All sample introduction items, nebulizer, injector tip, spray chamber and torch are cleaned and sonicated in a HNO_3 and HCl aqua-regia solution as needed. Dependent on sample load and sample concentrations.	As Listed with Inspection	MB, CCB, and QC passing criteria	Normal maintenance		
	Cones		• Cones are removed and cleaned in HNO_3 and sonicated. Replaced with new as needed.	As Listed with Inspection	Passing tunes and QC criteria.	Clean or replace as needed		
	Interference Checks		• Performance Maintenance	As needed	MB, CCB, and QC passing criteria	Performance Maintenance	Manufacturer's Instrument Technician	
	Chiller/Compressor		• Clean screens check and add fluid monthly • Drain and replace compressor oil monthly	As Listed with Inspection	Set to proper fluid levels	Set to proper fluid levels	Analyst.	

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity/Preventive Maintenance	Frequency	Acceptance Criteria	CA	Title/ Position Responsible for CA	Reference
GC/MS	Column/liner performance	ICAL and CCVs	• shape and tailing of chromatographic peaks continuously • monitor trending in surrogate & standard recoveries continuously • changes in tuning daily IB baselines continuously	As Listed with Inspection	MBs < DL, ICAL, ICV, CCV peak shape, & LCS, Internal Area Counts, surrogate limits as seen on **Worksheet #28**	Trim or replace column. Replace liner.	Analyst	SVOC-028
	Vacuum System		• Check level of oil in rotary pump quarterly Replace oil in vacuum rotary pump annually		Levels within level check marks	Add or change oil		
	Ion source/ chamber		• Clean MS ion source, check pre-rods and lenses quarterly Deep cleaning of MS including ion source, pre-rods and lenses semi-annually or as needed.		Passing Tune criteria	Clean and/or replace ion source parts.	Senior Analyst/ Department Supervisor	
	Filament		Check filaments condition (filaments are replaced through the year as needed)		Passing Tune criteria, Passing QC, Area Counts and Sensitivity.		Analyst	

Notes:

% – percent
< – Less than
CA – Corrective Action
CCB – Continuing Calibration Blank
CCV – Continuing Calibration Verification
DL – Detection Limit
HCl – Hydrochloric Acid
HNO_3 – Nitric Acid
ICAL – Initial Calibration
ICP-MS – Inductively Coupled Plasma-Mass Spectrometry
ICV – Initial Calibration Verification
LCS – Laboratory Control Sample
MB – Method Blank
MET – Metals
MS – Mass Spectrometry
QC – Quality Control

Worksheet #26: Sample Handling, Custody, and Disposal

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT (FIELD)
Sample Collection (Personnel/Organization): ECC/Bhate Personnel TBD
Sample Packaging (Personnel/Organization): ECC/Bhate Personnel TBD
Coordination of Shipment (Personnel/Organization): ECC/Bhate Personnel TBD
Type of Shipment/Carrier: Cooler/Lab Courier, FedEx
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): AEL Laboratory Personnel
Sample Custody and Storage (Personnel/Organization): AEL Laboratory Personnel
Sample Preparation (Personnel/Organization): AEL Laboratory Personnel
Sample Determinative Analysis (Personnel/Organization): AEL Laboratory Personnel
SAMPLE ARCHIVING
Field Sample Storage (number of days from sample collection): 60 days from receipt
Sample Extract/Digestate Storage (number of days from extraction/digestion): 3 months from sample extraction/digestion
Biological Sample Storage (number of days from sample collection): NA
SAMPLE DISPOSAL
Personnel/Organization: AEL Laboratory Personnel
Number of Days from Analysis: 30 days from submittal of Final report or 60 days from receipt, whichever is longer

Notes:
AEL – Advanced Environmental Laboratories
Bhate – Bhate Environmental Associates, Incorporated
ECC – Environmental Chemical Corporation
NA – not applicable
TBD – To be determined

Post sample collection in the field will be conducted in accordance with Standard Operating Projected Procedure (SOPP) 15.0 *Non-Hazardous Sample Handling, Packaging, and Shipping.* This procedure is located in the Installation-Wide – Quality Assurance Project Plan (IW-QAPP), Volume II (HGL, 2019).

Specific laboratory sample custody procedures (receipt of samples, archiving, and disposal) will be used for all post-sample handling. Coolers will be received and checked for proper temperature. A sample cooler receipt form will be filled out to note the conditions and any discrepancies. The chain of custody will be checked against the sample containers for correctness. Samples will be logged into the data base and given a unique log number, which can be tracked through processing. The Project Chemist will be notified of any problems.

Worksheet #28: Analytical Quality Control and Corrective Action

Analytical Group: Metals
Analytical Method/SOP Reference: USEPA 3005B/3010A/6020A by MET-002, MET-004 & MET-016

QC Sample	Number / Frequency	Method / SOP QC Acceptance Limits	Corrective Action	Title of Person Responsible for Corrective Action	Project Specific MPC
MB	Once every prep/analytical batch of 20 or fewer samples	No analyte detected equal to or above the DL or > 1/10 the regulatory limit, whichever is greater (DoD: No analytes > ½ LOQ; common lab contaminants none detected > LOQ)	Correct problem. If required, reprep and reanalyze MB and all QC samples and field samples processed with the contaminated blank. If not enough sample volume to re-prep, data qualified with case narration.	Analyst with Department Supervisor and QA Officer review.	MB detections used to qualify project samples per validation guidance
ICB/CCB	Immediately after the ICV and immediately after every CCV	The absolute values of all analytes must be > ½ LOQ	ICB: Correct problem and repeat ICV/ICB analysis. If that fails, rerun ICAL. All samples following the last acceptable Calibration Blank must be reanalyzed. CCBs may not be reanalyzed without reanalysis of the associated sample and CCV(s)	Analyst with Department Supervisor review.	Same as Method/SOP
ICS	After ICAL and prior to sample analysis	Absolute value of concentration for all non-spiked target analytes < ½ LOQ (Unless there are a verified trace impurity from one of the spiked analytes)	Stop analysis and locate problem. Correct problem and reanalyze ICS and all associated samples.	If corrective action fails and reanalysis cannot be performed, qualify data accordingly and notify client and or case narrate.	
LCS	Once every prep/analytical batch of 20 or fewer samples	QC limits set in QSM 5.4 LCS tables or in-house generated limits when DoD limits unavailable.	Correct problem. If required, reprep and reanalyze LCS and all QC samples and field samples processed in batch. If not enough sample volume to re-prep, data qualified with case narration.	Analyst with Department Supervisor and QA Officer review.	
MS	Once every prep/analytical batch of 10 or fewer samples	QC limits set in QSM 5.4 LCS tables or in-house generated limits when DoD limits unavailable.	When outside limits examine project specific requirements and/or contact client. Flag data appropriately.	Analyst with Department Supervisor review.	
MSD	Once every prep/analytical batch of 10 or fewer samples	QC limits set in QSM 5.4 LCS tables or in-house generated limits when DoD limits unavailable. RPD of all target compounds ≤ 20% between MS and MSD.			

Analytical Group: Metals
Analytical Method/SOP Reference: USEPA 3005B/3010A/6020A by MET-002, MET-004 & MET-016

QC Sample	Number / Frequency	Method / SOP QC Acceptance Limits	Corrective Action	Title of Person Responsible for Corrective Action	Project Specific MPC
Dilution Test	When MS or MSD fails	5-fold dilution must agree within ± 10% of original measurement	No specific corrective action unless a stated project requirement. Flag accordingly.		
PDS	When MS or MSD fails using same parent sample of failure.	Recovery within ±80-120%		Analyst with Department Supervisor review.	Same as Method/SOP

Analytical Group: PAHs
Analytical Method/SOP Reference: USEPA 3510C / 8270D-SIM by SVOC-001, SVOC-002 & SVOC-028

QC Sample	Number / Frequency	Method / SOP QC Acceptance Limits	CA	Title of Person Responsible for CA	Project Specific MPC
MB	Once every prep/analytical batch of 20 or fewer samples	No analyte detected ≥ DL or > 1/10 the regulatory limit, whichever is greater; (DoD: No analytes > ½ LOQ; common lab contaminants none detected > LOQ)	Correct problem. If required, reprep and reanalyze MB and all QC samples and field samples processed with the contaminated blank. If not enough sample volume to re-prep, data qualified with case narration.	Analyst with Department Supervisor and QA Officer review.	MB detections used to qualify project samples per validation guidance
LCS	Once every prep/analytical batch of 20 or fewer samples	QC limits set in QSM 5.4 LCS tables or in-house generated limits when DoD limits unavailable.	Correct problem. If required, reprep and reanalyze LCS and all QC samples and field samples processed in batch. If not enough sample volume to re-prep, data qualified with case narration.	Analyst with Department Supervisor and QA Officer review.	Same as Method/SOP
MS			When outside limits examine project specific requirements and/or contact client. Flag data appropriately.		
MSD		QC limits set in QSM 5.4 LCS tables or in-house generated limits when DoD limits unavailable. RPD of all target compounds ≤ 20% between MS and MSD.			
Surr	All samples and QC (except tune)	QC limits set in QSM 5.4 tables or in-house generated limits when DoD limits unavailable.	Action dependent upon type. If MB or LCS, correct problem and reprep-reanalyze all associated samples. If sample, examine matrix. If obvious chromatographic interferences, reanalysis may not be required. Qualify recovery data and notify and/or case narrate.		

Notes:

% – Percent
< – Less Than
≤ – Less Than or Equal To
> – Greater Than
CCB – Continuing Calibration Blank
DL – Detection Level
DoD – Department of Defense
ICAL – Initial Calibration
ICB – Initial Calibration Blank
ICS – Interference Check Solutions
LCS – Laboratory Control Spike
LOQ – Limit of Quantitation
MB – Method Blank
MPC – Measurement Performance Criteria
MS – Matrix Spike
MSD – Matrix Spike Duplicate
PDS – Post Digestion Spike
QA – Quality Assurance
QC – Quality Control
QSM – Quality Systems Manual
RPD – Relative Percent Difference
SOP – Standard Operating Procedure
USEPA – United States Environmental Protection Agency

Worksheet #36: Data Validation Procedures

This worksheet documents procedures that will be used to validate project data. Data validation is an analyte and sample-specific process for evaluating compliance with contract requirements, methods/Standard Operating Procedures (SOPs), and Measurement Performance Criteria (MPC).

All project field samples will undergo a Tier 1 Plus (Department of Defense [DoD] Quality Systems Manual [QSM] Stage 2B) data validation using lab limits as the MPC. Investigation-Derived Waste (IDW) samples will be reviewed for completeness only.

Data validation will be documented on Environmental Chemical Corporation (ECC) Data Validation Worksheets (DVW). Project electronic data deliverables (EDDs) (ECC Environmental Data Management System [EDMS] EDD and Environmental Remediation Information System [ERIS]) will be updated with Installation-Wide-Quality Assurance Project Plan (IW-QAPP) data validation qualifiers and rationale for validation qualifications provided in the DVW.

- U – Not detected by the lab or as a result of qualifying data due to cross contamination as determined by blank evaluation less than five times blank level) during data validation.
- UJ – Not detected with estimated reporting limits. Assigned due to data validation exceedance.
- R – Rejected data. Data determined to be unusable during data validation.

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator
IIa	Subsurface Soil	Metals, PAHs	Low/Medium	Laboratory MPC evaluated in accordance with applicable USEPA National Functional Guidelines as applicable to analytical methods listed in this appendix.	ECC Project Chemist or designate

Notes:

ECC – Environmental Chemical Corporation
MPC – Measurement Performance Criteria
PAH – Polycyclic Aromatic Hydrocarbons
USEPA – United States Environmental Protection Agency