State of Utah

GARY HERBERT
Governor

GREG BELL
Lieutenant Governor

Department of
Environmental Quality

Amanda Smith
Executive Director

DIVISION OF SOLID AND
HAZARDOUS WASTE
Scott T. Anderson
Director

October 1, 2013

Colonel Roger L. McCreery, Commander
Tooele Army Depot – South
JMTE-GMV, Building 5119
Attention: Troy Johnson
1 Tooele Army Depot
Tooele Army Depot
Tooele, Utah 84074-5000

RE: Overburden Soil Stockpile Sample Results
Solid Waste Management Unit (SWMU) 2
Tooele Army Depot South Area (TEAD-S)
UT5210090002

Dear Colonel McCreery:

The Division of Solid and Hazardous Waste has completed its review of the analytical results from the overburden soil sampling at SWMU 2 that was submitted on August 27, 2013. Your request to stockpile and utilize the soil at a later date as backfill is hereby approved. Use of additional soil that is excavated at the site in the future will depend on the analytical characterization of that soil.

If you have any questions, please call John Waldrip at (801) 536-0238.

Sincerely,

Scott T. Anderson, Director
Division of Solid and Hazardous Waste

STA/JTW/kk

c: Myron Bateman, EHS, MPA, Health Officer, Tooele County Health Department
Jeff Coombs, EHS, Environmental Health Director, Tooele County Health Department
Troy Johnson, TEADS
Nancy Morlock, Region 8 EPA

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KEMRON ENVIRONMENTAL SERVICES

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MEMORANDUM

To: Allyn Allison, COR

From: Jeff Gunn, Project Manager

CC: Tracy Bergquist, Cathy Etheredge, Brian Barker

Date: 29 April 2014

Re: Recommendations for management of SWMU 2 Stockpiles 2, 3 & 4

This memorandum provides;

1. Revised conclusions and recommendations for management of soils associated with Overburden Stockpiles 2, 3, and 4 generated during intrusive activities in support of the SWMU 2 Interim Remedial Action at DCD, Tooele, Utah. The updated recommendations incorporate comments received from the Utah Department of Environmental Quality (UDEQ) Division of Solid and Hazardous Waste on 21 April 2014.
2. Proposed revised sampling and analysis approach for waste characterization of Overburden Stockpile #2 in support of the SWMU 2 Interim Remedial Action, DCD, Tooele, Utah.

1. Revised Conclusions and Recommendations for Stockpile Management

Background

Grab samples were collected from Overburden Stockpiles 2, 3, and 4 at a frequency of one per 500 cubic yards of soil in accordance with the Interim Remedial Action Work Plan (UXB-KEMRON, 2012). Table 1 presents the stockpile volumes and sampling frequency for the three (3) overburden soil stockpiles. Following receipt of ECBC data that were below applicable decision criteria, sample aliquots were submitted to TestAmerica for remaining waste characterization analytes (Table 1).

Table 1 – Stockpile Sample Summary

Stockpile #	Sample ID(s)	Stockpile Dimensions	Volume	Analyses
Overburden Stockpile 2	S2WC-S201	104’ x 52’ x 2’	400 cy	**ECBC:** H, 1,4-Dithiane, 1,4-Thioxane, and TDG **TestAmerica:** VOCs, SVOCs, Explosives, Organosulfur and TCDs, CWM Degradates, Perchlorate, Metals, White Phosphorous, as well as TCLP VOC, TCLP SVOC, TCLP Pesticides, TCLP Herbicides, TCLP Metals, and RIC
Overburden Stockpile 3	S2WC-S301	102’ x 16’ x 2’	120 cy	
Overburden Stockpile 4	S2WC-S401 S2WC-S402 S2WC-S403	198’ x 46’ x 3’	1012 cy	

Data Summary

Analytical data results for the overburden stockpiles were presented in a memorandum to UDEQ dated 13 January 2014. A recommendation to use Overburden Stockpiles 2, 3, and 4 as site backfill was included in this memorandum. This memorandum was subsequently reviewed by UDEQ with comments provided to KEMRON on 21 April 2014.

UDEQ commented that "UAC R315-101-3 requires considering the soil to groundwater pathway in making decisions about how to manage a site and how to manage soil removed from a site. The soil may not be hazardous waste or represent a health risk, but may represent a source of groundwater contamination and may need to be disposed in a lined landfill." UDEQ commented that evaluating the soil to groundwater pathway yields the following revisions to data interpretation and findings for Overburden Stockpiles 2, 3, and 4:

- Hexachloroethane was detected at 1.4 mg/kg in sample S201. UDEQ states that hexachloroethane has a dilution attenuation factor (DAF) 20 soil to groundwater value of 0.058 mg/kg, and this level was exceeded;
- UDEQ commented that the data show tetrachloroethylene (PCE) at low concentrations in all the samples and PCE exceeds the risk-based DAF 20 soil to groundwater value (0.001 mg/kg) in 3 of 5 samples. UDEQ states that PCE was not detected above the MCL- based soil to groundwater value; and
- Pentachlorophenol (PCP) also exceeded its risk-based soil to groundwater value.

In response to UDEQ comments and subsequent discussion by the team, decision criteria applying the Maximum Contaminant Level (MCL)-based residential soil screening level (SSL) if available, or the risk-based residential soil screening level protective of groundwater were derived for the three chemicals (hexachloroethane, PCE, and PCP). Using the EPA Regional Screening Level On-Line Calculator http://www.epa.gov/region9/superfund//prg/index.html) to determine a DAF 20 residential MCL- or risk-based SSL protective of groundwater produces the following criteria:

- Hexachloroethane – the residential risk-based SSL (an MCL-based SSL is not available) DAF 20 is 0.096 mg/kg;
- PCE – the residential MCL- based SSL using a DAF 20 is 0.045 mg/kg; and
- PCP – the residential MCL- based SSL using a DAF 20 is 0.02 mg/kg.

Conclusions / Recommendations

The purpose of collecting and submitting overburden stockpile samples for fixed laboratory analysis is to ensure the proper reuse or disposal of site-generated soils. According to the Interim Remedial Action Work Plan (UXB-KEMRON 2012), overburden soils can be used as site backfill at SWMU 2 provided all Action Limits have been met.

Based on the initial screening of the data, hexachloroethane, PCE, and PCP are the only compounds that exceed the residential SSLs protective of groundwater when applying a conservative DAF of 1. Therefore, only analytical data for the three compounds were compared to a calculated residential SSL DAF 20 as previously discussed. Please refer to the initial

technical memorandum dated 13 January 2014 for a complete discussion of data quality, data interpretation, and recommendations and conclusions for the remaining overburden stockpile site-related analytes.

Extraction of sample aliquots using toxicity characteristic leaching procedure (TCLP) was performed as summarized in the 13 January 2014 memorandum. Reported TCLP concentrations for all Overburden Stockpiles 2, 3, and 4 samples were below regulatory levels.

As shown in Table 2, all analytes representing Overburden Stockpiles 3 and 4 yielded detected concentrations less than their respective residential SSL protective of groundwater. Based on these conclusions, it is recommended that soils comprising Overburden Stockpiles 3 and 4 be used as on-site backfill with no limitations.

2. Proposed revised sampling and analysis approach for waste characterization of Overburden Stockpile #2

Overburden Stockpile 2 had detected concentrations of hexachloroethane and PCP exceeding their respective residential MCL-based SSLs protective of groundwater based on the results of one grab sample (Table 2). It is recommended that additional soil samples be collected to better characterize hexachloroethane and PCP concentrations throughout Stockpile 2 allowing for more definitive recommendations regarding soil handling and disposal.

Table 2 – Comparison of Analytical Data to MCL-based SSLs protective of groundwater

Analyte	Analytical Result – Stockpile 2 (S2WC-S201) (mg/kg)	Analytical Result – Stockpile 3 (S2WC-S301)	Analytical Result – Stockpile 4 (S2WC-S401)	Analytical Result – Stockpile 4 (S2WC-S402)	Analytical Result – Stockpile 4 (S2WC-S403)	MCL-Based Soil Screening Level	Exceed SSL?
Hexachloro-ethane	**1.4**	ND	ND	ND	ND	0.096	YES, Stockpile 2
PCE	0.0091	0.016	0.00085	0.002	0.00066	0.045	NO
PCP	**0.2**	ND	ND	ND	ND	0.02	YES, Stockpile 2

KEMRON requests permission from the Utah Department of Environmental Quality (UDEQ) to apply the revised sampling and analysis approach as detailed below to more accurately characterize Overburden Stockpile #2. Results of additional analysis will be used to determine if Overburden Stockpile #2 can be used as on-site backfill or need to be disposed off-site.

Background

One waste characterization soil sample (S2WC—S201) was collected from Overburden Stockpile #2 according to the procedures and frequency outlined in the *Final Interim Remedial Action Work Plan* (UXB-KEMRON, 2012). The Work Plan states that one grab sample will be collected for every 500 cubic yards of overburden soil, whereas one composite sample will be collected for every 100 cubic yards of potential MEC-contaminated soil. Since Overburden Stockpile #2 measured 400 cubic yards, one grab sample was collected on 16 October 2013 to support waste characterization.

Results of S2WC-S201 were compared to the site-specific criteria (U.S. Environmental Protection Agency Residential Regional Screening Levels protective of inhalation, ingestion, and dermal contact) as presented in the Final Work Plan (UXB-KEMRON, 2012). S2WC-S201 analytical results were below criteria with the exception of arsenic, which yielded a result within the background range for naturally-occurring arsenic in soil. A detailed discussion of S2WC-S201 results was presented in a memorandum to UDEQ dated 13 January 2014.

Based on the results of the Overburden Stockpile #2 sample (S2WC-S201), KEMRON requested approval for use of Overburden Stockpile #2 as site backfill in accordance with the Final Work Plan (UXB-KEMRON, 2012). However, UDEQ rejected this request based on exceedances of tetrachloroethylene, hexachloroethane, and pentachlorophenol when compared to EPA Residential Maximum Contaminant Level (MCL) or Risk-Based Soil Screening Level (SSL) protective of groundwater values.

Path Forward

In response to UDEQ comments, site-specific criteria were developed for tetrachloroethylene, hexachloroethane, and pentachlorophenol based on the MCL and risk-based SSLs protective of groundwater. Soil screening levels as listed below (Table 3 - DAF 20) were calculated applying a dilution attenuation factor (DAF) of 20 to account for natural processes that reduce contaminant concentrations in the subsurface.

Table 3 – DAF 20

Analyte	S2WC-S201 Result (mg/kg)	Level of Quantitation (mg/kg)	Level of Detection (mg/kg)	Method Detection Limit (mg/kg)	Residential RSL (mg/kg)	MCL-based Soil Screening Level (DAF-20) (mg/kg)	Risk Based Soil Screening Level (DAF-20) (mg/kg)
Hexachloroethane	1.4	0.37	0.19	0.091	12	NA	0.0096
Pentachlorophenol	0.2 (J)	0.37	0.19	0.057	0.89	0.02	0.0072
Tetrachloroethene	0.0091	0.006	0.0012	0.00073	0.55	0.045	0.086

In response to comments received in an email from Dave Larsen (UDEQ Division of Solid and Hazardous Waste) dated 21 April 2014 to Paige Walton (TEAD-South), KEMRON requests approval of the revised sampling and analysis approach for waste characterization of Overburden Stockpile #2 as follows:

- Collection of (3) additional grab samples from Overburden Stockpile #2 to remain consistent with previous collection methods (e.g. grab sample) while increasing the sample frequency to one sample per 100 cubic yards (includes existing sample S2WC-S201);
- Analysis of potential chemical agent compounds by ECBC per Final Interim Remedial Action Work Plan (UXB-KEMRON, 2012);
- Analysis of semi-volatile organic compounds (SVOC) by Method SW8270C; no additional munitions constituent analytes are recommended since hexachloroethane and pentachlorophenol remain the only compounds of potential concern associated with this stockpile;
- Adherence to Level of Detection and Method Detection Limits as specified in the Quality Assurance Project Plan (QAPP) Table 15-2;
- Calculation of hexachloroethane and pentachlorophenol concentrations by arithmetic mean of the four waste characterization samples collected for Overburden Stockpile #2;
- Comparison of analytical data to DAF 20 (MCL-based SSL or, when not available, to risk-based SSLs protective of groundwater for each analyte.

Approval to use Overburden Stockpile #2 for on-site backfill will be requested provided the results are below the site-specific criteria. If exceedances to these site-specific criteria are identified, Overburden Stockpile #2 will be disposed of at an off-site facility per Final Interim Remedial Action Work Plan (UXB-KEMRON, 2012).

KEMRON requests approval of this revised sampling and analysis approach for Overburden Stockpile #2 to address the UDEQ request to use revised site-specific criteria for this stockpile.

Respectfully Submitted,

_____

Jeff Gunn
Project Manager

Please provide your concurrence and approval in the space provided below for this revised sampling and analysis approach. Should you require any additional information or clarification regarding this request, please do not hesitate to contact me at 314-440-3332, or via email at jgunn@kemron.com.

Approval: _____ Date: _____
Allyn Allison, COR

M2 Tear Gas Candles (DM) Extraction & Packaging Action

Tooele Army Depot - South, Utah

Contract Number: W912DY-10-D-0027

Delivery Order Number: 0006

KEMRON Environmental Services, Inc.

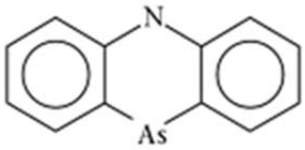
INTRODUCTION

1.1 The purpose of this document is to establish the standard operating procedure (SOP) for the removal and packaging of the M2 Tear Gas Candles (military designation, DM) buried in SWMU 2 at Tooele Army Depot – South (TEAD-S), Utah. This SOP describes the goals, methods, procedures, and personnel used for field activities associated with this Interim Remedial Action.

CHEMICAL AND PHYSICAL PROPERTIES OF DM

2.1

Chemical and Physical Properties

Appearance	Light green to yellow crystals at room temperature
Odor	No odor, but irritating
Chemical formula	$C_{12}H_9AsClN$
Molecular weight	277.57
Chemical structure	
Melting point	195°C
Boiling point	410°C
Flash point	Does not flash
Decomposition temperature	Above melting point
Vapor density	Negligible
Liquid density	No data available
Solid density	1.65 g/cm^3 at 20°C
Vapor pressure	2×10^{-13} mmHg at 20°C
Volatility	19,300 mg/m^3 at 0°C
	26,000–120,000 mg/m^3 at 20°C
	72,500–143,000 mg/m^3 at 25°C

	72,500–143,000 mg/m^3 at 25°C
Solubility	Soluble in furfural and acetone; slightly soluble in common organic solvents; insoluble in water. Not readily soluble in any of the liquid chemical warfare agents.

Informational

Designation	DM
Class	Vomiting agent
Type	A – nonpersistent
Chemical name	10-chloro-5,10-dihydrophenarsazine chloride
CAS number	[578-94-9]

2.2 AGENT CHARACTERISTICS

2.2.1 APPEARANCE: Light green to yellow crystals (solid) at room temperature. When dispersed by heat, fine particulate smoke; canary yellow when concentrated, colorless when diluted with air.

2.2.2 DESCRIPTION: DM is a vomiting compound that has been used as a riot-control agent. It is released as an aerosol. Adverse health effects due to exposure to DM are generally self-limited and do not require specific therapy. Most adverse health effects resolve within 30 minutes. Exposure to large concentrations of DM, or exposure to DM within an enclosed space or under adverse weather conditions, may result in more severe adverse health effects, serious illness, or death. DM is also known as Adamsite.

2.2.3 METHODS OF DISSEMINATION:

Indoor Air: DM can be released into indoor air as fine particles (aerosol).

Water: DM is not soluble in water and cannot be used to contaminate water.

Food: Not established/determined

Outdoor Air: DM can be released into outdoor air as fine particles (aerosol).

Agricultural: If DM is released into the air as fine particles (aerosol), it has the potential to contaminate agricultural products.

2.2.4 ROUTES OF EXPOSURE: DM can affect the body through inhalation, ingestion, skin contact, or eye contact. Ingestion is an uncommon route of exposure.

TOXICOLOGY AND PHYSIOLOGICAL EFFECTS

3.1 Riot-control agents may be classified as to type (e.g., lacrimators, vomiting agents), based on a salient physiological effect. Diphenylaminochlorarsine (DM) is one of several compounds that include diphenylchloroarsine (DA), diphenylcyanoarsine (DC), and chloropicrin, which are classified militarily as vomiting agents.

3.2 DM is more toxic than other riot-control compounds- it is considered a potentially dangerous agent. DM produces symptoms of slightly delayed onset and a relatively long recovery period. DM-related effects do not appear immediately as in the case of CN, CS, and CR. DM-induced effects occur in about 3 minutes after exposure begins and, depending on the severity of the exposure effects, may last for several hours.

3.3 Unlike the other tear agents, DM is more likely to cause prolonged systemic effects. Signs and symptoms include eye irritation (burning, tear production (lacrimation), spasmodic blinking (blepharospasm), swelling of the blood vessels that supply the membranes lining the eye (conjunctival injection), necrosis of the corneal epithelium), upper respiratory tract irritation, uncontrolled sneezing and coughing, choking, headache, acute pain, tightness in the chest, nausea, and vomiting.

3.4 Additionally, DM can cause unsteady gait, weakness in the limbs, and trembling. Mental depression is a prominent symptom following exposure to DM. Exposure to high concentrations can result in serious illness as a result of pulmonary damage and edema or death.

3.5 There are usually no long-term effects from vomiting agent exposures, and symptoms generally disappear within 20 minutes to 2 hours.

3.6 Dermal exposures to low concentrations of DM are likely to produce short-lived skin redness (erythema) and irritation. Exposure to higher concentrations of DM can result in more severe, longer-lasting redness, itching, and swelling possibly followed by blister (vesicle) formation. More severe skin irritation may require symptomatic treatment.

INTERIM HAZARD CLASSIFICATION

Note: Interim Hazard Classification valid from 04 December 2013 to 04 December 2014.

4.1 DOD Hazard Class/Div/CG: 6.1G

DOT Hazard Class/Div/CG: 6.1

DOT Marking: PSN: TEAR GAS CANDLES

UN: 1700

Other: 345215

DOT Label:	POISON
Packaging Requirements:	49 CFR 173.62 (Packing Instruction 173.340) and 49 CFR 173.7 (UN Performance Oriented Packaging)
NEW:	3.25 pounds per item
Heaviest Candle Weight:	10.2 pounds per item (Chemical Warfare Board, 1943)
Special Instructions:	Emergency Response Guide 159 – Subsidiary 4.1

APPLICABLE DOT PACKAGING REGULATIONS

5.1 49 CFR Ch. 1 (10-1-13 Edition) 173.7

Government Operations and Materials

(a) Hazardous materials offered for transportation by, for, or to the Department of Defense (DOD) of the U.S. Government, including commercial shipments pursuant to a DOD contract, must be packaged in accordance with the regulations in this subchapter or in packagings of equal or greater strength and efficiency as certified by DOD in accordance with the procedures prescribed by "Packaging of Hazardous Material, DLAD 4145.41/AR 700-143/AFJI 24-210/NAVSUPINST 4030.55B/MCO 4030.40B (IBR, see § 171.7 of this subchapter)." Hazardous materials offered for transportation by DOD under this provision may be reshipped by any shipper to any consignee provided the original packaging has not been damaged or altered in any manner.

(1) Hazardous materials sold by the DOD in packagings that are not marked in accordance with the requirements of this subchapter may be shipped from DOD installations if the DOD certifies in writing that the packagings are equal to or greater in strength and efficiency than the packaging prescribed in this subchapter. The shipper shall obtain such a certification in duplicate for each shipment. He shall give one copy to the originating carrier and retain the other for no less than 1 year.

5.2 49 CFR Ch. 1 (10-1-13 Edition) 173.340

Tear Gas Devices

(a) Packagings for tear gas devices must be approved prior to initial transportation by the Associate Administrator.

(b) Tear gas devices may not be assembled with, or packed in the same packaging with, mechanically- or manually-operated firing, igniting, bursting, or other functioning elements unless of a type and design which has been approved by the Associate Administrator.

(c) Tear gas grenades, tear gas candles, and similar devices must be packaged in one of the following packagings conforming to the requirements of part 178 of this subchapter at the Packaging Group II performance level:

(1) In UN 4A, 4B, or 4N metal boxes or UN 4C1, 4C2, 4D, or 4F metal-strapped wooden boxes. Functioning elements not assembled in grenades or devices must be in separate compartment of these boxes, or in inner or separate outer boxes, UN 4C1, 4C2, 4D, or 4F, and must be packed and cushioned so that they may not come in contact with each other or with the walls of the box during transportation. Not more than 50 tear gas devices and 50 functioning elements must be packed in one box, and the gross weight of the outer box may not exceed 35 kg (77 pounds).

(2) In UN 1A2, 1B2, 1N2 or 1H2 drums. Functioning elements must be packed in a separate inner packaging or compartment. Not more than 24 tear gas devices and 24 functioning elements must be packed in one outer drum, and the gross weight of the drum may not exceed 35 kg (77 pounds).

(3) N/A

(4) In other packagings of a type or design which has been approved by the Associate Administrator.

(d) Tear gas devices may be shipped completely assembled when offered by or consigned to the U.S. Department of Defense, provided the functioning elements are packed so that they cannot accidentally function. Outer packagings must be UN 4A, 4B, or 4N metal boxes or UN 4C1, 4C2, 4D, or 4F metal-strapped wooden boxes.

Note: 1H2 drums

“1” means drum

“H” means plastic

“2” indicates a removable head drum

PERSONAL PROTECTIVE EQUIPMENT (PPE)

NOTE: Safe use of protective clothing and equipment requires specific skills developed through training and experience.

NOTE: Ensure all smoking is in the appropriate designated area and that individuals wash their hands prior to smoking to ensure any residue that may be present on the hands is not aerosolized.

6.1 Personnel performing site tasks will wear and use appropriate level and type of PPE for each individual task. The level of PPE will be in accordance with the hazards and contamination level anticipated for this operation.

6.2 The level of PPE for M2 Tear Gas Candle (DM) removal and packaging will be Modified Level D with the minimum addition of Tyvek coveralls, particulate face mask, boot covers, and chemical resistant inner gloves.

6.3 Modified Level D PPE without DM additions consists of:

(a) Work clothes (i.e., long pants, long sleeve shirt).

(b) Approved respirator – slung.

(c) Leather work boots.

(d) Safety glasses with side shields or goggles when eye hazards exist.

(e) Hard hat when working around heavy equipment or when overhead hazard exists.

(f) Hearing protection when high noise levels are present.

(g) Nitrile gloves for soil handling, leather or canvas work gloves when a scrape or cut hazard exists.

6.4 The level of PPE modification will be addressed if any of the following occur:

a) Previously unidentified or unanticipated chemicals, conditions or hazards are encountered.

b) Airborne concentrations of known chemicals exceed the action levels specified in the Site Safety and Health Plan.

c) Ambient weather conditions affect the use of assigned PPE.

d) A new task is introduced, or a previously assigned and evaluated task is expanded in scope.

DECONTAMINATION

7.1 The purpose of decontamination is to make an individual and/or their equipment safe by physically removing toxic substances quickly and effectively. Care should be taken during decontamination, because absorbed agent can be released from clothing and skin as a gas. Riot-control agents are particulate in nature, exposures may require decontamination.

7.2 Bleach solutions WILL NOT be used for decontamination of DM. Bleach solutions worsen the effects of DM.

7.3 Plain soap and water is the best decontamination solution. Emergency decontamination may be performed with plain water. The removal of clothing will remove a majority of the agent particles off the person.

7.4 Ensure all tools and equipment utilized in the packaging process of the DM items is washed in accordance with 7.3 in order to ensure no one is exposed outside of this operation.

FIRST AID

Note: Utilize the following procedures until patient can be evacuated to on-site medical personnel for professional treatment.

8.1 The effects of exposure to vomiting agents under usual outdoor conditions generally are self-limited, disappearing in 20 minutes to 2 hours, and require no specific therapy other than symptomatic relief. Exposure to large concentrations of DM, or exposure to DM within an enclosed space or under adverse weather conditions, may result in more severe adverse health effects, serious illness, or death and may require supportive measures for symptomatic complaints of eye, skin, and airway irritation.

8.2 There is no antidote for DM toxicity.

8.3 **Eye Exposure**

8.3.1 Immediately remove the patient/victim from the source of exposure. Immediately wash eyes with large amounts of tepid water for at least 15 minutes. Provide symptomatic relief. Seek medical attention immediately.

8.4 **Ingestion**

8.4.1 Immediately remove the patient/victim from the source of exposure. Provide symptomatic relief. Seek medical attention immediately.

8.5 **Inhalation**

8.5.1 Immediately remove the patient/victim from the source of exposure. Evaluate respiratory function and pulse. Ensure that the patient/victim has an unobstructed airway. If shortness of breath occurs or breathing is difficult (dyspnea), administer oxygen. Assist ventilation as required. Always use a barrier or bag-valve-mask device. If breathing has ceased (apnea), provide artificial respiration. Gargling may provide symptomatic relief. Seek medical attention immediately.

8.6 **Skin Contact**

8.6.1 Immediately remove the patient/victim from the source of exposure. May require the use of soothing compounds such as calamine, camphor, or mentholated creams. See section 7 for patient/victim decontamination procedures. Seek medical attention immediately.

Note: A small minority (less than 1%) of people will experience serious, prolonged adverse health effects following DM exposure. Those seeking medical attention will generally have complaints relating to ocular, airway, and/or skin irritation. Patient/victims with severe or prolonged adverse health effects should be observed until effects abate.

DELAYED EFFECTS OF EXPOSURE: Not established/determined

EFFECTS OF CHRONIC OR REPEATED EXPOSURE: Information is unavailable about the carcinogenicity, developmental toxicity, or reproductive toxicity of chronic or repeated exposure to DM.

REMOVAL AND PACKAGING PROCEDURE, M2 TEAR GAS CANDLES (DM)

9.1 Removal of M2 Tear Gas Candles (DM) will occur under the supervision of a UXO Technician III (Team Leader).

9.2 The M2 Tear Gas Candles (DM) will be removed manually by UXO II/III Technicians wearing appropriate PPE (see section 6).

9.3 DM candle material will be placed in a 6 mil thick clear plastic bag not to exceed 30.6 pounds (the combined gross weight of 3 M2 Tear Gas Candles). The bag will be taped shut.

Note: Wood debris generated from candle removal will be segregated for further processing.

9.4 Bagged DM candle material will be placed into DOT approved final shipping containers (see sections 5.2 & 5.3). The total gross weight of the final shipping container shall not exceed 77 pounds or the maximum allowable weight of the shipping container, whichever is less.

9.5 The removable head of the drum will be positioned and secured ensuring the closure of the drum. A tamper proof seal will then be emplaced on the drum to maintain knowledge of contents. The waste serial number assigned to the drum will be recorded and provided to UXO QC.

9.6 A label shall be affixed to the exterior of the drum. The label shall at a minimum include the following information:

(a) DOD Hazard Class/Div/CG:

(b) DOT Hazard Class/Div/CG:

(c) DOT Marking:

(d) DOT Label:

(e) Waste Serial Number (WSN):

(f) Container Weight:

(g) Waste Description:

(h) Waste Generation Location:

(i) Waste Accumulation Start Date:

Note: See Appendix A.

9.7 The closed, sealed, labeled, DOT approved, final shipping container will be placed on an inspected and serviceable, or new, undamaged pallet.

9.8 Filled drums placed on a shipping pallet shall not be stacked more than two drums high. Drums stacked on a pallet will be wrapped together as one unit in shipping cellophane before any movement of the loaded pallet occurs.

9.9 The loaded pallet will be placed in storage or prepared for shipping.

9.10 Items needed to ship a loaded pallet off site include: bills of lading, hazardous waste manifest, load certification document, copy of Memorandum JMAC-EST/ #38521, and DOT authorization letter.

APPENDIX A

LABEL

DOD Hazard Class/Div/CG:	**6.1G**
DOT Hazard Class/Div/CG:	**6.1**
DOT Marking:	**PSN: TEAR GAS CANDLES**
	UN: 1700
	Other: 345215
DOT Label:	**POISON**
Waste Serial Number (WSN):	
Container Weight:	
Waste Description:	**CANDLE, GAS, IRRITANT, DM, M2**
Waste Generation Location:	**TOOELE ARMY DEPOT - SOUTH**
Waste Accumulation Start Date:	

State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Amanda Smith
Executive Director

DIVISION OF SOLID AND
HAZARDOUS WASTE
Scott T. Anderson
Director

June 9, 2014

Colonel Roger L. McCreery, Commander
Tooele Army Depot South
JMTE-GMV, Building 5119
Attn: Troy Johnson
1 Tooele Army Depot
Tooele Army Depot
Tooele, Utah 84074-5000

RE: Overburden Sampling Memorandum
Phase II RFI Addendum for SWMU 2
Tooele Army Depot South (TEADS)
UT5210090002

Dear Colonel McCreery:

The proposal for collection of three additional soil samples from overburden pile #2 is hereby approved. The plan indicates the samples will be analyzed for chemical agent breakdown products and semi-volatile organics. In addition, since perchloroethylene (PCE) was also detected in overburden pile #2, TEADS has agreed to also collect samples for volatile organic compound analysis.

The sample data from overburden pile #2 will be used to calculate an average value for comparison with the EPA risk and groundwater screening values to determine if the soil can be used as backfill. Please provide the Division with a seven-day notice of when the sampling event will occur.

The Division agrees with the proposal to utilize overburden piles #3 and #4 as backfill. Contamination above EPA risk and groundwater screening values was not detected in the samples from these piles.

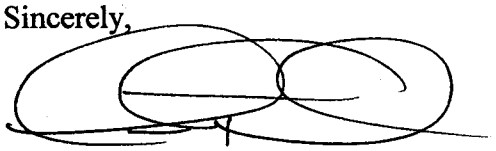
Please also note that, based on the detections of PCE in the overburden soil, the Division recommends that soil gas samples be collected in the disposal area before the collection of confirmation soil samples. The Division suggests this be a topic of discussion at the next monthly project management meeting.

(Over)

195 North 1950 West • Salt Lake City, UT
Mailing Address: P.O. Box 144880 • Salt Lake City, UT 84114-4880
Telephone (801) 536-0200 • Fax (801) 536-0222 • T.D.D. (801) 536-4414
www.deq.utah.gov

If you have any questions, please contact Dave Larsen at (801) 536-0226.

Sincerely,



Scott T. Anderson, Director
Division of Solid and Hazardous Waste

STA/DCL/tjm

c: Myron Bateman, EHS, MPA, Health Officer, Tooele County Health Department
Jeff Coombs, EHS, Environmental Health Director, Tooele County Health Department
Troy Johnson, DCD, (Email)
Nancy Morlock, USEPA, Region 8

Incremental Soil Sampling Standard Operating Procedure

Table of Contents

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to describe the procedures for design and implementation of incremental sampling (IS) of soil at SWMU 2, Tooele Army Depot – South Area (formerly Deseret Chemical Depot), Tooele, Utah. Analytical soil samples collected using the IS approach will be performed in accordance with Interim Guidance 09-02 *Implementation of Incremental Sampling (IS) of Soil for the Military Munitions Response Program* (USACE 2009) and the Interstate Technology Regulatory Council (ITRC) *Incremental Sampling Methodology* (ITRC 2012).

The area proposed for IS at SWMU 2 consists of a gravel pit outside of the main burial pit where inert cultural debris has been discarded. There is no history indicating that Resource Conservation and Recovery Act- (RCRA) regulated waste, munitions or explosives of concern (MEC), or chemical warfare materiel (CWM) was ever buried or disposed of in this area. Further, there is no history or photographic evidence to indicate that wastes were ever disposed of on the surface of this area (i.e., dumping of liquids or other waste). This has also been confirmed through interviews with former installation employees. The overall assumption for the area of the SWMU outside of the burial pit is that this was a gravel pit and the debris present is nonhazardous with no indication of surface disposals. Therefore, a better approach to evaluating the surface soil is via the IS approach. The IS approach will provide sufficient and statistically defensible data to assess surface contamination and demonstrate the surface soil is either below risk-based levels or requires additional actions.

IS is a sample collection and processing methodology having specific elements designed to control data variability due to heterogeneity in contaminant distribution. Required elements are in both the field collection and laboratory processing and sub-sampling procedures. The objective is to obtain a single sub-sample that contains all analytes in exactly the same proportion as the entire sampled area. This is achieved by collecting a sufficient number of discrete “increments” (typically 30 to 100) in an unbiased manner from throughout a specified area (i.e. Decision Unit), combining and processing the increments, and incrementally sub-sampling the processed material to obtain a representative aliquot for analysis. Properly executed, the method provides unbiased, representative, and reproducible estimates of the mean concentration of analytes in the Decision Unit (DU).

This SOP defines a standard set of procedures that may be varied or changed as required by site conditions, equipment limitations, or other factors. Variances from this SOP will be approved by the Stakeholders prior to field implementation and any changes will be documented in the field log book notes.

2.0 DECISION UNITS AND BACKGROUND SAMPLING UNIT

2.1. Decision Units

A DU is defined as a specific area (or volume of soil) about which a decision is to be made (USACE 2009). A DU may be composed of a single Sampling Unit (SU), or may include multiple Sampling Units. In the ideal and most direct case, the DU and Sampling Unit are the same volume of soil. Depending on project objectives and practical constraints, however, there are cases where multiple Sampling Units may be the most effective means of obtaining an estimate of mean analyte concentration in a DU.

Rural acreage for IS is typically based on a 3-acre plot (as was used for the confirmation sampling for the closure of Hazardous Waste Management Unit 31 at TEAD-S). As shown on Figures 1 and 2 (attached), three DUs have been proposed (outside of the main burial pit) based on the density of the geophysical data. Each DU at SWMU 2 is composed of a single Sampling Unit. Working left to right on the figures, DU #1 (orange outline) is approximately 1.91 acres, DU #2 (blue outline) is approximately 1.50 acres and DU #3 (purple outline) is approximately .92 acres. These acreages conservatively represent rural/industrial use.

2.2. Background Sampling Unit

A separate background DU (DU #4) of similar size has been identified to represent background conditions, as presented on Figure 3. The location of DU #4 was selected based on its status as an area that has not been impacted by previous site activity while maintaining geologic conditions similar to DUs 1-3. Background DU #4 will be used to estimate site-specific mean background or ambient concentration for metals in soil.

2.3. SWMU 2 Sample Collection Design

The sample collection design selected for DUs 1-4 at SWMU 2 is the systematic random approach. According to the IS Guidance (USACE 2009), the systematic random approach is the most commonly used and most reproducible sampling pattern. Key steps for collection of a systematic random sample are:

- Sub-divide the Sampling Unit (Decision Unit) into uniform grid cells, one per increment.
- Randomly select a single increment sampling point in an initial grid cell.
- Collect increments from the same relative location within each of the other grid cells.

Irregular grid cells along the border of the DU will be sized to represent an area of similar square footage to the uniform cells on the interior of the DU. The systematic random approach to be used at SWMU 2 is presented below.

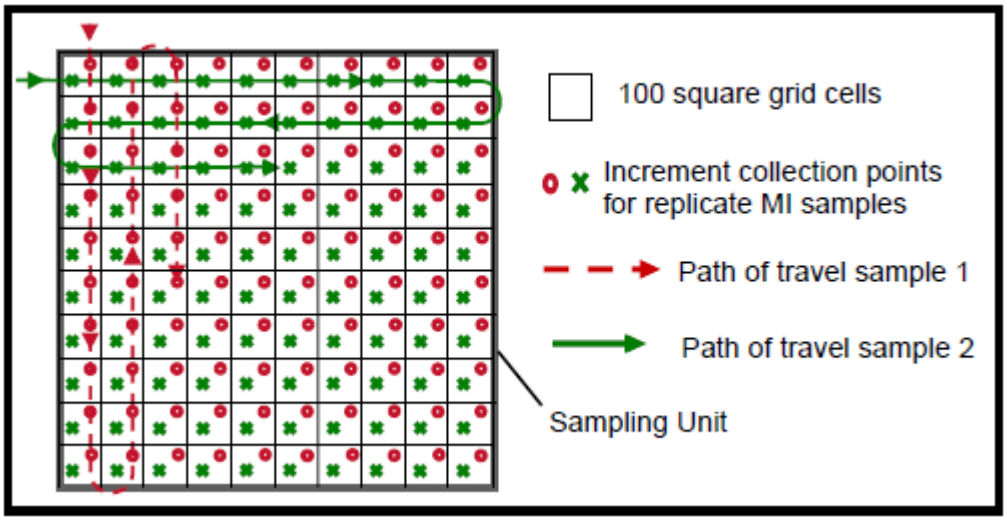


Figure shows the collection points for two (replicate) sample locations (USACE 2009). Triplicate samples will be collected from each DU at SWMU 2.

3.0 INCREMENTAL SAMPLING APPROACH

Results of the IS method will be used to characterize the soil in each respective DU.

3.1. Data Quality Objectives

Data Quality Objectives (DQOs) for Incremental Soil Sampling are summarized in Table 3-1.

Table 3-1. SWMU 2 DQOs for Incremental Sampling

Data Quality Objective Elements		Data Quality Objective Output Laboratory Analytical Samples
Step 1: State the Problem	Problem Statement	Contamination may be present within the identified SI Decision Units (DUs) adjacent to the SWMU 2 burial pit at concentrations greater than risk-based screening levels due to historical munitions disposal activities. Surface soil within the identified DUs may have been impacted in the SWMU 2 area. Groundwater will be addressed as part of the DCD base-wide hydrogeological study, which is not part of this effort.
Step 2: Identify the Goal of the Study	Decision Statement	Confirm that surface soil within each DU is below risk-based screening levels by collecting Incremental Samples. All samples must be screened by ECBC for potential agent prior to shipment. Collect background data at SU4 by collecting Incremental Samples.
	Alternative Actions	Incremental Samples will be selected and analyzed from surface locations as part of the IRA based on a systematic random grid across each DU to provide a statistically significant population from which recommendations and decisions for future action can be based.
Step 3: Identify Information Inputs	Chemicals Of Interest	Previous investigations and historical activities indicate that the following are contaminants of potential concern (COPCs) within each IS DU: • SVOC • Explosives (including white phosphorus) • Metals
	Physical Data	Map locations for all sample locations will be generated.
	Sampling Method	Stainless steel or disposable hand tools. All samples must be screened onsite by ECBC for potential agent prior to shipment for laboratory analysis at the ECBC analytical laboratory in Maryland prior to subsequent release and shipment to the commercial laboratory (TestAmerica).
	Analytical Methods	Lab Data: (Solid - soil) (DCD QAPP) • SVOC SW-846 Method SW8270C • Explosives: SW-846 Method SW8330B and SW7580 • Metals: SW-846 Method 6020A/7471A
	Method Quantitation Limits	Practical quantitation levels (PQLs) will be established with detection limits less than the risk-based screening levels.
	Field Quality Control Samples	Field Duplicate (10 percent frequency)
	Data Use	Site Closure Determination
	Validation Data Level	100% of definitive data will be validated based on QC criteria referenced in the UFP-QAPP (Attachment A).
Step 4: Define the Boundaries of the Study	Action Level Criteria	Risk-based screening levels protective of human health and groundwater will be used as the action level for determination of cleanup goals. Groundwater is not being characterized as part of this investigation. Metals will be compared to background values from the DCD Risk Assumptions Document under a Site-Attribution Analysis. Ecological impacts are not being addressed because the area is disturbed. Ecological impacts, if any, will be short-lived.
	Media To Sample	Surface soil across each identified DU, where inert cultural debris has been discarded.
	Spatial Boundaries	SWMU 2 (approximately 10 acres), which is located in the southwest corner of the Area 10 Chemical Storage Area (SWMU 11). Specifically, DUs 1, 2, and 3 as well as DU 4 as indicated on Figures 1, 2 and 3.
	Time Frame	72-hour turn around time for analysis of samples for potential agent; 21-day turn around time for final confirmation soil samples collected from each DU floor.
	Practical Constraints	UXO hazards, potential CWM hazards, and exposed heterogeneous nature of contaminants in soil matrix.
	Scale	NA
Step 5: Develop the Analytic Approach	Decision Rule	For Incremental Samples collected at DUs 1-3 and DU 4, no further sampling is warranted if sample results are less than risk-based levels.

Table 3-1. SWMU 2 DQOs for Incremental Sampling

Data Quality Objective Elements		Data Quality Objective Output
		Laboratory Analytical Samples
Step 6: Specify Performance or Acceptance Criteria	Tolerance Limits	Project specific Type I and Type II error rates are 0.05 and 0.25, respectively. The gray region (delta) is approximately 15% of the risk-based residential land-use screening levels. The data will be compared to risk-based soil to groundwater values or background concentrations.
Step 7: Develop the Detailed Plan for Obtaining Data	Sampling Design	Systematic random sampling of the floor in each DU (0 to 2 inches) will be performed to collect representative data for decision-making about site closure or further action.

3.2. Sample Increment Quantity and Sample Increment Volume

Each sample will be composed of a minimum of 30 incremental samples for each DU (DUs1-4) to address the distributional heterogeneity of the analytes. Triplicate samples will be taken for each DU as described in Section 5.1.

To obtain a sample that is representative of the population in terms of particle type, size, and proportion, the volume of soil in each increment must be constant (USACE 2009). The IS method samples will be composed of increments collected from specific points throughout each DU. A total sample mass of 1 to 2 kg (dry weight) will ensure that sufficient sample mass has been collected. Depending on the quantity of increments established for each DU, approximately 30 to 50 grams of soil will be collected from each increment.

Sample mass will be determined based on the information provided in Table 5.1 of the ITRC guidance (ITRC, 2012).

3.3. Sample Depth

A portion of the anomalies identified within each DU during the geophysical investigation at SWMU 2 was identified in the surface or near-surface soil. As such, this interval of soil is considered a representative depth to evaluate the potential presence/absence of soil contamination resulting from the geophysical anomalies. Soil increments collected in each Decision Unit will be collected from the surface soil, defined as 0 inches to 2 inches below ground surface.

3.4. Chemical Agent Screening and Analysis

Split samples are required to be collected at the site from the primary sample for chemical agent screening and analysis prior to shipment to the commercial lab. Two aliquots will be collected from the primary sample as separate 4-ounce jars from each homogenized sample for chemical agent screening as described in the Work Plan (UXB-Kemron, 2012).

During IS method sample collection/packaging, each bulk sample will be homogenized in the field. Subsamples will be collected for chemical agent screening and analysis using the slabcake method to reduce delimitation error (DE) and extraction error (EE) as described in Section 6.2.2.7 of the ITRC guidance (ITRC, 2012). The remaining soil from the primary sample will be placed in a sample container and held under chain of custody until chemical agent results are received from the fixed ECBC lab.

ECBC will conduct headspace monitoring of one aliquot of each soil sample in the field to ensure the media is below the applicable Airborne Exposure Limit (AEL) of less than the short term exposure limit (STEL).

A second aliquot of each soil sample with headspace results below the STEL will be sent off-site for ECBC fixed-lab analyses of ABPs including: 1,4-Dithiane; 1,4-Thioxane, and HD (TDG analysis will be conducted if H is not detected, and 1,4-dithiane and 1,4-thioxane are detected

greater than the LOQ). Chemical agent clearance must be received prior to sending any environmental samples to commercial laboratories for analysis. Once this confirmation is received, the IS method sample will be shipped to the commercial lab for analysis of SVOCs, metals, and explosives as detailed below.

3.5. Analytical Methods

In addition to the chemical agent screening described in Section 3.4 above, IS method samples will be shipped to a contract lab for additional analyses. Samples will be analyzed for semi-volatile organic compounds (SVOCs - SW-846 Method SW8270C), metals (SW-846 Method 6020A/7471A), and explosives (SW-846 Method SW8330B and SW7580). Specific SVOC, explosive, and metals to be analyzed are listed in QAPP Worksheets 15-2, 15-3, 15-4, 15-6, and 15-7 of Appendix E Final Work Plan (UXB-Kemron 2012).

4.0 EQUIPMENT

Soil sampling equipment may include, but is not limited to, the following:

- Appropriate PPE (at minimum, safety glasses and nitrile gloves – may require more based on site-specific COCs, refer to project HSP for details)
- Appropriate size and quantity of sample containers
- Sample labels
- Stainless steel spoons or spatulas
- Survey stakes, pin flags, or similar to mark grid and sample locations
- Tape measure
- 5-gallon plastic buckets
- Resealable plastic bags
- Shovel, trowel, or other digging tools
- Hand auger, core sampler, or other appropriate sampling device
- Chain-of-custody
- Camera
- Logbook

Field sampling equipment will be decontaminated by standard procedures before moving to a new DU. Because individual increments from a single DU are combined, it is not necessary to decontaminate sampling equipment while collecting increments from within a single DU.

5.0 QUALITY CONTROL

5.1. Triplicate Locations

The sample locations for the duplicate and triplicate samples will not be collocated with the primary sample. The duplicate and triplicate samples will be collected by using separate borings and offset from the primary sample. The offset will be along one of the cardinal directions for the duplicate sample and a different cardinal direction for the triplicate sample.

The sampler will mark the initial (primary) sample increment locations with flags or stakes. Offsets for the duplicate sample will be approximately ½ the distance north from the primary location to the adjacent grid. The sampler will then return to the initial sample increment

location and approximately ½ the distance south from the primary location to the adjacent grid. The distance between the original and duplicate/triplicate samples will therefore be adequate enough to evaluate variability. The resulting sampling pattern essentially becomes systematic random so long as the sampler does not introduce any bias to any of the sample increment locations.

5.2. Potential Interferences

Two potential issues associated with soil sampling are cross-contamination and inadequate sample homogenization. To prevent cross-contamination of samples, disposable sampling equipment will be used when appropriate and reusable sampling equipment will be decontaminated before each use. As stated in ITRC guidance, it is not necessary to decontaminate reusable sampling equipment between sample points within a DU; however, decontamination will take place between each DU (ITRC 2012).

The issue of sample homogeneity is addressed based on the DU designation as well as sample collection procedures. In addition, each sample (the primary, duplicate, and triplicate) will be homogenized in order to minimize variance in sample results and ensure representative sample data are collected.

6.0 INCREMENTAL SAMPLING PROCEDURES

The location of DU boundaries will be accurately determined and marked by stakes, flagging, or other means of clear visual reference in the field. DU boundaries will be located using a Global Positioning System (GPS). Locations of individual increments for each DU will not be recorded, as the DU will be subdivided into uniform grid cells and increments will be collected from the same relative location within each of the grid cells (see Section 3.4).

Soil IS for laboratory analysis will be performed in accordance with the following procedures:

- Don new PPE (gloves, etc.) before starting sample collection.
- Verify that all equipment and sample containers are properly decontaminated and that the sample containers are new and have been properly prepared.
- Label container and initiate CoC and sample-specific data sheet, if applicable.
- One duplicate/triplicate sample will be collected at each DU. Samples will not be co-located (Section 5.1).
- Soil from IS will be collected and sieved into another container using a #10 (2 millimeter) sieve. A sub-sample of adequate volume for analytical methods may be collected in the field or submitted to the laboratory for chemical analysis.
- Note in field notebook the interval from which the soil was collected, if odor was present, discoloration, and other pertinent details.
- Decontaminate sampling equipment (sieve frame) or dispose (sieve mesh) sampling equipment.

7.0 LABORATORY CONSIDERATIONS

IS method sample processing will occur in a controlled setting to minimize errors. Therefore, bulk samples will be preserved to 4 degrees Celsius and shipped to the laboratory for preparation and analysis. Metals, explosives and SVOCs will be prepared and analyzed in accordance with USEPA Method 8330B Appendix A (USEPA 2006). Metals will be sub-sampled in the laboratory following the full drying and sieving process, but prior to the grinding process as this could introduce laboratory contaminants.

7.1. Sample Preservation, Containers, Handling, and Storage

Samples will be collected using the appropriate sample containers (with preservative, if required by the analytical method) provided by the analytical laboratory. Sample containers will be labeled with the sample identification number, date and time of collection, sampler initials, and analysis requested. Samples will be maintained at 4°C ± 2°C while in storage. Samples will then be packaged and transported to the subcontracted laboratory for preparation and analysis. Clean plastic bags or clean large mouth glass bottles will be needed to hold a larger weight of soil than is normally submitted for analysis.

7.2. Laboratory Procedures

The laboratory will perform full drying and sieving on all primary, duplicate, and triplicate IS method samples collected from DUs 1-4 in accordance with USEPA Method 8330B (USEPA 2006). A subset of each dried and sieved sample will be segregated for metals analysis. The remaining sample aliquot will be ground to less than 2 millimeters for SVOC and explosives analysis. The laboratory will then perform the extraction and analysis on the entire final sub-sampled portions.

The laboratory selected for the analyses will meet the requirements outlined in the Quality Assurance Project Plan (QAPP) as contained in the Work Plan and be Utah-certified for SW-846 Method 8330B (UXB-Kemron 2012).

8.0 DATA EVALUATION AND REPORTING

Laboratory results of IS method samples will be evaluated using USEPA Regional Screening Level Soil to Groundwater values (May 2014). The MCL-based SSL will be used for comparison; if an MCL-based value is not available, the Risk-based SSL will be used for comparison. Compounds that exceed the initial SSL screen will subsequently be compared to site-specific criteria calculated using a Dilution Attenuation Factor (DAF) of 38.

It is understood that the project-specific Limit of Detection (LOD) and Level of Quantitation (LOQ) may not be as low as the published SSLs for certain compounds. If compounds are reported as non-detect but LOD/LOQ values exceed the SSL, the data will be accepted as non-detect but flagged due to uncertainty.

Reporting of IS method sample field screening data and laboratory analytical results will be in accordance with the Work Plan (UXB-Kemron 2012).

9.0 HEALTH AND SAFETY

Procedures for working with potentially hazardous materials, as well as the relevant Material Safety Data Sheets (MSDS) for each chemical that will be used at the site, are included in the Health and Safety Plan. Personnel using this procedure must be trained on the information contained in the MSDSs, engineering controls, and the personal protective equipment (PPE) outlined in this procedure.

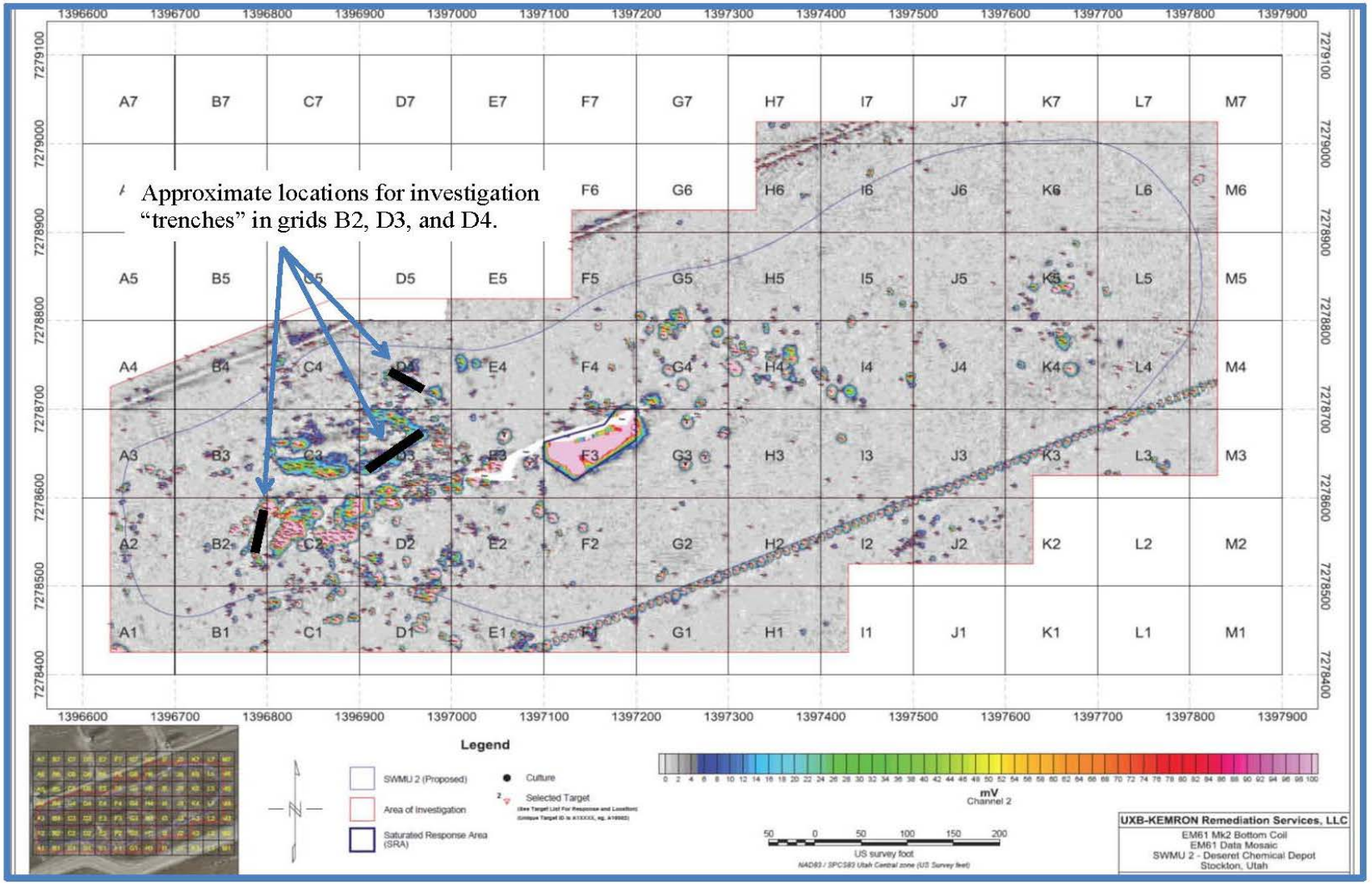
All soil samples will be treated as potentially containing contaminants of concern. Care must be used when handling soil samples to prevent the possible spreading of contaminants in the work area. At a minimum, Level D PPE, including nitrile gloves and safety glasses, will be worn while collecting soil samples.

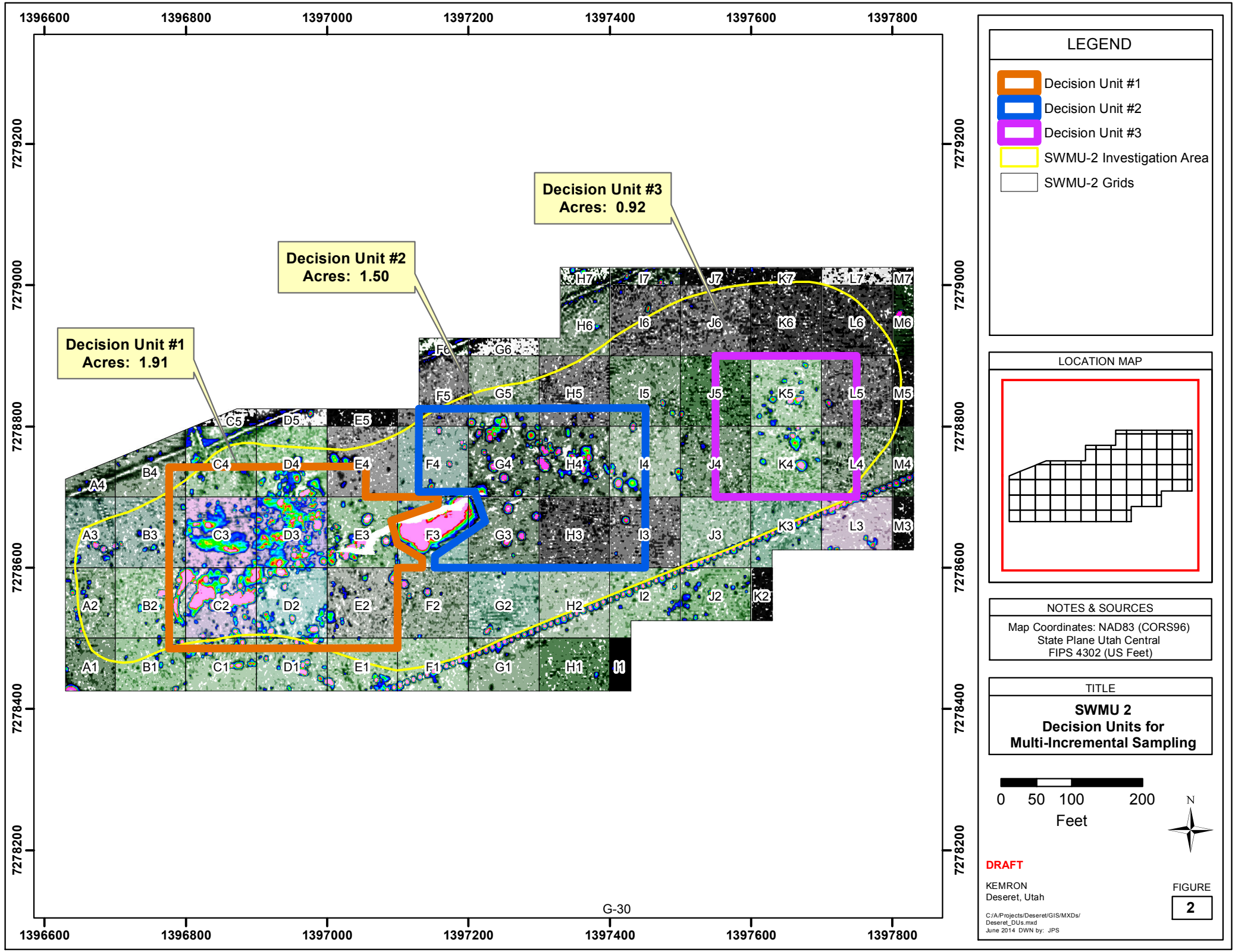
IS will be conducted in accordance with the project-specific Accident Prevention Plan (UXB-KEMRON 2012).

10.0 REFERENCES

ITRC, 2012	Interstate Technology Regulatory Council (ITRC) *Incremental Sampling Methodology*. February 2012.
USACE, 2009	Interim Guidance 09-02 *Implementation of Incremental Sampling (IS) of Soil for the Military Munitions Response Program*
USEPA, 2006	Method 8330B *Nitroaromatics, Nitramines, and Nitrate Esters by High Performance Liquid Chromatography (HPLC).* Revision 2. October 2006.
UXB-KEMRON, 2012	Final Work Plan Interim Removal Action, SWMU 2, Deseret Chemical Depot, Accident Prevention Plan (Appendix D)

Figure 1 - Proposed Anomaly Investigation Trenches

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Decision Unit #1
Acres: 1.91
Decision Unit #2
Acres: 1.50
Decision Unit #3
Acres: 0.92
A1 A2 A3 A4
B1 B2 B3 B4
C1 C2 C3 C4 C5
D1 D2 D3 D4 D5
E1 E2 E3 E4 E5
F1 F2 F3 F4 F5 F6
G1 G2 G3 G4 G5 G6
H1 H2 H3 H4 H5 H6 H7
I1 I2 I3 I4 I5 I6 I7
J2 J3 J4 J5 J6 J7
K2 K3 K4 K5 K6 K7
L3 L4 L5 L6 L7
M3 M4 M5 M6 M7
G-30
LEGEND
Decision Unit #1
Decision Unit #2
Decision Unit #3
SWMU-2 Investigation Area
SWMU-2 Grids
LOCATION MAP
NOTES & SOURCES
Map Coordinates: NAD83 (CORS96)
State Plane Utah Central
FIPS 4302 (US Feet)
TITLE
SWMU 2
Decision Units for
Multi-Incremental Sampling
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N
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Deseret, Utah
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Deseret_DUs.mxd
June 2014 DWN by: JPS
FIGURE
2

Figure 3. Background Decision Unit (#4)

State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Amanda Smith
Executive Director

DIVISION OF SOLID AND
HAZARDOUS WASTE
Scott T. Anderson
Director

September 5, 2014

Colonel Roger L. McCreery, Commander
Tooele Army Depot South
JMTE-GMV, Building 5119
Attn: Troy Johnson
1 Tooele Army Depot
Tooele Army Depot
Tooele, Utah 84074-5000

RE: Incremental Sampling Plan
Solid Waste Management Unit (SWMU) 2
Tooele Army Depot- South (TEADS) UT5210090002

Dear Colonel McCreery:

The revised incremental sampling plan for SWMU 2 is hereby approved. Responses to comments and the background sampling location are acceptable. In the CMI report, please provide documentation regarding laboratory sample processing as outlined in sections 7.0-7.2 of the plan. TEADS has indicated both incremental sampling and sampling in the main excavation area will begin September 15, 2014.

If you have any questions, please call Dave Larsen at (801) 536-0226.

Sincerely,

Scott T. Anderson, Director
Division of Solid and Hazardous Waste

STA/DCL/tjm

c: Myron Bateman, EHS, MPA, Health Officer, Tooele County Health Department
Jeff Coombs, EHS, Environmental Health Director, Tooele County Health Department
Troy Johnson, TEAD, (Email)
Nancy Morlock, USEPA Region 8

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MEMORANDUM

To: Allyn Allison, COR

From: Jeff Gunn, Project Manager

CC: Tracy Bergquist, Cathy Etheredge, Brian Barker

Date: 30 September 2014

Re: Management of SWMU 2 Stockpiles 5, 6, 7, and 11

The purpose of this memorandum is to provide a summary of analytical data results for four (4) soil stockpiles (Stockpiles 5, 6, 7, and 11) generated during intrusive activities at the burial pit at SWMU 2, TEAD-S, UT as part of the SWMU 2 Interim Remedial Action. Kemron requests permission from the State of Utah to use this characterized soil as site backfill per the approved *Interim Remedial Action Work Plan* (UXB-Kemron, 2012).

Background

A total of five (5) soil samples were collected from four soil stockpiles according to the procedures and frequency outlined in the *Interim Remedial Action Work Plan* (UXB-Kemron, 2012). The three overburden soil stockpiles (stockpiles 5, 6, and 7) and one mixed soil stockpile (stockpile 11) were generated during excavation activities in the vicinity of the burial pit at SWMU 2. The overburden soil from stockpiles 5, 6, and 7 represents backfill historically used to cover any potential MEC and is not anticipated to contain MC or other contaminants of concern. Soil from stockpile 11 was a mix of overburden and soil potentially contacting buried MC.

One grab sample was collected for every 500 cubic yards of overburden soil and one composite sample was collected for every 100 cubic yards of MEC-impacted soils. Table 1 presents the stockpile volumes and sampling frequency for the four soil stockpiles discussed in this memorandum. Following receipt of ECBC data that are below applicable decision criteria, sample aliquots were submitted to TestAmerica for remaining waste characterization analytes (Table 1).

Table 1 – Stockpile Sample Summary

Stockpile #	Sample ID(s)	Volume	Analyses
Stockpile 5	S2WC-S501 S2WC-S502	678 cy	**ECBC**: H, 1,4-Dithiane, 1,4-Thioxane, and TDG **TestAmerica:** VOCs, SVOCs, Explosives, Organosulfur and TCDs, CWM Degradates, Perchlorate, Metals, White Phosphorous, as well as TCLP VOC, TCLP SVOC, TCLP Pesticides, TCLP Herbicides, TCLP Metals, and RIC
Stockpile 6	S2WC-S601	274 cy	
Stockpile 7	S2WC-S701	228 cy	
Stockpile 11	S2WC-S1101	7 cy	

Results Summary

All laboratory results were reviewed by Jacobs for accuracy and completeness following receipt of data. Detected concentrations of analytes in Stockpiles 5, 6, 7 and 11 were compared to the project Action Limits detailed in the *Interim Remedial Action Work Plan* (UXB-Kemron, 2012) and presented in Table 2. Project Action Limits include Residential Soil Levels, Risk-Based SSLs, and MCL-Based SSLs. Site-specific SWMU 2 Action Limits (DAF 38) were calculated for compounds exceeding the Project Action Limits using Equation 16 and 17 of the *Tooele Chemical Depot South Area Final Risk Assumptions Document* (RAD) (AQS, 2013).

Miscellaneous detections of VOCs (benzene, tetrachlorethene [PCE]) were reported in some or all of the stockpile samples. However, detected concentrations are below the site-specific SWMU 2 Action Limits (DAF 38) as presented in Table 2. Napthalene was detected in Stockpiles 5 and 6 but was detected in associated blank samples, "B-qualified," and eliminated as a laboratory contaminant.

Table 2 – SWMU 2 Stockpiles – Organic Results Summary

Sample ID	Analyte	Result		Units	Risk Based SSL Limit	MCL Based SSL Limit	Residential RSL Limit	Site-Specific (DAF38)
S2WC-S1101	Benzene	0.00098	J	mg/Kg	0.00023		1.2	0.019
S2WC-S1101	Tetrachloroethene	0.0031	J	mg/Kg		0.0023	24	0.354
S2WC-S1101-FD	Benzene	0.0013	J	mg/Kg	0.00023		1.2	0.019
S2WC-S1101-FD	Tetrachloroethene	0.0033	J	mg/Kg		0.0023	24	0.354
S2WC-S501	Benzene	0.0018	J	mg/Kg	0.00023		1.2	0.019
S2WC-S501	Naphthalene	0.0007	J, B	mg/Kg	0.00054		3.8	0.062
S2WC-S501	Tetrachloroethene	0.005	J	mg/Kg		0.0023	24	0.354
S2WC-S502	Benzene	0.00038	J	mg/Kg	0.00023		1.2	0.019
S2WC-S502	Naphthalene	0.00094	J, B	mg/Kg	0.00054		3.8	0.062
S2WC-S502	Tetrachloroethene	0.0071	J	mg/Kg	0.0051	0.0023	24	0.354
S2WC-S601	Benzene	0.0015	J	mg/Kg	0.00023		1.2	0.019
S2WC-S601	Naphthalene	0.0009	J, B	mg/Kg	0.00054		3.8	0.062
S2WC-S601	Tetrachloroethene	0.004	J	mg/Kg		0.0023	24	0.354
S2WC-S601-FD	Benzene	0.0014	J	mg/Kg	0.00023		1.2	0.019
S2WC-S601-FD	Tetrachloroethene	0.0028	J	mg/Kg		0.0023	24	0.354
S2WC-S701	Benzene	0.00098	J	mg/Kg	0.00023		1.2	0.019
S2WC-S701	Tetrachloroethene	0.0083	J	mg/Kg	0.0051	0.0023	24	0.354

In general, metals were detected in soil stockpile samples at concentrations below Project Action Limits and/or remain consistent with TEAD-S background levels as presented in the TEAD-S RAD. Site-specific Action Limits (DAF 38) were calculated for sample locations with metals exceedances greater than

background levels. Table 3 presents detected levels of metals and their associated Project Action Limits and site-specific background values.

Stockpile 5 had a detected concentration of thallium (15 mg/kg) and cobalt (14 mg/kg) exceeding the SWMU 2 Project Action Limits. Thallium does not have a background level available. The thallium and cobalt detections and action limit exceedances are considered questionable and not believed to be significant because:

- Thallium has not been detected in any stockpile samples collected to date at SWMU 2;
- Thallium and cobalt are not compounds associated with munitions; and
- Thallium is naturally occurring but a background value has not been established for TEAD-S.

Table 3 – SWMU 2 Stockpiles – Inorganic Results Summary

SampleID	Analyte	Result		Units	TEAD-S Background Reference Value (RAD)	Risk Based Site Specific SSL (DAF38)
S2WC-S501	Mercury	0.064		mg/Kg	0.05	3.97*
S2WC-S502	Antimony	3.2		mg/Kg	0.96	10.3*
S2WC-S502	**Cobalt**	**14**		**mg/Kg**	**5.7**	**10.3**
S2WC-S502	Manganese	840		mg/Kg	698.7	1,070
S2WC-S502	Mercury	0.065		mg/Kg	0.05	3.97*
S2WC-S502	Molybdenum	3.5		mg/Kg	0.9	76.6
S2WC-S502	**Thallium**	**15**		**mg/Kg**	**-**	**5.41**
S2WC-S601	Antimony	1.2	J	mg/Kg	0.96	10.3*
S2WC-S601	Cobalt	6.4		mg/Kg	5.7	10.3
S2WC-S601	Mercury	0.067		mg/Kg	0.05	3.97*
S2WC-S601-FD	Antimony	1	J	mg/Kg	0.96	10.3*

***MCL-based SSL**

Extraction of sample aliquots using toxicity characteristic leaching procedure (TCLP) was performed for the stockpile samples as well. Reported TCLP concentrations for all overburden stockpile samples are below regulatory levels.

Conclusions / Recommendations

The purpose of collecting and submitting stockpile samples for fixed laboratory analysis is to ensure the proper reuse or disposal of site-generated soils. According to the Interim Remedial Action Work Plan (UXB-Kemron 2012), soils can be used as site backfill at SWMU 2 provided Site-Specific Action Limits have been met.

As shown in Table 2 and Table 3, all analytes representing Stockpiles 5, 6, 7, and 11, with the exception of thallium and cobalt in Stockpile 5, yielded concentrations less than their respective Project Action Limits and/or background values (metals only). Although thallium and cobalt exceeded its Action Limit in Stockpile 5, they are not considered COCs at the site and were eliminated from further consideration. TCLP regulatory levels were not exceeded in any of the stockpile samples.

It is recommended that the soils comprising Stockpiles 5, 6, 7, and 11 be used as on-site backfill with no limitations. Kemron requests an acceptance letter from the State of Utah showing concurrence with this determination based on the data provided in this memorandum.

References

AQS, 2013 (August). *Tooele Chemical Depot South Area Final Risk Assumptions Document.* Prepared By Analytical Quality Solutions.

UXB-Kemron, 2012 (October). *Interim Remedial Action Work Plan*. Prepared By UXB-Kemron Remediation Services, LLC.

State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Amanda Smith
Executive Director

DIVISION OF SOLID AND
HAZARDOUS WASTE
Scott T. Anderson
Director

October 17, 2014

Colonel Roger L. McCreery, Commander
Tooele Army Depot South
JMTE-GMV, Building 5119
Attn: Troy Johnson
1 Tooele Army Depot
Tooele Army Depot
Tooele, Utah 84074-5000

RE: Soil Stockpiles 5, 6, 7 and 11 Sample Results
Solid Waste Management Unit (SWMU) 2
Tooele Army Depot South (TEADS)
UT5210090002

Dear Colonel McCreery:

The Division of Solid and Hazardous Waste has completed its review of the sampling results for overburden soil stockpiles 5, 6, 7 and 11 at SWMU 2. The samples contain low concentrations of benzene (1 µg/kg), tetrachloroethene (8.3 µg/kg) and naphthalene (1 µg/kg), but because the volatile contaminants appear to come from an unknown source, the soil will not be considered a listed hazardous waste. The sample results also indicate the organic contamination does not exceed the residential land-use and groundwater protection values described in R315-101 of the Utah Administrative Code.

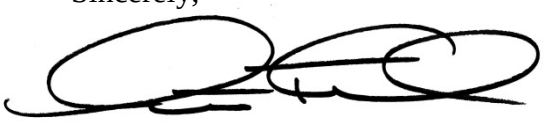
Significant numbers of smoke pots containing hexachloroethane and CN-DM grenades containing arsenic were removed at SWMU 2. However, hexachloroethane was not detected in the TCLP or EPA Method 8270 results and the concentration of arsenic in the stockpile soil was below TEAD-S background. Please note that metals detected above background in confirmation samples will be considered contaminants of potential concern and must be evaluated in a risk assessment.

Based on the sample results described above, the Division concurs with the proposal for unrestricted use of the overburden stockpiles 5, 6, 7, and 11 as fill at SWMU 2.

(Over)

If you have any questions, please call Dave Larsen at (801) 536-0226.

Sincerely,



Scott T. Anderson, Director
Division of Solid and Hazardous Waste

STA/DCL/tjm

c: Myron Bateman, EHS, MPA, Health Officer, Tooele County Health Department
Jeff Coombs, EHS, Environmental Health Director, Tooele County Health Department
Troy Johnson, TEAD, (Email)
Nancy Morlock, USEPA Region 8

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MEMORANDUM

To:	Allyn Allison, COR
From:	Jeff Gunn, Project Manager
CC:	Tracy Bergquist, Cathy Etheredge, Brian Barker
Date:	18 November 2014
Re:	Path Forward SWMU 2 Burial Pit Characterization and Excavation

The purpose of this memorandum is to provide a summary of analytical data for the SWMU 2 burial pit floor; present the approach for additional vertical characterization of several grids in burial pit floor; and outline additional burial pit excavation activities planned for the spring of 2015.

Background

Confirmation soil samples were collected from the surface of the burial pit floor after completion of excavation of all MEC, other waste disposed, and associated potentially contaminated soil.

The number of confirmation samples required for the SWMU 2 burial pit area was determined using a 30 feet x 30 feet grid pattern of the final excavated area, with a composite sample collected from each grid. Each 30 ft x 30 ft grid sample was represented by a 5-part composite sample, with one aliquot collected from the center of each grid and four additional aliquots collected from the center of each grid quadrant (Figure 1).

Based on the 30 ft x 30 ft grid pattern, the burial pit floor was divided into nine grids with one composite confirmation sample being collected to represent each grid. Field duplicate samples were collected at a frequency of one per ten primary samples (10%). A split sample was collected by UDEQ from burial pit sample location GP06.

A total of nine (9) composite soil samples were collected from the burial pit sample grids to confirm effectiveness of the removal action. Samples were screened for chemical agent by ECBC and analyzed for VOCs, SVOCs, explosives, organosulfur and TCDs, CWM Degradates, perchlorate, and metals in accordance with the Work Plan.

Confirmation Soil Sample Results

All laboratory results were reviewed by Jacobs for accuracy and completeness following receipt of data. Attachment 1 presents all chemicals that were detected in post-excavation confirmation samples collected from the burial pit floor. Note the last integer in the Sample ID denotes the grid number (e.g. S2GP-010**3** is a composite sample from Grid #3). Detected concentrations of analytes from with each burial pit grid were compared to the project Action Limits detailed in the *Interim Remedial Action Work Plan* (UXB-Kemron, 2012). Project Action Limits include Residential Soil Levels, Risk-Based SSLs, and MCL-Based SSLs. Site-specific SWMU 2 Action Limits (DAF 38) were calculated for compounds exceeding the Project Action Limits using Equation 16 and 17 of the *Tooele Chemical Depot South Area Final Risk Assumptions Document* (RAD) (AQS, 2013).

Miscellaneous detections of organic compounds (benzene, hexachloroethane], N-Nitrosodiphenylamine, and, tetrachlorethene [PCE]) were reported in some of the burial pit confirmation soil samples. However, with the exception of hexachloroethane, all detected organic concentrations are below the site-specific SWMU 2 Action Limits (residential screening level and site specific SSL [DAF 38]) as presented in Table 1. Hexachloroethane was detected at concentrations less than its residential screening level in all samples but greater than its soil to groundwater screening level in burial pit locations GP-05, GP-06, and GP-07.

Table 1 – SWMU 2 Burial Pit Confirmation Soil Samples – Organic Results Summary

Sample ID	Analyte	Result		Units	Risk Based SSL Limit	MCL Based SSL Limit	Residential RSL Limit	Site-Specific (DAF38)
S2GP-0101	Benzene	0.00068	J	mg/Kg	0.00023		1.2	0.019
S2GP-0102	Benzene	0.00073	J	mg/Kg	0.00023		1.2	0.019
S2GP-0103	Benzene	0.00044	J	mg/Kg	0.00023		1.2	0.019
S2GP-0103	Tetrachloroethene	0.015	J	mg/Kg	0.0051	0.0023	24	0.354
S2GP-0104	Benzene	0.0023	J	mg/Kg	0.00023		1.2	0.019
S2GP-0104	N-Nitrosodiphenylamine	0.53		mg/kg	0.033		110	7.42
S2GP-0104	Tetrachloroethene	0.011		mg/Kg	0.0051	0.0023	24	0.354
S2GP-0105	Benzene	0.0017	J	mg/Kg	0.00023		1.2	0.019
S2GP-0105	**Hexachloroethane**	**0.32**	J	mg/Kg	0.00055		13	0.048
S2GP-0105	Tetrachloroethene	0.012		mg/Kg	0.0051	0.0023	24	0.354
S2GP-0106	Benzene	0.0023	J	mg/Kg	0.00023		1.2	0.019
S2GP-0106	N-Nitrosodiphenylamine	0.19	J	mg/Kg	0.033		110	7.42
S2GP-0106	**Hexachloroethane**	**0.32**	J	mg/Kg	0.00055		13	0.048
S2GP-0106	Tetrachloroethene	0.0063		mg/Kg	0.0051	0.0023	24	0.354
S2GP-0107	Benzene	0.0014	J	mg/Kg	0.00023		1.2	0.019
S2GP-0107	**Hexachloroethane**	**0.23**	J	mg/Kg	0.00055		13	0.048
S2GP-0107	Tetrachloroethene	0.0067	J	mg/Kg	0.0051	0.0023	24	0.354
S2GP-0108	Benzene	0.00066	J	mg/Kg	0.00023		1.2	0.019
S2GP-0109	Benzene	0.0013	J	mg/Kg	0.00023		1.2	0.019
S2GP-0109	N-Nitrosodiphenylamine	0.26	J	mg/kg	0.033		110	7.42
S2GP-0109	Tetrachloroethene	0.0063		mg/Kg	0.0051	0.0023	24	0.354

In general, metals were detected in burial pit soil confirmation samples at concentrations below Project Action Limits and/or are consistent with TEAD-S background levels as presented in the TEAD-S RAD.

Table 2 presents detected concentrations of metals that exceed their respective TEAD-S background levels and EPA soil to groundwater screening level.

Burial pit locations GP-04 and GP-07 (partial grids only) contain metals concentrations greater than their respective background levels with arsenic concentrations also exceeding its residential screening level. Arsenic is the risk driver in GP-04 and GP-07 (Table 2 and Figure 1).

Burial pit locations GP-05 (partial grid only) and GP-06 contain elevated levels of zinc above background levels but below residential screening levels. However, the presence of hexachloroethane above soil to groundwater screening levels is considered the risk driver in both grids (Figure 1).

At GP-09, iron (18,000 mg/kg) was detected at concentrations greater than its background level (15,460 mg/kg). However, iron will not be addressed further because site concentrations slightly exceed background and iron is an essential element not associated with toxicity.

Table 2 – SWMU 2 Burial Pit Confirmation Soil Samples – Metals Results Summary (Exceedances Only)

SampleID	Analyte	Result		Units	TEAD-S Background Reference Value (RAD)
S2GP-0104	Arsenic	46		mg/Kg	35
S2GP-0104	Iron	16,000		mg/Kg	15,460
S2GP-0105	Zinc	2,000		mg/Kg	77.1
S2GP-0106	Iron	17,000		mg/Kg	15,460
S2GP-0106	Zinc	440		mg/Kg	77.1
S2GP-0107	Antimony	1.6		mg/Kg	0.96
S2GP-0107	Arsenic	150		mg/kg	35
S2GP-0107	Cadmium	2.4		mg/kg	1.2
S2GP-0107	Cobalt	5.8		mg/kg	5.7
S2GP-0107	Iron	34,000		mg/kg	15,460
S2GP-0107	Molybdenum	2.9		mg/kg	0.9
S2GP-0109	Iron	18,000		mg/kg	15,460

***MCL-based SSL**

Recommendations

Additional soil sampling is recommended to define the vertical extent of site contaminants at locations GP-04, GP-05, GP-06, and GP-07. Defining the vertical extent of contamination will provide data related to soil excavation depths and volumes in support of additional excavation activities proposed for the spring of 2015. No additional characterization activities are proposed at GP-01, GP-02, GP-03, GP-08, or GP-09 because site contaminants were not detected at concentrations greater than site-specific decision criteria.

The proposed approach to define the vertical extent of contamination in each of the four identified grids is summarized in Figure 2 and presented below. All vertical delineation samples from the gravel pit floor will be collected during a single sampling event, and deeper intervals will be held for analysis pending the result of the upper interval. Field sampling procedures including collection methods and equipment decontamination will be conducted in accordance with the Work Plan. The proposed approach includes:

- Each existing 30 ft x 30 ft burial pit grid will be further divided into four 15 ft x 15 ft quadrants as shown in Figure 2. Each 15 ft x 15 ft quadrant represents an area of 225 square feet.
- Five discrete soil sample locations will be identified in each complete grid. Grids that are not whole (GP-05 and GP-07) will have one sample located to represent each 225 square feet area within a partial grid (Figure 2).
- Each sample location will consist of discrete samples collected at depths from 6 to 12-inches, 12 to 24-inches, and 24 to 36-inches below the burial pit floor. Using this approach, three soil samples representing each identified depth will be collected at each sample location.
- Soil screening tools including an X-Ray Fluorescence (XRF) and photoionization detector (PID) may be used to screen soil for metals and volatile organics as soil borings are advanced to assist in vertical delineation.
- A total of 36 soil samples, excluding QA/QC, will be collected from 12 discrete locations as shown on Figure 2. Field duplicate samples will be collected at a frequency of one per ten primary samples (10%) and matrix spike/matrix spike duplicate (MS/MSD) samples at a frequency of one per 20 primary samples (5%).
- It has been determined that there are no munitions constituents on site thus, screening by ECBC prior to submittal to Test America (TA) is not needed. Soil samples will be submitted to TA to further characterize site risk drivers as follows: VOCs (tetrachloroethane), SVOCs (hexachloroethane), and metals (arsenic).
- A phased approach for sample submittal to TA will be completed. The 6 to 12-inch depth interval for a discrete location will be submitted to TA. If results exceed the site-specific decision criteria then the next depth interval, 12 to 24-inches, will be submitted. If the 6 to 12-inch depth interval for a discrete location does not exceed criteria, the next depth interval will not be submitted for analyses.

Additional soil characterization is recommended to define the vertical extent of contaminants identified during post-removal confirmation sampling of the burial pit. Vertical extent data will be combined with existing aerial extent data to define excavation depths and volumes in support of excavation activities proposed for the spring of 2015. The additional data will also be used to support selection of a final excavation strategy. Following the second iteration of excavation, confirmation samples will again be collected from the floor of the excavation in accordance with the procedures outlined in the Work Plan to verify that project-specific cleanup levels have been met.

Respectfully Submitted,

Jeff Gunn
Project Manager

Please provide your concurrence and approval in the space provided below for this data evaluation and revised sampling approach. Should you require any additional information or clarification regarding this request, please do not hesitate to contact me at 314-440-3332, or via email at jgunn@kemron.com.

Approval: _____ Date: _____

State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Amanda Smith
Executive Director

DIVISION OF SOLID AND
HAZARDOUS WASTE
Scott T. Anderson
Director

December 17, 2014

Colonel Roger L. McCreery, Commander
Tooele Army Depot South
JMTE-GMV, Building 5119
Attn: Troy Johnson
1 Tooele Army Depot
Tooele Army Depot
Tooele, Utah 84074-5000

RE: Sampling Plan for the Collection of Boring Data
Solid Waste Management Unit (SWMU) 2
UT5210090002

Dear Colonel McCreery:

Based on a review of surface soil sampling data at the SWMU 2 burial area, TEADS has proposed to remove contaminated soil. To prepare a removal plan and estimate the depth and amount of soil to be removed, TEADS has proposed collection of subsurface samples. Twelve borings will be completed in Grids 4-7 and samples will be collected from six to 12 inches, 12-24 inches and 24-36 inches, for a total of 36 samples. Each of the 36 sample intervals will be sampled for all previously detected contaminants (VOC, SVOC and total metals). The plan for collection of this data is hereby approved.

The Division notes two additional issues that must be addressed after collection of the boring data and as part of the removal plan: 1) the extent of contamination in the side walls areas of Grids 4 and 7 needs to be defined; and, 2) the boring plan proposed arsenic background concentration of 20/mg/kg needs to be further justified due to arsenic being a site contaminant.

If you have any questions, please call Dave Larsen at (801) 536-0226.

Sincerely,

Scott T. Anderson, Director
Division of Solid and Hazardous Waste

STA/DCL/tjm

(Over)

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c: Myron Bateman, EHS, MPA, Health Officer, Tooele County Health Department
Jeff Coombs, EHS, Environmental Health Director, Tooele County Health Department
Troy Johnson, TEAD, (Email)
Nancy Morlock, USEPA Region 8 (Email)

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MEMORANDUM

To: Allyn Allison, COR

From: Jeff Gunn, Project Manager

CC: Tracy Bergquist, Cathy Etheredge, Brian Barker

Date: 3 March 2015

Re: SWMU 2 Burial Pit Vertical Delineation Results and Excavation Plan

The purpose of this memorandum is to provide a summary of sampling activities for the SWMU 2 Burial Pit floor; present results of additional vertical characterization; complete an excavation plan based on the soil sample results; and outline the path forward for the Burial Pit floor.

Background

Confirmation soil samples were collected in September 2014 from the surface of the Burial Pit floor after completion of the MEC removal and associated contaminated soil. Confirmation soil samples were collected as 5-point composites along a 30 foot x 30 foot grid. Results identified contaminants of concern (COCs) as VOCs (tetrachloroethane), SVOCs (hexachloroethane), and metals (arsenic) at grid locations GP-04, GP-05, GP-06, and GP-07.

The State of Utah Department of Environmental Quality (UDEQ), in a memorandum dated 17 December 2014, approved additional soil sampling to further define the vertical extent of contamination at locations GP-04, GP-05, GP-06, and GP-07. The purpose of additional vertical delineation was to generate soil data to support development of an Excavation Plan and to estimate quantities of contaminated soils for planning purposes. For the December vertical delineation sampling event, each existing 30 ft x 30 ft Burial Pit grid was further divided into four 15 ft x 15 ft quadrants at GP-04, GP-05, GP-06, and GP-07, with five discrete soil sample locations collected from each grid (Figure 1). Two grids were partial grids (GP-05 and GP-07) with one discrete sample being collected to represent a footprint of 225 square feet as shown in Figure 1. Vertical delineation soil samples were collected from 6 to 12-inches, 12 to 24-inches, and 24 to 36-inches below the Burial Pit floor, screened using an X-Ray Fluorescence (XRF) and photoionization detector (PID), and analyzed at a fixed laboratory for VOCs, SVOCs, and metals.

Vertical Delineation Soil Sample Results

All laboratory results were validated by Jacobs for accuracy and completeness following receipt of data. Attachment 1 presents all chemicals that were detected in vertical delineation samples collected from the Burial Pit floor. Attachment 2 includes the Chemical Data Quality Report associated with this data.

The sample ID used for the vertical delineation samples is detailed as follows:

EXAMPLE: **S2GP-0205-NW-1.0**, where

S2GP = SWMU2 gravel pit;
0205 = second iteration, grid cell 05;
NW= cardinal direction from center point; and

1.0 = collected from 0.5' – 1.0' bgs; or
2.0 = collected from 1.0' – 2.0' bgs; or
3.0 = collected from 2.0' – 3.0' bgs

Detected concentrations of analytes from each Burial Pit grid were compared to the project Action Limits detailed in the *Interim Remedial Action Work Plan* (UXB-Kemron, 2012). Project Action Limits include EPA Regional Screening Levels protective of residential use, Risk-Based Soil Screening Levels (SSLs), MCL-Based SSLs, and site-specific SWMU 2 SSLs. Site-specific SSLs (applying a DAF 38) were calculated for compounds exceeding the Project Action Limits using Equation 16 and 17 of the *Tooele Chemical Depot South Area Final Risk Assumptions Document* (RAD) (AQS, 2014).

Miscellaneous metals and SVOCs were identified in the Burial Pit floor at concentrations above Project Action Limits as presented in Table 1. The highest concentrations of SVOCs included hexachloroethane and hexachlorobenzene that were detected above their residential soil standard at locations S2GP-0204-NE, S2GP-0206-CP, S2GP-0206-NE, and S2GP-0206-SW. The vertical extent of contamination has not been fully delineated at these locations due to elevated concentrations of metals and/or SVOCs in the 2'to 3' interval. Other locations within the 4' excavation footprint, including S2GP-0204-CP and S2GP-0204-SE, will be over-excavated to simplify field implementation. All remaining locations indicated on Figure 1 have been bound vertically for VOCs, SVOCs, and metals. A full list of sample data is included in Attachment 2 (Data Quality Report tables) of this memorandum.

Several metals throughout the Burial Pit floor exceeded their background values as published in the RAD, but are considered within range of background. In most cases, metals exceeding their published background values are not attributable to munitions at the site and are not considered COCs. This is evidenced at S2GP-0206SE, where the molybdenum result (3 mg/kg) exceeded its background value of 0.9 mg/kg but is not attributed to munitions and is considered within its range of background for the area.

Arsenic background values as presented in TEAD-S RAD (AQS, 2014) were used during the evaluation of arsenic in the Burial Pit. Per the TEAD-S RAD, an arsenic background value of 12.1 applies if Adamsite (DM) or other arsenic sources are known to be present. Therefore, the background value of 12.1 mg/kg was applied for areas below and immediately surrounding the location of DM candles, smoke pots, and grenades (Figure 2). All DM source material identified in the Burial Pit was found in discrete areas, stacked vertically, and surrounded by coarse-grained gravelly soil.

In areas where no sources of arsenic (e.g. DM candles) were present, the arsenic background value of 35 mg/kg was used (AQS, 2014). This value is consistent with areas within and adjacent to the Burial Pit where no known arsenic sources were identified. These areas include the 30-foot grid cells sampled during Round 1 confirmation sampling (15 September 2014), represented by the green shading on Figure 1. The average arsenic concentration in these areas is 13.6 mg/kg, which is consistent with the average arsenic concentration identified in the Open Burn baseline samples (13.6 mg/kg) and the Incremental Sample Decision Units within the gravel pit (11.6 mg/kg).

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Table 1 – Summary Discussion of Results

Sample Location	Interval	Results Discussion – Risk Drivers
S2GP-0204-CP	1' bgs	Miscellaneous metals significantly above background (including arsenic, a risk driver); hexachloroethane significantly above SSL-DAF38 (7.7 mg/kg)
	2' bgs	Miscellaneous metals above but within range of background; hexachloroethane significantly above SSL-DAF38 (8.8 mg/kg)
	3' bgs	Molybdenum above but within range of background; no detection of hexachloroethane
S2GP-0204-NE	1' bgs	Metals significantly above background (Zn, Hg only); hexachloroethane above SSL-DAF38 (0.12 mg/kg)
	2' bgs	Metals significantly above background (Zn); other metals within range of background; hexachlorobenzene above residential soil standards (0.61 mg/kg); hexachloroethane (2.7 mg/kg) and tetrachloroethene (1.0 mg/kg) above SSLs-DAF38)
	3' bgs	Zn significantly above background; Other metals within range of background; hexachlorobenzene above residential standards (6.3 mg/kg); hexachloroethane above SSL-DAF38 (4.1 mg/kg)
S2GP-0204-NW	1' bgs	Metals above but within range of background (Molybdenum)
	2' bgs	Metals above but within range of background (Mercury)
	3' bgs	Metals above but within range of background (Molybdenum)
S2GP-0204-SE	1' bgs	Miscellaneous metals significantly above background; hexachloroethane significantly above SSL-DAF38 (2.1 mg/kg)
	2' bgs	Miscellaneous metals significantly above background; hexachloroethane significantly above SSL-DAF38 (1.2 mg/kg)
	3' bgs	Molybdenum above but within range of background (hexachloroethane below site standards)
S2GP-0204-SW	1' bgs	Miscellaneous metals significantly above background; hexachloroethane significantly above SSL-DAF38 (0.91 mg/kg)
	2' bgs	Molybdenum above but within range of background (hexachloroethane below site standards)
	3' bgs	Molybdenum above but within range of background (hexachloroethane below site standards)
S2GP-0205-NW	1' bgs	Zinc significantly above background; Miscellaneous VOCs above criteria; Miscellaneous metals above but within range of background; hexachloroethane significantly above SSL-DAF38 (6.1 mg/kg)
	2' bgs	Molybdenum above but within range of background (hexachloroethane below site standards)
	3' bgs	Nickel above but within range of background (hexachloroethane below site standards)
S2GP-0206-CP	1' bgs	Miscellaneous metals significantly above background (including Arsenic at 41 mg/kg); hexachloroethane above residential soil standard (11 mg/kg); hexachlorobenzene above SSL-DAF38 (0.11 mg/kg)
	2' bgs	Miscellaneous metals above but within range of background (Arsenic at 17 mg/kg); hexachloroethane above SSL-DAF38; (1.1 mg/kg)
	3' bgs	Metals above but within range of background; hexachloroethane above SSL-DAF38 (0.17 mg/kg)
S2GP-0206-NE	1' bgs	Zinc significantly above background (2600 mg/kg); Miscellaneous metals within range of background; hexachloroethane above residential standard (28 mg/kg); hexachlorobenzene

Sample Location	Interval	Results Discussion – Risk Drivers
		above SSL-DAF38 (0.17 mg/kg)
	2' bgs	Zinc above background (130 mg/kg); Miscellaneous metals within range of background; hexachloroethane above SSL-DAF38 (0.96 mg/kg).
	3' bgs	Miscellaneous metals significantly above background (Fe at 180,000 mg/kg) (hexachloroethane and hexachlorobenzene below site standards)
S2GP-0206-NW	1' bgs	Miscellaneous metals significantly above background (including arsenic and zinc); hexachloroethane above SSL-DAF38 (1.9 mg/kg)
	2' bgs	Zinc significantly above background; Miscellaneous metals within range of background; hexachlorobenzene (0.12 mg/kg) and hexachloroethane (1.4 mg/kg) above SSL-DAF38
	3' bgs	Molybdenum and selenium above but within range of background (hexachloroethane and hexachlorobenzene below site standards)
S2GP-0206-SE	1' bgs	Miscellaneous metals above but within range of background (Mb and Ni)
	2' bgs	No detections above criteria
	3' bgs	Molybdenum within range of background (3.0 mg/kg)
S2GP-0206-SW	1' bgs	Zinc significantly above background (1300 mg/kg); Miscellaneous metals within range of background; hexachloroethane (28.0 mg/kg) above residential standard; hexachlorobenzene above SSL-DAF38 (0.21 mg/kg)
	2' bgs	Zinc significantly above background (560 mg/kg); Miscellaneous metals above background; hexachloroethane (1.1 mg/kg), hexachlorobenene (0.24 mg/kg), pentachlorophenol (0.53 mg/kg) above SSL-DAF38
	3' bgs	Iron and zinc significantly above background; Miscellaneous metals above background; hexachloroethane above SSL-DAF38 (1.2 mg/kg)
S2GP-0207-SE	1' bgs	Zinc and iron significantly above background; Miscellaneous metals within range of background; hexachloroethane above SSL-DAF38 (1.4 mg/kg)
	2' bgs	Miscellaneous metals within range of background (hexachloroethane below site standards)
	3' bgs	No detections above criteria

Real-time field screening data was collected from a separate borehole drilled immediately adjacent to the borehole used to collect analytical soil samples. The presence of organic compounds and metals were screened using a PID and an XRF, respectively, at 1-foot intervals extending to 4-feet bgs. The correlation between field screening results and analytical results was somewhat consistent, with results used to assist in the development of the Excavation Plan. Field screening results are presented in Attachment 3.

Excavation Plan

A second iteration of excavation is proposed for March 2015 to remove soils exhibiting concentrations of COCs above Project Action Limits. An estimated 230 cubic yards will be excavated from the Burial Pit floor during this second iteration of excavation. Proposed excavation limits are presented in Figure 1.

Based on a review of the analytical data as summarized in Table 1, excavation to 4’ bgs is proposed at the following locations:

- S2GP-0204CP
- S2GP-0204NE
- S2GP-0204SE
- S2GP-0206CP
- S2GP-0206NW
- S2GP-0206NE
- S2GP-0206SW

Excavation to 1' bgs is proposed at the following locations based on the findings presented in Table 1:

- S2GP-0204NW
- S2GP-0204SW
- S2GP-0207SE
- S2GP-0206SE
- S2GP-0205NW

Excavated soils from the pit will be placed directly onto plastic by an excavator to prevent cross contamination. Utilizing a front-end loader the soil will then be transferred from the pit floor up the incline and directly into a roll-off container for transport and disposal.

Excavation depths will be measured and verified utilizing conventional differential leveling techniques, documented both in paper and electronic field books. It is anticipated that both and automatic spirit level with rod will be used to transfer elevations, and that a rotating laser system will be used for grade checking. Final grades will be verified and documented using automatic differential leveling techniques in accordance with standards of practice, and as depicted in FM 5-233 and FM3-34.331.

The results of the vertical delineation sampling show miscellaneous detections of metals and SVOCs (e.g hexachloroethane and hexachlorobenzene). These results indicate that contaminants do not pose a health risk, but removal is required to meet protection of groundwater. The soil results are similar to the waste characterization data of soil previously removed from the Burial Pit (Stockpiles #1 through 11), and suggest that the soil would not fail TCLP and would not be considered a characteristic waste. According to the USEPA, soil does not need to be managed as hazardous waste if it does not exhibit a hazardous characteristic and it does not contain hazardous constituents above site-specific health-based levels; this determination is referred to as a "contained out" determination. Therefore, KEMRON proposes to collect waste characterization samples from excavated soils and to apply the "contained-out" policy as summarized below. This waste management procedure is consistent with all previously excavated soil removed from the Burial Pit.

Waste characterization samples will be collected from the excavated soils and analyzed for TCLP VOCs, TCLP SVOCs, and TCLP metals at a frequency of one sample per 100 cubic yards of excavated soil;

- If TCLP results are less than regulatory levels, the soil will not be considered characteristic waste and will be disposed of as non-hazardous waste in a lined landfill under the "contained-out" policy;
- If TCLP results are greater than regulatory levels, soils will be treated as characteristic hazardous (D-coded) waste and transported/disposed of accordingly.

Waste management will be conducted in accordance with the procedures outlined in the *Interim Remedial Action Work Plan* (UXB-Kemron, 2012).

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Confirmation Soil Sampling (Spring 2015)

Post-excavation confirmation floor samples will be collected from the bottom of the 4' excavations to guide future site decisions. Confirmation floor samples will be collected from 0.0' to 0.5' bgs following excavation for VOCs, SVOCs, and metals along the same 15' grid used as a part of vertical delineation conducted in December 2014 (Figure 2).

Sidewall samples will be collected at a frequency of 1 sample per every 15 linear feet from soil representing the true sidewall of the excavation. Each sidewall sample will be collected as a 5-point composite at 2-foot intervals and analyzed for VOCs, SVOCs, and metals. VOC samples will be collected from the center of the sidewall, two inches below the surface of the sidewall. Proposed sidewall sample collection design is presented in Figure 2.

Confirmation soil samples will be collected in accordance with the procedures and methods outlined in the *Interim Remedial Action Work Plan* (UXB-Kemron, 2012). Post-excavation confirmation floor samples and sidewall samples will be used in conjunction with existing site data to guide future site decisions. Existing site data includes results from the initial post-excavation confirmation sampling (15 September 2014) as well as results from the December 2014 vertical delineation (Attachment 1 and 2).

Reporting

A final report will be developed to support a path forward at the site and will include a summary of excavation activities, analytical data and results evaluation, field notes, GPS data, waste manifests, and all other supporting documentation associated with excavation and environmental sampling at the SWMU 2 Burial Pit.

Respectfully Submitted,

Jeff Gunn
Project Manager

Please provide your concurrence and approval in the space provided below for this data evaluation and revised sampling approach. Should you require any additional information or clarification regarding this request, please do not hesitate to contact me at 314-440-3332, or via email at jgunn@kemron.com.

Approval: _____ Date: _____

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Attachment 1

SWMU 2 Burial Pit Vertical Delineation

Summary of Detections

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Attachment 2

SWMU 2 Burial Pit Vertical Delineation

Data Quality Report

(DQR Tables Provided Electronically)

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Attachment 3

SWMU 2 Burial Pit Vertical Delineation

Field Screening Results

Safety and Health Requirements for Open Burning of CBU-E46 & M69 Incendiary Bomblets

SWMU-2, Tooele Army Depot-South (TEAD-S), Utah

Original Issue Date: February 12, 2015

Last Review/Implementation Date: March 31, 2015

KEMRON Environmental Services, Inc.

1359-A Ellsworth Industrial Boulevard, Atlanta, GA 30318

Approved by:

Leland Meadows, Corporate Health and Safety Manager	Date
Tracy Bergquist, Program Manager	Date
Jeff Gunn, Project Manager	Date

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LIST OF APPENDICES

1 POLICY

KEMRON personnel will follow procedures established in this SOP in conjunction with the Chemical Safety Submission (CSS) and the Accident Prevention Plan (APP) for all Open Burn Operations work performed at Tooele Army Depot – South (TEAD-S). Personnel will follow all Health and Safety procedures as directed by the Corporate Health and Safety Plan (CHSP) and the Site Specific Health and Safety Plan. The KEMRON Safety Policy is to have a Safety Program that meets federal 29CFR1910.120 (b), and 29 CFR 1926.65 (b) along with other local regulations as applicable. The policy, purpose, and goal of KEMRON's Safety and Health Program are the elimination and/or reduction of accidents that endanger worker, public, and environment.

1.1 Precautions

Open burn operations are used to destroy excess, obsolete, or unserviceable munitions and energetic (i.e., explosive) materials. Open burns are subject to increasing regulatory restriction, and these techniques may no longer be feasible in the near future. In open burning, materials such as rocket fuel are destroyed by self-sustained combustion after being ignited. In general, electric initiation systems are preferable because they provide better control. In the past, these operations occurred at land surface or in pits. Recently, burn trays and blast boxes have been used to control and contain resulting emissions.

The following precautions shall be followed by UXO field personnel when performing Open Burning Operations:

Burn Site
The burning site should be free of all combustible material (leaves, grass, undergrowth and shrubbery). The burning area shall consist of a rectangle or pad, measuring 566 feet by 866 feet. The area should be entirely cleared so that nothing remains other than a dirt or sand pad. Burn sites on the pad shall not be closer than 150 feet from another burn site. If required, materials to be burned may be placed on a bed of combustibles (untreated lumber or wood, excelsior). Nonvolatile flammable liquids (motor or diesel oil) may be poured over the materials to be burned. Ignition may be accomplished using an electric firing system with an electric squib or match, or a nonelectric firing system, and a bag of smokeless powder.

Tools
Hand and power tools should be used with proper guards and handles in place. Cutting edges should be kept properly shaped. The appropriate tool should be used for each task.

PPE
Site personnel shall be protected with appropriate PPE for the protection of head, eyes, respiratory organs, hands, feet, and other parts of the body.

Fire Safety
KEMRON's primary means of firefighting is through the implementation of preventative measures, particularly during demolition events. These preventative measures are outlined in Paragraph 6.10.7 of the Work Plan and KEMRON's Fire Protection SOP.

To minimize the potential for unintentional fires during burning operations, all personnel will practice appropriate housekeeping procedures in the vicinity of the burn site to ensure materials that can potentially catch fire (e.g., vegetation) have been removed from the burn site.

A sufficient quantity of Fire extinguishers having an Underwriters' Laboratories rating of 10 B-C or more will be maintained on site during burn operations.

No flame or spark producing items will be allowed on the burn site.

No Smoking is allowed on the burn site. Smoking is only allowed in designated areas away from the burn site.

2 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide all KEMRON employees and subcontractors the minimum safety and health requirements applicable to the conduct of open burning of CBU-E46 and M69 Incendiary Bomblets at SWMU-2, Tooele Army Depot South (TEAD-S), Utah.

3 SCOPE

This SOP applies to all site personnel, including contractor and subcontractor personnel, involved in the conduct of open burn operations. This SOP is not intended to contain all of the requirements needed to ensure complete compliance, and should be used in conjunction with approved project plans and applicable referenced regulations. All KEMRON employees involved in open burn operations will read this SOP and sign the acknowledgement sheet. If personnel have not conducted Open Burn Operations in the last 15 days they will reread the SOP and sign the acknowledgement sheet.

4 MAINTENANCE

The Project Manager (PM), in collaboration with the Senior Unexploded Ordnance Supervisor (SUXOS) is responsible for ensuring the maintenance of this procedure. Approval authority rests with the Director, KEMRON Munitions Response Division (MRD).

5 PERSONNEL REQUIREMENTS

5.1 Project Manager

The PM shall be responsible for ensuring the availability of the resources needed to implement this SOP, and will also ensure that this SOP is incorporated into plans, procedures, and training for sites where this SOP is to be implemented.

5.2 Senior UXO Supervisor

The SUXOS will be responsible for ensuring that adequate safety measures and housekeeping are performed during all phases of site operations, to include burn activities, and will visit site burn pad locations, as deemed necessary, to ensure that burn operations are carried out in a safe, clean, efficient, and economic manner. The burn activities will then be conducted under the direct control of the SUXOS, who will have the responsibility of supervising all open burn operations within the area.

The SUXOS will be responsible for ensuring that all on-site unexploded ordnance (UXO) personnel are trained in regards to the nature of the materials handled, the hazards involved, and the precautions necessary. The SUXOS will also ensure that the Visitors Log, the Daily Operations Log, Ammunition Consumption Certificate, DA Form 5692-R and the Weekly Quality Control Report are properly filled out and accurately depict the demolition/burn events and demolition material consumption for each day's

operations. The SUXOS will be present during all burn operations or designate a competent, qualified person to be in charge during any absences.

5.3 UXO Safety Officer

The UXO Quality Control Specialist (UXOQCS) / Safety Officer (SO) for the site is responsible for ensuring that all burn operations are being conducted in a safe and healthful manner, and is required to be present during all open burn operations. The UXOQCS / SO will ensure that the burn team complies with all referenced documents that are applicable to the particular task being performed.

5.4 UXO Quality Control Specialist

The UXOQCS / SO is also responsible for ensuring the completeness of demolition/burn operations records and completing the Daily QC Report, QC Inspection Record, and Weekly Quality Control Report. The UXOQCS / SO, assisted by demolition/burn team personnel, will inspect each burn pan and an area of appropriate radius after each burn, in accordance with the approved Final Explosive Siting Plan, to ensure that there are no kick-outs, hazardous MEC components, or other hazardous items. In addition, the burn pan may be visually inspected, and large metal fragments, and any hazardous debris, will be removed on a per use basis. Any MEC discovered during the quality control (QC) check will be properly disposed of using the burn procedures described in this SOP. Extreme caution must be exercised when handling MEC, which has been exposed to the forces of detonation or fire. Personnel must adhere to acceptable safe practices and procedures when determining the condition of munitions and fuzes that have not been consumed in the disposal process. UXOQCS / SO will make certain that all UXO technicians handling demolition material have the applicable ATF permits to possess explosives. Copies of the certificates will be maintained by the UXOQCS / SO.

6 PROCEDURES

All personnel, including contractor and subcontractor personnel, involved in open burn operations sites will be familiar with the potential safety and health hazards associated with the conduct of open burn / disposal operations, and with the work practices and control techniques used to reduce or eliminate these hazards. All UXO that are to be disposed of by open burning must be guarded while waiting for disposal. During burn operations, the general safety provisions listed below will be followed by all burn team personnel. Noncompliance with the general safety provisions listed below will result in disciplinary action, which may include termination of employment.

All safety regulations applicable to demolition range activities and demolition and MEC materials involved will be complied with:

- Demolition of any kind is prohibited without an approved Final Explosives Siting Plan and must be in compliance with the Explosives Safety Submission (ESS).

- The quantity of MEC to be destroyed at one time will be determined by the fragmentation and K (degree of protection provided)-Factor distance calculations.

- In the event of an electrical storm, dust storm, or other hazardous meteorological conditions, immediate action will be taken to cease all burn operations and evacuate the area.

- In the event of a fire, which does not include explosives or energetic material, put out the fire using the firefighting equipment located at the site. No fire shall be fought where the fire is in imminent danger of contact with explosives. If unable to fight the fire, notify the fire department and evacuate the area. If injuries are involved, remove the victims from danger, administer first aid, and seek medical attention.

- The UXOQCS / SO is responsible for reporting all injuries and accidents that occur.

- Personnel will not tamper with any safety devices or protective equipment.

- Any defect or unusual condition noted that is not covered by this SOP will be reported immediately to the SUXOS or UXOQCS / SO for evaluation and / or correction.

- Methods of open burn/demolition will be conducted in accordance with this SOP and approved changes or revisions thereafter.

- Adequate fire protection and first aid equipment will be provided at all times.

- All personnel engaged in the destruction of MEC will wear clothing made of natural fiber, close-weave clothes, such as cotton. Synthetic material such as nylon is not authorized unless treated with anti-static material.

- Care will be taken to minimize exposure to the smallest number of personnel, for the shortest time, to the least amount of hazard, consistent with safe and efficient operations.

- Work locations will be maintained in a neat and orderly condition.

- All hand tools will be maintained in a good state of repair.

- Each heavy equipment and / or vehicle operator will have a valid operator's permit or license for the equipment being operated.

- Equipment and other lifting devices designed and used for lifting will have the load rating and date of next inspection marked on them. The load rating will not be exceeded and the equipment will not be used without a current inspection date.

- Leather or leather-palmed gloves will be worn when handling wooden boxes, munitions, or MEC.

- Lifting and carrying require care. Improper methods cause unnecessary strains. Observe the following preliminaries before attempting to lift or carry:

  - When lifting, keep your arms and back as straight as possible, bend your knees and lift with your leg muscles.
  - Be sure you have good footing and hold, and lift with a smooth, even motion.

- The demolition site will be provided with two forms of communication, capable of contacting appropriate personnel or agencies (i.e., medical response, etc.).

- Employees are required to wear leather or rubber gloves when handling demolition materials. The type of glove worn is dependent on the type of demolition material.

- When required to reduce the fragmentation effect of a demolition shot, sandbagging or tamping IAW DDESB TP16 will be accomplished.

- An observer will be stationed at a location where there is a good view of the air and surface approaches to the burn pad area, before material is ignited. It will be the responsibility of the observer to order the SUXOS to suspend firing if any aircraft, vehicles, or personnel are sighted approaching the general burn pad area.

• Two-way radios and cell phones or other electronic devices will not be operated in close proximity of the burn pad area while the shot is primed or during the priming process. Radio transmissions and explosives will be separated by a minimum of 50 feet (ft).

• No burn operation will be left unattended during the active portion of the operation (i.e., during the burn or once any explosives or UXO / MEC are brought to the site).

• A minimum radius (approximately 200 ft) around the burn pad site will be cleared of dry grass, leaves, and other extraneous combustible materials around the burn pad site.

• No open burn activities will be conducted if there is less than a 2,000-ft ceiling or if wind velocity is less than 3 mph or, in excess of 15 miles per hour (mph).

• Open burns must be initiated during daylight hours (minimum time for sunrise and sunset is determined by the firing procedure used (i.e., allowing appropriate wait times; electric, non-electric, shock tube 30/60/60).

• Notification of the local authorities will be made in accordance with the site requirements.

• Prior to conducting any other task, personnel will wash their faces and hands after handling demolition material or MEC.

- Electric Blasting Caps or Detonators of different manufacturers or types will not be used in the same system.

- Blasting Cap work ups for electrically primed shots will be conducted a minimum of 50 feet (ft.) away and downwind of the shot.

7 SPECIAL REQUIREMENTS FOR DEMOLITION ACTIVITIES

The following safety and operational requirements will be met during burn operations. Any deviations from this procedure will be allowed only after receipt of written approval from the PM, the contracting officer representative (COR), and the on-site GDA i.e. OESS or NTR. Failure to adhere to the requirements and procedures listed in the paragraphs below could result in serious injury or death; therefore, complete compliance with these requirements and procedures will be strictly enforced.

7.1 General Requirements

The general demolition and OB/OD site requirements listed below will be followed at all times:

• Technical Manual – 60A-1-1-31, “EXPLOSIVE ORDNANCE DISPOSAL PROCEDURES” will be followed when performing open burn operations on USACE sites. This document will be present on site during site operations.

• Material awaiting destruction will be kept at not less than intra-line distance, based on the largest quantity involved, from adjacent explosive materials and from explosives being destroyed. The material will be protected against accidental ignition or explosion from fragments, grass fires, burning embers, or detonating impulses originating in materials being destroyed.

• Prevailing weather condition information can be obtained from the local weather service, or other acceptable source and the data logged in the Daily Operations Log.

- All shots will be dual primed.

- Upon completion of the project, all disturbed burn pad areas will be thoroughly inspected for MEC. Depending upon contract requirements, the site may have to be backfilled and leveled. If necessary, this will be coordinated with the COR.

- Prior to and after each burn, the Daily Operations Log, is to be filled out by the SUXOS with all applicable information.

7.2 Electric Detonator Use

The following requirements are necessary when using electric detonators and blasting circuits:

- Electric detonators and electric blasting circuits may be energized to dangerous levels from outside sources such as static electricity, induced electric currents, and radio communication equipment. Safety precautions will be taken to reduce the possibility of a premature detonation of the electric detonator and explosive charges of which they form a part. Radios, cell phones and other electronic devices will not be operated while the shot is primed or during the priming process.

- Blasting Cap work ups for electrically primed shots will be conducted a minimum of 50 feet (ft.) away and downwind of the shot.

- Electric Blasting Caps or detonators of different manufacturers or types will not be used in the same system.

- The shunt will not be removed from the leg wires of the detonator until the continuity check of the detonator is to be performed.

- When uncoiling, or straightening, the detonator leg wires, keep the explosive end of the detonator pointing away from the body and away from other personnel. When straightening the leg wires, do not hold the detonator itself; rather, hold the detonator leg wires approximately 1 inch (in.) from the detonator body. Straighten the leg wires by hand; do not throw or wave the wires through the air to loosen them.

- Prior to use, the detonators will be tested for continuity. To conduct the test, stretch the wires to their full length, place the detonators in a pre-bored hole in the ground or place them in a sand bag, and walk facing away from the detonators, being sure to not pull the detonators from the hole or sand bag. With the leg wires stretched to their fullest length, ground yourself then test the continuity of the detonators one at a time by un-shunting the leg wires and attaching them to the galvanometer and checking for continuity. After the test, re-shunt the wires by twisting the two ends together. Repeat this process for each detonator until all detonators have been tested. This process will be accomplished at least 50 ft from and downwind of any MEC or demolition materials and out of the demolition site personnel and vehicle traffic flow pattern. In addition, all personnel on the demolition site will be alerted prior to the test being conducted.

NOTE: When testing the detonator, prior to connecting the detonator to the firing circuit, the leg wires of the detonator must be shunted by twisting the bare ends of the wires together immediately after testing. The wires will remain short circuited until time to connect them to the firing line or Remote Firing Device (RFD) Receiver.

- At the power source end of the blasting circuit, the ends of the wires will be shorted or twisted together (shunted) at all times, except when actually testing the circuit or firing the charge. The

connection between the detonator and the circuit firing wires must not be made, unless the power ends of the firing wires are shorted and grounded or the firing panel is off and locked.

- The firing line will be checked using pre-arranged hand signals or through the use of two-way radios, if the burn pad is not visible from the firing point. If radios are used, communication will be accomplished a minimum of 50 ft from the burn pad site and detonators. The firing line will be checked for electrical continuity in both the open and closed positions, and will be closed/shunted after the check is completed.

- Demolition material will be placed in such a manner as to ensure the total detonation of the MEC item to be disposed of. Once the MEC and demolition material are in place, the detonators will be connected to the detonation cord. Prior to handling any detonators that are connected to the firing line or RFD, personnel will again ensure that they are grounded. The detonators will then be carried to the demolition site with the end of the detonators pointed away from the individual. The detonators are then connected to the detonation cord, Non-EI, etc., ensuring that the detonator is not covered with tamping material to allow for ease of recovery / investigation in the event of a misfire.

- Prior to making connections to the blasting machine or RFD Transmitter, the entire firing circuit will be tested for electrical continuity and ohms resistance, or transmitting power (as applicable), to ensure the blasting machine or RFD Transmitter (distance) has the capacity to initiate the shot.

- The individual assigned to make the connections at the blasting machine or panel will not complete the circuit at the blasting machine or panel, and will not give the signal for detonation, until satisfied that all personnel in the vicinity have been evacuated to a safe distance. When in use, the blasting machine, or its actuating device, will be in the blaster's possession at all times. When using the panel, the switch must be locked in the open position until ready to fire, and the single key must be in the blaster's possession.

- Prior to initiating a burn/demolition shot(s), a warning will be given; the type and duration of such warning will be determined by the prevailing conditions at the burn pad site. At a minimum, this should be an audible signal using a siren, air horn, or megaphone, which is sounded for the duration of one minute, five minutes prior to the shot, and again one minute prior to the shot. Verbally signal **"Fire in the hole"** three times and initiate charge.

7.3 Detonating Cord Use

The following procedures are required when using detonating cord (detonation cord):

- Detonation cord should be cut using approved crimpers, and only the amount required should be removed from inventory.

- When cutting detonation cord, the task should be performed outside the magazine.

- For ease of inventory control, remove detonation cord only in 1-ft increments.

- Detonation cord should not be placed in clothing pockets or around the neck, arm, or waist, and should be transported to the demolition location in either an approved "day box," original container, or a cloth satchel, depending upon the magazine location and proximity to the demolition area.

- Detonation cord should be placed at least 50 ft away from detonators until ready for use. To ensure consistent safe handling, each classification of demolition material will be separated by at least 25 ft until ready for use.

- When ready to "tie in" either the detonation cord to demolition materials, or detonation cord to detonator, the detonation cord will be connected to the demolition material and secured to the UXO / MEC. The cord is then strung out of the hole and secured in place with soil, or filled sandbags, being sure to leave a minimum of 6 ft of detonation cord exposed outside the hole.

- Once the hole is filled, make a loop in the detonation cord large enough to accommodate the detonator, place the detonator in the loop, and secure it with tape. The detonator's explosive end will face down the detonation cord toward the demolition material or parallel to the main line.

- In all cases, ensure that there is a minimum of 6 ft of detonation cord extending out of the hole to allow for ease of detonator attachment and detonator inspection / replacement should a misfire occur.

- If the detonation cord detonators are electric, they will be checked, tied in to the firing line, and shunted prior to being taped to the loop. If the detonation cord detonators are non-electric, the time / safety fuze will be prepared with the igniter in place prior to taping the detonators to the detonation cord loop. If the detonation cord detonators are Non-EI, simply tape the detonators into the loop as described above.

- In the event that a time / safety fuze is used, an igniter is not available, and a field expedient initiation system is used (i.e., matches), do not split the safety fuze until the detonator is taped into the detonation cord loop.

7.4 Misfire Procedures

A thorough check of all equipment, firing wire, and detonators will prevent most misfires. However, if a misfire does occur, the procedures outlined below will be followed.

7.4.1 Electric Misfires

To prevent electric misfires, one technician will be responsible for all electrical wiring in the circuit. If a misfire does occur, it must be cleared with extreme caution, and the responsible technician will investigate and correct the situation, using the steps outlined below:

- Check firing line and blasting machine connections, and make a second initiation attempt.

- If unsuccessful, disconnect and connect to another blasting machine (if available), and attempt to initiate a charge.

- If unsuccessful, commence a 30-minute wait period.

- After the maximum delay predicted for any part of the shot has passed, the designated technician will proceed down range to inspect the firing system, and a safety observer must watch from a protected area.

- Disconnect and shunt the detonator wires, check the replacement detonator for continuity, connect the replacement detonator to the firing circuit and prime the charge without disturbing the original detonator.

- Follow normal procedures for effecting initiation of the charge.

7.4.2 Detonating Cord Misfires

KEMRON uses detonation cord to tie in multiple demolition shots, and to ensure that electric detonators are not buried. Since detonation cord initiation will be either electrical or non-electrical, the procedures presented in Paragraph 11.1, will be used to clear a detonation cord misfire. In addition, the following will be conducted:

- If there is no problem with the initiating system, wait the prescribed amount of time, and inspect the initiator to the cord connection to ensure it is properly connected. If it was a bad connection, simply attach a new initiator, and follow the appropriate procedures in Paragraph 10.
- If the initiator detonated and the cord did not, inspect the cord to ensure that it is detonation cord and not time fuze. Also, check to ensure that there is PETN in the cord at the connection to the initiator.
- It may be necessary to uncover the detonation cord and replace it. This must be accomplished carefully, to ensure that the demolition charge and the MEC item are not disturbed.

7.5 Demolition Site Inspection Schedule

The schedule for the burn pad site inspection will be followed when burn operations are being conducted. This inspection will be conducted by the UXOQCS / SO and will be documented in the Site Safety Log. If any deficiencies are noted, burn operations will be suspended and the deficiency reported to the SUXOS. Once the deficiencies are corrected, demolition operations may be resumed.

8 METEOROLOGICAL CONDITIONS

In order to control the effects of burn operations and to ensure the safety of site personnel, the following meteorological limitations and requirements will apply to demolition operations:

- Burn operations will not be conducted during electrical storms or thunderstorms.
- No Burn operations will be conducted if the sustained surface wind speed is less than 3 mph or greater than 15 mph.
- Demolition operations will not be conducted during periods of visibility of less than 1 mile caused by, but not limited to, dense fog, blowing snow, rain, sand storms, or dust storms.
- Demolition will not be carried out on extremely cloudy days, defined as overcast (more than 80 percent cloud cover) with a ceiling of less than 2,000 ft.
- Demolition operations will not be initiated until an appropriate time after sunrise, and will be secured at an appropriate time prior to sunset (see Section 6).

9 PRE-BURN / DISPOSAL PROCEDURES

9.1 Pre-Burn / Disposal Operational Briefing

It is the belief of KEMRON that the success of any operation is dependent upon a thorough brief, covering all phases of the task, which is presented to all affected personnel. The SUXOS will brief all personnel involved in burn operations in the following areas:

- Type of UXO / MEC being destroyed
- Type, placement, and quantity of demolition material being used
- Method of initiation (electric, non-electric, or NON-EL)
- Means of transporting (if applicable) and packaging MEC
- Route to the disposal site
- Equipment being used (i.e., galvanometer, blasting machine, firing wire, etc.)
- Misfire procedures
- Post-shot clean-up of site.

9.2 Pre-Burn / Disposal Safety Briefing

The KEMRON SUXOS or UXOQCS / SO will conduct a safety brief for all personnel involved in demo operations in the following areas:

- Care and handling of explosive materials
- Personal hygiene
- Two man rule, and approved exceptions
- Personnel roles and responsibilities
- Potential trip/fall hazards
- Horseplay on the site
- Stay alert for any explosive hazards on the site
- Calling a safety stop for hazardous conditions
- Location of emergency shelter (if available)
- Parking area for vehicles (vehicles must be positioned for immediate departure, with the keys in the ignition
- Location of emergency vehicle (If applicable)
- Location of the assigned paramedic (If applicable)
- Wind direction (to assess potential toxic fumes)
- Locations of first aid kit and fire extinguisher

- Route to nearest hospital or emergency aid station
- Type of communications in event of an emergency
- Handling and placement location of demolition materials and MEC awaiting disposal
- Burn schedule.

9.3 Task Assignments

Individuals with assigned tasks will report the completion of the task to the SUXOS. The types of tasks that may be required are:

- Contact local military authorities and fire response personnel, and get air clearance, as required.
- Contact hospital/emergency response / medevac personnel, if applicable.
- Secure all access roads to the burn area.
- Visually check burn pad area for any unauthorized personnel.
- Check firing wire for continuity and shunt.
- Prepare designated burn pans as required.
- Check continuity of detonators.
- Designate a custodian of the blasting machine.
- Secure detonators in a safe location.
- Position initiation charges on MEC in burn pans.

9.4 Preparing Explosive Charge for Initiation

To prepare the explosive charge for initiation, the procedures listed below will be followed:

- Ensure firing wire is shunted.
- Connect detonator to the firing wire.
- Isolate or insulate all connections.
- Prime the demolition charge.
- Place demolition charge on MEC.
- Depart to firing point (if using non-electric firing system, obtain head count, pull igniters, and depart to designated safe area).
- Obtain a head count.
- Give one minute warning signal, using a bullhorn or siren, five minutes prior to detonation, and again at one minute prior to detonation.

- Check the firing circuit.
- Signal **"fire in the hole"** three times (or an equivalent warning), and take cover.
- If using electric firing system, connect firing wires to blasting machine, and initiate charge.
- Remove firing wires from blasting machine and shunt or turn off RFD Transmitter.
- Remain in designated safe area until SUXOS announces **"All Clear."** This will occur after a post-burn waiting period of five minutes and the SUXOS has inspected the pan(s).

10 POST BURN / DISPOSAL PROCEDURES

After the burning has visually exhausted itself, a wait of at least 5 minutes is required prior to anyone returning to the burn pad. The SUXOS or the UXOSO and one qualified person shall return to inspect the general area of the burn for completeness of burn, heat retainage and any other dangerous conditions. If no unusual conditions exist, a minimum of 4 hours shall elapse prior to use of the pad for a successive burn.

If smoke or smoldering embers are observed during the inspection, then the personnel conducting the inspection shall back out of the burn pad area and may choose to have the burn pan(s) wetted down and then perform re-inspection. A period of at least 2 hours from the wet-down time is required before successive burns can be conducted on the same burning pad.

Do not approach a smoking pan or allow personnel out of the designated safe area until cleared to do so, and follow the procedures listed below:

- After the **"All Clear"** signal, check burn pad area for low orders or kick outs.
- Examine burn pad area and remove any large fragmentation, as needed.
- Remove trays from the burn pans for cleaning.
- All burned metal will be removed from the pan and placed in a container for future disposal.
- Ash resulting from the burn will also be removed from the pans and placed in separate containers or future disposal. If water has been used for cooling, ash sludge will be present and careful management and mitigation will be used to limit spilling on native soil. The sludge ash will also be placed in the ash disposal container and disposed of accordingly.
- If unburned items are discovered, these items will be inspected by the SUXOS and UXOSO to determine if they are safe to move. If the items are safe to move then they will be consolidated in a designated area for re-burn with the next scheduled burn operation.
- Police all equipment.
- Notify military authorities, fire department, etc., that the operation is complete.

11 RECORD KEEPING

To document the burn operations procedures and the completeness of the demolition of MEC, the following record keeping requirements will be met:

- KEMRON (as directed) will obtain and maintain all required permits.
- The SUXOS will ensure the accurate completion of the logs, and the SUXOS and UXOQCS / SO will monitor the entries in the log for completeness, accuracy, and compliance with meteorological conditions.
- The SUXOS will enter the appropriate data on the KEMRON MEC Report to reflect the MEC destroyed, and will complete the appropriate information on the Ammunition Consumption Certificate, DA Form 5692-R which indicates the demolition materials used to destroy the MEC.
- The quantities of MEC recovered must also match the quantities of MEC destroyed or disposed.
- KEMRON will retain a permanent file of all demolition records, including permits; magazine data cards; training and inspection records; waste manifests, if applicable; and operating logs.
- Copies of the Bureau of Alcohol Tobacco and Firearms (BATF) License and any required permits must be on hand.

12 PERSONAL PROTECTIVE EQUIPMENT

The following safety measures and personal protective equipment (PPE) will be used in preventing or reducing exposure to the hazards associated with MEC demolition / disposal operations. These requirements will be implemented unless superseded by site-specific requirements stated in the Accident Prevention Plan (APP).

- Hard hats are required only when working around heavy equipment or when an overhead or head impact hazard exists.
- Steel toe / shank boots are not required during surface / subsurface location of anomalies, unless a serious toe hazard exists i.e. working near heavy equipment, whereupon a composite safety toe will be used.
- Safety glasses will be required whenever an eye hazard exists, for example, when working around flying dirt / debris, using hand tools, etc. Safety glasses will provide protection from impact hazards and, if necessary, ultraviolet radiation (i.e., sunlight).
- Positive means will be required to secure the PPE and prevent it from falling and causing an accidental detonation.

13 REFERENCES

Applicable sections and paragraphs in the documents listed below will be used as references for the conduct of MEC demolition / disposal operations:

- KEMRON Corporate Site Safety and Health Plan
- Chemical Safety Submission (CSS), Solid Waste Management Unit (SWMU) 2 Interim Remedial Action
- Final Work Plan, Interim Remedial Action, SWMU 2 – Appendix D, Accident Prevention Plan
- OSHA General Industry Standards, 29 CFR 1910
- OSHA Construction Standards, 29 CFR 1926
- DDESB TP-16, Methodology for Calculation of Fragmentation Characteristics
- DoD 4160.21-M, Defense Reutilization and Marketing Manual
- DoD 6055.9-M, DoD Ammunition and Explosives Safety Standards
- AR 385-10, Army Safety Program
- DA PAM 385-64, U.S. Army Explosives Safety Program
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives
- Applicable TM 60 Series Publications
- AR 190-11, Physical Security of Arms, Ammunition, and Explosives
- ATF 5400.7, Alcohol, Tobacco, and Firearms Explosives Laws and Regulations
- DOT, 49 CFR, Parts 100 to 199, Transportation (applicable sections)
- EPA, 40 CFR Parts 260 to 299, Protection of Environment (applicable sections).
- USACE EM 385-1-1, Safety and Health Requirements Manual
- USACE EM 385-1-97, Explosives Safety and Health Requirements Manual
- USACE EP 1110-1-17, Establishing a Temporary Open Burn and Open Detonating Site for Conventional Ordnance and Explosives.
- TM 60A-1-1-31 General Demolition Procedures
- TM-9-1375-213-12 “Demolition Materials Manual”

Appendix A: SOP Signature Page

The following persons have read and understand this SOP:

Signature:	Date:

Signature:	Date:

Signature:	Date:

ENVIRONMENTAL SERVICES

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MEMORANDUM

To: Allyn Allison, COR

From: Jeff Gunn, Project Manager

CC: Tracy Bergquist, Sandy Carlson, Brian Barker

Date: 23 June 2015

Re: SWMU 2 Burial Pit Conclusions and Recommendations

The purpose of this memorandum is to provide confirmation sampling results and other lines of evidence to support State of Utah concurrence for no additional excavation or confirmation sampling at the SWMU 2 Burial Pit. This memorandum includes a summary of project comparison criteria; a chronology of SWMU 2 Burial Pit sampling events; justification to support no additional excavation for the Burial Pit including confirmation sample results; and Interim Removal Action (IRA) conclusions and recommendations for the Site. A comprehensive Final Report will subsequently be issued to support a No Further Action (NFA) designation for the site.

Background

All soil data collected during IRA activities were compared to USEPA RSLs (January 2015) for residential soil and for protection of Groundwater (MCL-based SSL or, when not available, to risk-based SSLs) for each analyte. In the event of an exceedance to the soil to groundwater SSLs, a site-specific soil-to-groundwater value using a Dilution Attenuation Factor (DAF) of 38 was used to evaluate potential impacts to groundwater. The DAF38 was developed based on SWMU 2 site-specific parameters in accordance with the TEAD-S Risk Assumptions Document (AQS, 2014). Using this methodology, the project team was able to remove source contamination in the Burial Pit to below residential risk standards and remove the majority of residual contamination that may impact groundwater.

Soil samples that will be used to support an NFA determination in the Final Report were collected during three distinct sampling events. Round 1 sampling was conducted along a 30-foot grid on 15 September 2014 following the excavation and removal of all Discarded Munitions (DM); Round 2 sampling was conducted along a 15-foot grid on 18 December 2014 to further define the vertical and horizontal extent of contamination identified during Round 1; and, Round 3 sampling was conducted on 19 March 2015 following a second iteration of excavation in the Burial Pit. Analytical methods were performed using a DoD and State of Utah-certified laboratory following the laboratory limits as outlined in the project Quality Assurance Project Plan (QAPP).

Soil Sampling Results

Soil samples collected during Round 1 (S2GP-**01**xx) were collected as composite samples along a 30-foot grid as shown on Figure 1 following the first iteration of excavation and DM removal. Residential and/or soil-to-groundwater exceedances were flagged for additional delineation and/or removal based on elevated hexachloroethane and/or arsenic concentrations (Table 1 – Sample Exceedances). Sample locations exhibiting analytes below criteria, including S2GP-0101, S2GP-0102, S2GP-0103, S2GP-0108,

and S2GP-0109, will be used in the Final Report to support an NFA determination (Table 2 – Sample Non-Exceedances). A comprehensive, searchable data table including all Burial Pit data collected during the SWMU 2 IRA is included as Attachment 1.

Additional delineation of the Burial Pit floor was conducted during Round 2 confirmation sampling (denoted by the suffix S2GP-**02**xx). Subsurface soil samples were collected along a 15-foot grid using Direct Push Technology (DPT) to 3 feet below ground surface (bgs) to further refine the footprint of source contamination. Round 2 residential and/or soil-to-groundwater exceedances were flagged for excavation as presented in Table 1 and on Figure 1. Round 2 exceedances again included hexachloroethane and arsenic, as well as compounds not previously detected above criteria including hexachlorobenzene, pentachlorophenol and tetrachloroethene. Excavation proceeded in 1-foot lifts or 4-foot lifts depending on the extent of contamination identified during Round 2 sampling. Some portions of the Burial Pit floor were over-excavated to simplify field operations and to ensure removal of potential source material, including an area of staining identified near the northern boundary of the Burial Pit. All stained soil was removed in this area, in the vicinity of S2GP-0307OS as shown on Figure 2.

Following this second iteration of excavation, Round 3 confirmation sampling was conducted to further verify source removal (denoted by the suffix S2GP-**03**xx). Round 3 samples were collected along the 15-foot grid from locations within the 4' excavation area, along sidewalls adjacent to previously uncharacterized soil, and from the area of stained soil as detailed above. All Round 3 post-removal samples yielded results below residential standards, while hexachloroethane was detected in three samples above soil-to-groundwater (DAF38) criteria as shown on Figure 2 and in Table 1. These exceedances included one floor sample (S2GP-0306), one sidewall sample along the northern edge of the Burial Pit (S2GP-0304NE-SDW5045), and one sidewall sample adjacent to the area of excavated stained soil (S2GP-0307OS-SDW5045). Round 2 and Round 3 sample data that will be used to support an NFA determination in the Final Report are presented in Table 2.

All laboratory results were validated by Jacobs for accuracy and completeness following receipt of data.

Conclusions

Data from three sampling rounds conducted within the SWMU 2 Burial Pit suggest the source of soil contamination has been removed. Prior to removal, all DM items were found palletized and/or containerized and exhibited moderate visual and olfactory evidence of leakage. Following receipt of soil delineation data, up to four feet of MC-impacted soil was excavated from beneath the footprint of DM, as shown in Figure 1. All exceedances to the residential soil standard have been removed from the Burial Pit, thereby removing possible completed exposure pathways addressing ingestion, dermal contact, and inhalation of particulates from soil.

Three samples remain with concentrations exceeding soil-to-groundwater (DAF38) criteria. Sample S2GP-0306CP, collected from the floor of the Burial Pit (4' bgs), contains hexachloroethane (1.5 mg/kg in the field duplicate) above the DAF38 of 0.0485 mg/kg. Hexachloroethane at this location has trended downward from its high concentration of 32 mg/kg at 1' bgs, and is bound horizontally in all directions (Figure 2). Sample S2GP-0304NE-SDW5045, collected from the sidewall along the northern boundary of the excavation, yielded hexachloroethane (0.091 mg/kg) slightly above the DAF38 criteria. Sample S2GP-0307OS-SDW5045, collected along the sidewall of the excavation adjacent to stained soil that had

been removed, contains hexachloroethane (0.22 mg/kg) above the DAF38 criteria. Data for the adjacent floor sample (S2GP-0307OS) remains below criteria.

Several metals were detected throughout the Burial Pit above background values as defined in the TEAD-S RAD (AQS, 2014). However, the highest concentrations of these metals including zinc, iron, and molybdenum remain below the residential risk standards and therefore do not present a risk to human health and environment. Chromium was detected above but within the practical range of background at six locations; the background value is 19.8 mg/kg, and all exceedances are below 25 mg/kg.

Arsenic concentrations vary significantly across TEAD-S, with a maximum concentration commonly reported around 35-38 mg/kg. In order to address the high variability of arsenic in soils at TEAD-S, the background reference value for arsenic has been established at 35 mg/kg, and the UTL of 12.1 mg/kg is used for the samples located within the footprint of the DM sources (Figure 2). Arsenic concentrations remain consistent with these background values, with concentrations ranging from 6.3 mg/kg to 13 mg/kg within the footprint of the DM sources and arsenic concentrations remaining less than 19 mg/kg outside of this boundary.

Impacts to groundwater and the soil vapor pathway from remaining residual hexachloroethane concentrations are considered limited based on several factors, including:

- Source Removal – Evidence supports the removal of source contamination as detailed above;
- Remaining concentrations of COPCs below risk levels - The residential scenario was evaluated and shown to meet acceptable human health risk levels in accordance with UAC R315-101. The exposure scenario includes ingestion of soil and dust, inhalation of contaminants, dermal contact with chemicals in soil, and direct contact with contaminants that have migrated to groundwater;
- Limited *frequency* of detection - of the 29 sample locations currently remaining in the Burial Pit, only three exhibit concentrations of hexachloroethane above site-specific groundwater criteria;
- Limited *magnitude* of detection – the highest pre-removal concentration of hexachloroethane in the source area at the site was 32 mg/kg; remaining post-removal residual contamination ranges from 1.5 mg/kg to 0.091 mg/kg. The site-specific soil-to-groundwater (DAF38) criterion is 0.0485 mg/kg;
- Groundwater monitoring results – According to the most recent groundwater monitoring report, monitoring wells downgradient and cross-gradient of the SWMU 2 Burial Pit (S-3-82 and S-46-90) reported no detections of hexachloroethane in monitoring wells between 2005 and 2010(2010 Final Groundwater Monitoring Report). The most recent groundwater monitoring event occurred in 2010, prior to SWMU 2 source removal. Monitoring well locations and groundwater flow direction are presented on Figure 1;
- Soil Profile – Although the groundwater surrounding the SWMU 2 Gravel Pit is considered unconfined, a fine-grained, sandy silt layer exists below the coarse gravel and was identified during vertical delineation (Round 2 sampling) beginning at an average depth of 4.5’ below the pre-excavation surface. According to the 2010 Hydrogeological Assessment Report, this gradation extends into the screened interval at S-3-82 beginning at 24.4’ bgs. Based on this soil profile and its soil adsorption factor, migration of any remaining residual hexachlorethane is likely to have low mobility through this soil horizon;

- Horizontal Delineation - Incremental samples were collected from three Decision Units north of the SWMU 2 Burial Pit as shown on Figure 1 (DU1, DU2, and DU3). Incremental sample data was collected to evaluate and subsequently eliminate magnetic anomalies as sources of contamination within these DUs. Hexachloroethane was not detected in these DUs, which are north of the sidewall exceedances (S2GP-0304NE-SDW5045 and S2GP-0307OS-SDW5045), or in all other samples surrounding these sidewall samples above site-specific groundwater criteria as shown on Figure 2. The detection of hexachloroethane in the floor sample at S2GP-0306CP represents a *deminimis* volume of residual contamination based on its limited horizontal footprint and its concentration below residential risk criteria.

Recommendations

No additional excavation is recommended for the SWMU 2 Burial Pit based on evidence of successful source removal and data suggesting minimal impacts to groundwater. All compounds of concern at the site are below residential risk standards. Although a *deminimis* volume of residual hexachloroethane remains in the Burial Pit above the site-specific (DAF38) groundwater standard, the footprint of hexachloroethane appears to be limited in size and does not represent a source of groundwater contamination based on the results of the adjacent DU samples and floor samples. The detection of hexachloroethane in the floor sample at S2GP-0306CP has not been vertically delineated but concentrations are below the residential risk standard.

It is also recommended that the SWMU 2 Burial Pit be backfilled in accordance with the specifications outlined in the SWMU 2 IRA Work Plan. Stockpiles previously approved for use as on-site backfill can be used to complete this task.

Reporting

A final report will be developed to support a No Further Action determination at the site under the requirements of UAC R315-101-5 and 6 and guidance of the TEAD-S RAD to include a summary of excavation activities, analytical data and results evaluation, risk screening, DAF38 inputs, field notes, GPS data, waste manifests, and all other supporting documentation associated with excavation and environmental sampling at the SWMU 2 Burial Pit.

Respectfully Submitted,

Jeff Gunn
Project Manager

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Attachment 1

(Electronic)

SWMU 2 Burial Pit

Raw Data

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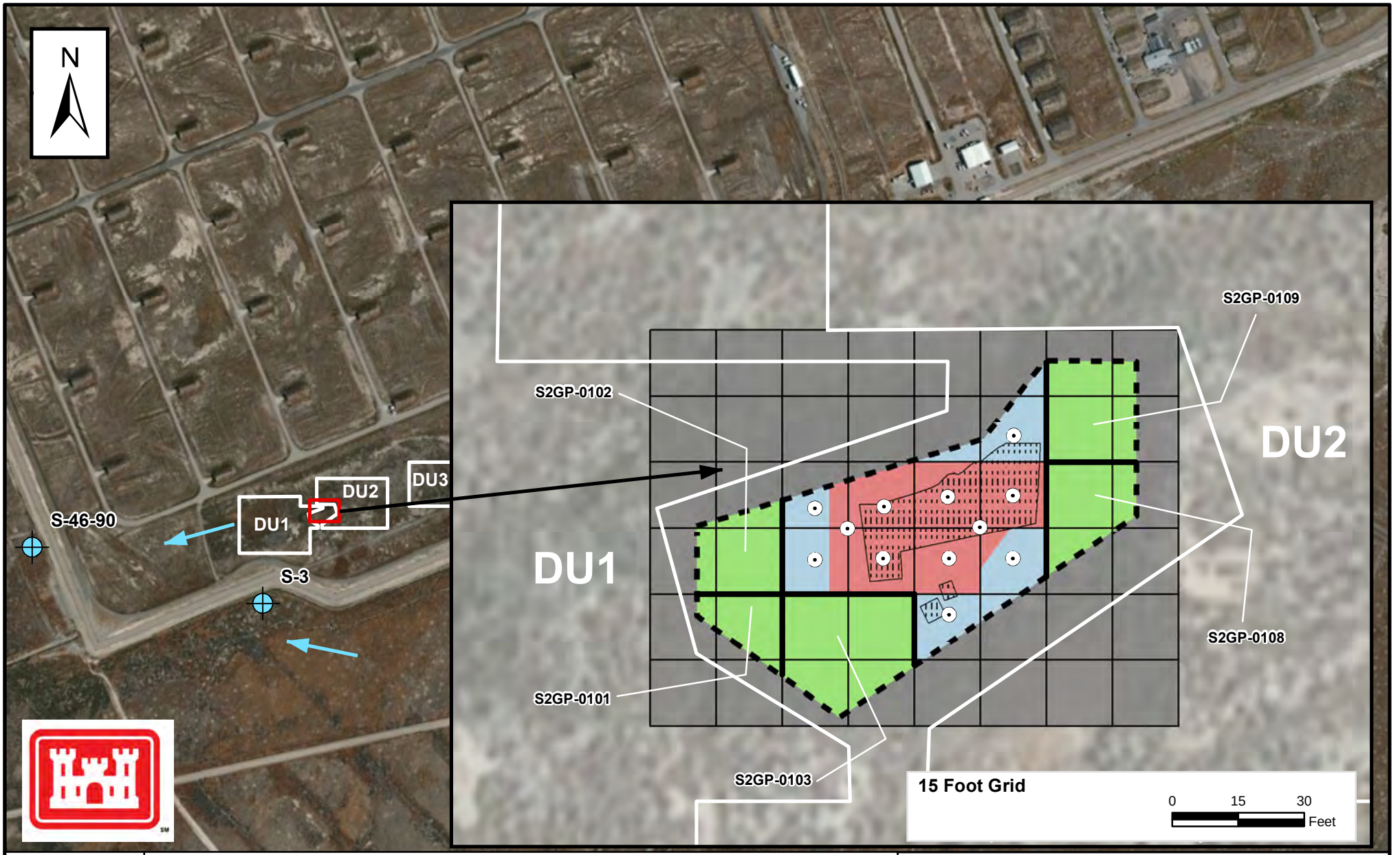
Figure 1



Project: 35DK2103

Date: May 2015

Revision: 1

Prepared By: JP/PJL

Checked By: PJL

Legend

- Groundwater Well
- Discrete Sample Location (6" to 12" bgs, 12" to 24" bgs, 24" to 36" bgs)
- 30 foot Grid
- 15 foot Grid
- Previously Characterized Less Than Project Criteria
- Estimated Location of DM Sources
- Excavate to 1' BGS
- Original Burial Pit Boundary
- Excavate to 4' BGS
- General Direction of Groundwater Flow

G-80 0 600 Feet

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SWMU 2 Gravel Pit Excavation Depths Tooele Army Depot - South

Deseret Chemical Depot
Stockton, Utah

Path: Y:\GIS\DCD\Projects\35DK2103\A7990\ArcGIS\SWMU_2_GP_exc_wells_du.mxd

Figure 1

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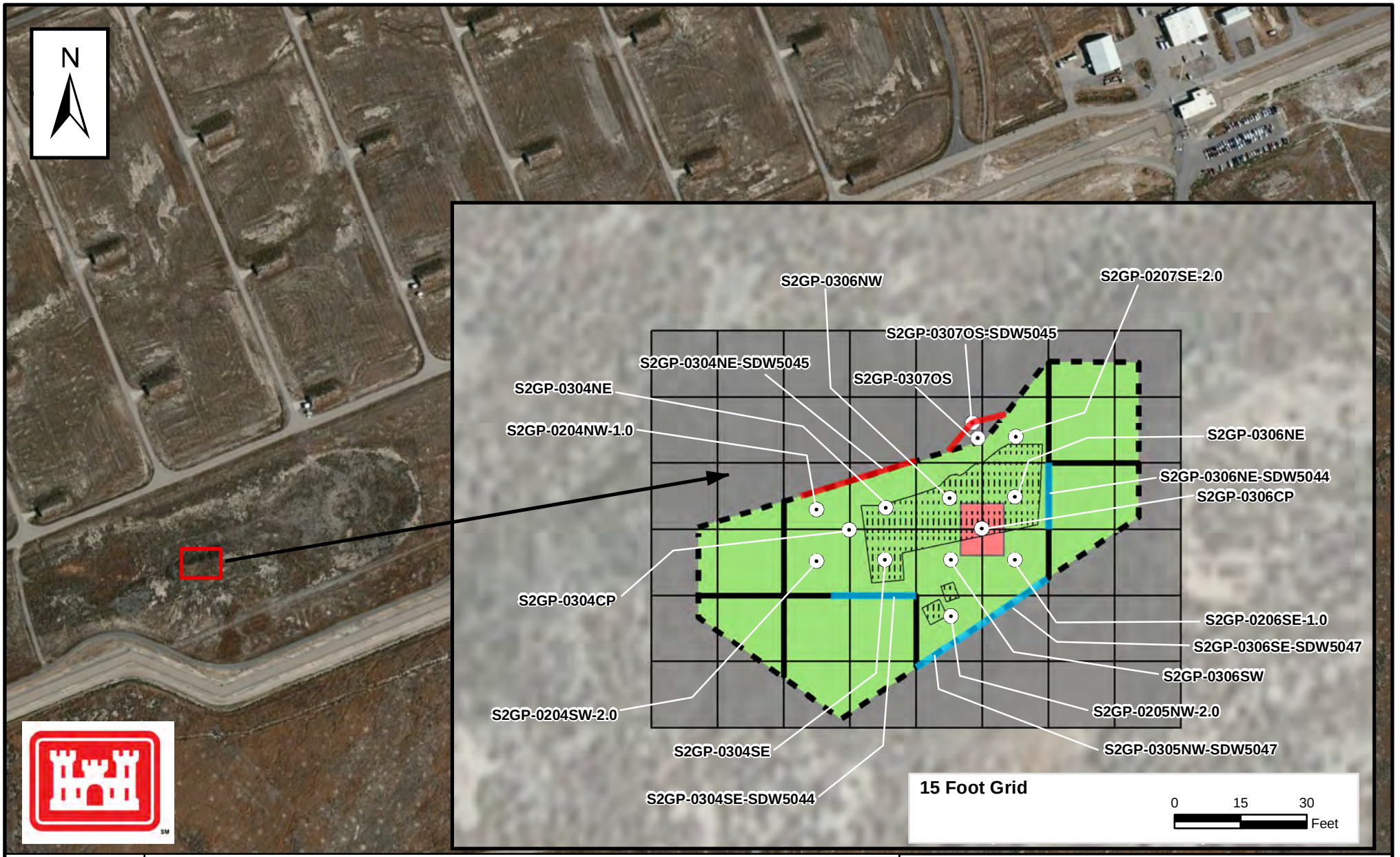
Figure 2



Project: 35DK2103

Date: May 2015

Revision: 1

Prepared By: JP/PJL

Checked By: PJL

Legend

- 15 foot Grid
- Sidewall Sample Exceeds Project Criteria
- Sidewall Sample Less Than Project Criteria
- Exceeds Project Criteria
- Discrete Sample Location
- Previously Characterized Less Than Project Criteria
- Original Burial Pit Boundary
- 30 foot Grid
- Estimated Location of DM Sources

G-82 0 400 Feet

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JACOBS™

SWMU 2 Gravel Pit
Summary of Confirmation Sample Results
Tooele Army Depot - South

Deseret Chemical Depot
Stockton, Utah

Path: Y:\GIS\DCD\Projects\35DK2103\A7990\ArcGIS\SWMU_2_GP_sample_results2.mxd

Figure 2

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Table 1

Table 1 - Sample Exceedances and Locations Removed From SWMU 2 Burial Pit							
Sample ID	**COPC**	**Concentration**	**Units**	**Residential**	**Background**	**DAF38**	**Units**
ROUND 1 SAMPLES							
S2GP-0104	Arsenic	46	mg/kg		20		mg/kg
S2GP-0105	Hexachloroethane	0.32	mg/kg	13		0.0485	mg/kg
S2GP-0106	Hexachloroethane	0.32	mg/kg	13		0.0485	mg/kg
S2GP-0107	Hexachloroethane	0.23	mg/kg	13		0.0485	mg/kg
S2GP-0107	Arsenic	150	mg/kg		20		mg/kg
ROUND 2 SAMPLES							
S2GP-0204CP-1.0	Arsenic	31	mg/kg		20		mg/kg
S2GP-0204CP-1.0	Hexachloroethane	7.7	mg/kg	13		0.0485	mg/kg
S2GP-0204CP-1.0	Iron	58000	mg/kg	55000	15460		mg/kg
S2GP-0204CP-2.0	Hexachloroethane	8.8	mg/kg	13		0.0485	mg/kg
S2GP-0204NE-1.0	Hexachloroethane	0.12	mg/kg	13		0.0485	mg/kg
S2GP-0204NE-2.0	Hexachlorobenzene	0.61	mg/kg	0.33		0.0708	mg/kg
S2GP-0204NE-2.0	Hexachloroethane	2.7	mg/kg	13		0.0485	mg/kg
S2GP-0204NE-2.0	Tetrachloroethene	1	mg/kg	24		0.354	mg/kg
S2GP-0204NE-3.0	Hexachlorobenzene	6.3	mg/kg	0.33		0.0708	mg/kg
S2GP-0204NE-3.0	Hexachloroethane	4.1	mg/kg	13		0.0485	mg/kg
S2GP-0204SE-1.0	Arsenic	120	mg/kg		20		mg/kg
S2GP-0204SE-1.0	Hexachloroethane	2.1	mg/kg	13		0.0485	mg/kg
S2GP-0204SE-2.0	Arsenic	34	mg/kg		20		mg/kg
S2GP-0204SE-2.0	Hexachloroethane	1.2	mg/kg	13		0.0485	mg/kg
S2GP-0204SW-1.0	Arsenic	45	mg/kg		20		mg/kg
S2GP-0204SW-1.0	Hexachloroethane	0.91	mg/kg	13		0.0485	mg/kg
S2GP-0205NW-1.0	Hexachloroethane	6.1	mg/kg	13		0.0485	mg/kg
S2GP-0206CP-1.0	Arsenic	41	mg/kg		20		mg/kg
S2GP-0206CP-1.0	Hexachlorobenzene	0.23	mg/kg	0.33		0.0708	mg/kg
S2GP-0206CP-1.0	Hexachloroethane	32	mg/kg	13		0.0485	mg/kg
S2GP-0206CP-2.0	Hexachloroethane	1.1	mg/kg	13		0.0485	mg/kg
S2GP-0206CP-3.0	Hexachloroethane	0.17	mg/kg	13		0.0485	mg/kg
S2GP-0206NE-1.0	Hexachlorobenzene	0.17	mg/kg	0.33		0.0708	mg/kg
S2GP-0206NE-1.0	Hexachloroethane	28	mg/kg	13		0.0485	mg/kg
S2GP-0206NE-2.0	Hexachloroethane	0.96	mg/kg				mg/kg
S2GP-0206NE-3.0	Iron	180000	mg/kg	55000	15460		mg/kg
S2GP-0206NW-1.0	Arsenic	59	mg/kg		20		mg/kg
S2GP-0206NW-1.0	Hexachloroethane	1.9	mg/kg	13		0.0485	mg/kg
S2GP-0206NW-2.0	Hexachlorobenzene	0.12	mg/kg	0.33		0.0708	mg/kg
S2GP-0206NW-2.0	Hexachloroethane	1.4	mg/kg	13		0.0485	mg/kg
S2GP-0206SW-1.0	Hexachlorobenzene	0.21	mg/kg	0.33		0.0708	mg/kg
S2GP-0206SW-1.0	Hexachloroethane	28	mg/kg	13		0.0485	mg/kg
S2GP-0206SW-2.0	Hexachlorobenzene	0.24	mg/kg	0.33		0.0708	mg/kg
S2GP-0206SW-2.0	Hexachloroethane	1.1	mg/kg	13		0.0485	mg/kg
S2GP-0206SW-2.0	Pentachlorophenol	0.53	mg/kg	0.99		0.0463	mg/kg
S2GP-0206SW-3.0	Hexachloroethane	1.2	mg/kg	13		0.0485	mg/kg
S2GP-0207SE-1.0	Hexachloroethane	1.4	mg/kg	13		0.0485	mg/kg
S2GP-0207SE-1.0	Iron	61000	mg/kg	55000	15460		mg/kg
ROUND 3 SAMPLES * not excavated *							
S2GP-0304NE-SDW5045	Hexachloroethane	0.091	mg/kg	13		0.0485	mg/kg
S2GP-0307OS-SDW5045	Hexachloroethane	0.22	mg/kg	13		0.0485	mg/kg
S2GP-0306CP	Hexachloroethane	0.65	mg/kg	13		0.0485	mg/kg
S2GP-0306CP-FD	Hexachloroethane	1.5	mg/kg	13		0.0485	mg/kg

KEMRON ENVIRONMENTAL SERVICES
1359-A Ellsworth Industrial Boulevard ■ Atlanta, GA 30318 ■ Telephone (404) 636-0928 ■ FAX (404) 636-7162 ■ http://www.kemron.com

Table 2

Table 2 - Non-Exceedances - Samples Supporting NFA at the SWMU 2 Burial Pit							
Sample ID	**COPC**	**Concentration**	**Units**	**Residential**	**Background**	**DAF38**	**Units**
S2GP-0101	Arsenic	13	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg	0.33		0.0708	mg/kg
S2GP-0102	Arsenic	12	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0103	Arsenic	15	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0108	Arsenic	13	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0109	Arsenic	15	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0204NW-1.0	Arsenic	11	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0204SW-2.0	Arsenic	11	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0304CP	Arsenic	9.5	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0304NE	Arsenic	6.3	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0304SE	Arsenic	7.4	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0304NE-SDW5045	Arsenic	19	mg/kg		20		mg/kg
	Hexachloroethane	0.091	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0304SE-SDW5044	Arsenic	16	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0306NW	Arsenic	10	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0306SW	Arsenic	8.3	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg

Sample ID	COPC	Concentration	Units	Residential	Background	DAF38	Units
S2GP-0306CP	Arsenic	9.9	mg/kg		20		mg/kg
	Hexachloroethane	0.65	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0306CP-FD	Arsenic	11	mg/kg		20		mg/kg
	Hexachloroethane	1.5	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0306NE	Arsenic	13	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0206SE-1.0	Arsenic	12	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0306NE-SDW5047	Arsenic	18	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0306SE-SDW5047	Arsenic	18	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0205NW-2.0	Arsenic	9.8	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0305NW-SDW5047	Arsenic	14	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0307OS	Arsenic	16	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0307OS-SDW5045	Arsenic	15	mg/kg		20		mg/kg
	Hexachloroethane	0.22	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg
S2GP-0207SE-2.0	Arsenic	15	mg/kg		20		mg/kg
	Hexachloroethane	ND	mg/kg	13		0.0485	mg/kg
	Hexachlorobenzene	ND	mg/kg				mg/kg

UXB-KEMRON Remediation Services, LLC
2020 Kraft Drive, Suite 2100 • Blacksburg, Virginia 24060
Tel: 540.443.3700 Fax: 540.443.3790

307876-004

March 25, 2013

US Army Corps of Engineers
Engineering and Support Center, Huntsville
Attn: Ms. Janice Jamar
P.O. Box 1600 (4820 University Square)
Huntsville, Alabama 35807-4301

Subject: W912DY-10-D-0027-0006 – Request for Work Plan Variance

Dear Ms. Jamar:

UXB-KEMRON Remediation Services, LLC (JV) respectfully submits the attached request for work plan variance on the subject task order.

These changes are necessitated because we were prevented by the OESS from installing blind seeds at the site. The blind seeds were identified in the work plan as a part of our proposal geophysical QC program for the EM-61MK2 survey. Instead, in order to demonstrate dynamic repeatability, our geophysicists performed two repeat lanes per dataset.

Sections of the work plan that are impacted (changes are shown in red) include:

3.6.2.1 – This section is changed as follows to clarify that repeat lines will be used in lieu of blind seeds:

> "The initial phase of the investigation to locate MEC as well as non-MEC metallic items in the subsurface will be the verification of the proposed geophysical system using the GSV process. The GSV process is two-fold, consisting of an IVS and a repeat line program. On this project, due to concerns of glass items potentially containing mustard, blind seeds cannot be installed. In lieu of blind seeds, two repeat lines per dataset shall be collected to demonstrate dynamic detection repeatability in the field. Repeat lines will be examined to evaluate the position and amplitude of anomalies in a comparison of the originally surveyed line with the repeat line."

3.6.2.3 – This section is changed as follows to further describe the Repeat Line program. Text describing the blind seeding program which was suspended by the OESS was also removed from this section.

3.6.2.3 Repeat Line Program

> 3.6.2.3.1. Two repeat lines per dataset shall be collected to demonstrate dynamic detection repeatability in the field. Repeat lines will be examined to evaluate the position and amplitude of anomalies in a comparison of the originally surveyed line with the repeat line.

3.7.4.8.1.6 - Changed "will" to "may". This was because only one IVS was necessary for installation due to the compact and homogeneous nature of the site. Multiple IVS' were only proposed to expedite daily QC checks but were determined to be unnecessary in the field.

3.7.4.10.3.6 - New paragraph added based upon a teleconference between Debra Edwards of UAESCH and the UXB-KEMRON geophysical team on 3/22/2013, as follows:

> "The decay of the EM61 response will be examined over anomalies to identify potential terrain noise/cultural source targets. Normal decay is expected to be Ch1>Ch2>Ch3>Ch4. In the event an anomaly has characteristics different from the expected decay, the target list comments will denote this anomaly as a possible noise source target."

This text explains the process for analyzing decay rates across multiple channels as a methodology to eliminate certain noise/cultural source targets.

4.5.2.1 – Text was added to clarify that DQO's in this section are specific to the EM-61MK2. The EM-31MK2 has a different operating principle and attempting to apply these DQO's to the EM-31MK2 would not be possible.

4.5.2.2.6 - Text revised as follows to remove mention of blind seeds in favor of the repeat lines.

> "Repeat lines show good repeatability for amplitude and positioning of anomalies. It is expected that some differences will exist due to differences in line path and location of individual data station locations; "

4.5.6.1 – Text revised as follows to describe the rationale for removing the blind seeds in favor of the repeat lines.

> "Repeat lines will be utilized on this project in lieu of blind seeds due to the potential presence of glass bottles containing mustard which cannot be detected using traditional anomaly avoidance procedures. Repeat lines provide an opportunity for ongoing monitoring which will build confidence that all the geophysical surveying operational procedures are in place and working as expected. The failure to of a repeat line will allow the project team to recognize that a problem exists and provide a means to identify the root cause and undertake corrective action while still in the field."

4.5.6.2.1 - Text revised as follows to remove mention of blind seeds in favor of the repeat lines.

> "For DGM surveys, two repeat lines will be performed within each data set to ensure required dynamic detection repeatability is achieved."

As of the conclusion of fieldwork on 3/22/2013, the EM-61MK2 survey of the SWMU2 site has been completed and the EM-31 MK2 survey is ongoing. As the blind seed/GSV program is not used as part of the EM-31MK2 survey due to the principle of operation of that instrument being different than the EM-61MK2 (see Section 3.6.1.2 of the Work Plan), approval of this variance is necessary for the QA

acceptance of the EM-61MK2 data but does not affect the collection, processing, and acceptability of the EM31-MK2 data.

Should you require any additional information or clarification regarding this notification, please do not hesitate to contact the undersigned at 540.443.3706, or via email at rich.dugger@uxb.com.

Sincerely,

Richmond H. Dugger IV, PE
Project Manager

Attachments:
Slipsheet package (redline format) for Work Plan Variance Request

Copy to:
Allyn T. Allison
Rich Dugger
Cathy Etheredge
John Dwyer

UXB-KEMRON Remediation Services, LLC
1359-A Ellsworth Industrial Blvd, N.W., Atlanta, GA 30318
Tel: 404.636.0928 Fax: 404.636.7162

February 5, 2014

U.S. Army Engineering & Support Center, Huntsville
Attn: Allyn Allison
White Tiger Building
4820 University Square
Huntsville, AL 35816-1822

Subject: Field Change Request to approved Work Plan dated October 15, 2012
Interim Remedial Action, SWMU 2, Tooele Army Depot – South, Utah

Dear Mr. Allison,

The purpose of this Field Change Request is to gain concurrence on variance to the approved Work Plan, dated October 15, 2012, for this site by reducing the area of the remaining intrusive activities. A summary of the work performed to date is presented below which supports the conclusion that any Discarded Military Munitions (DMM) or Munitions and Explosives of Concern (MEC) are limited to a much smaller footprint than the current boundaries of Solid Waste Management Unit (SWMU 2).

Project Authorization

UXB-KEMRON Remediation Services, LLC. ("UXB-KEMRON") has been contracted by the US Army Engineering and Support Center, Huntsville (USAESCH) under contract W912DY-10-D-0027, Delivery Order (DO) 0006 to perform an Interim Remedial Action (IRA) in SWMU 2 at the Tooele Army Depot - South (TEAD-S) (formerly Deseret Chemical Depot [DCD]), Stockton, Utah.

Project Purpose

The purpose of this project is to conduct Interim Measures to control or eliminate the release or potential release of hazardous wastes or hazardous constituents from SWMU 2 by removing all Discarded Military Munitions (DMM), other military related devices, and surface and sub-surface debris; perform confirmatory sampling and analysis from the bottom of the burial area and soil piles, as needed; and remove contaminated soil, as necessary. The goal is to achieve No Further Action (NFA) per Utah Administrative Code (UAC) R315-101.

Site Summary

TEAD-S has been used since the 1940s for storage, renovation, and disposal of many types of chemical agent munitions. These munitions included mustard (H, HD, and HT), Lewisite (L), Sarin (GB), Tabun (GA), O-ethyl S-[2-(diisopropylamino)ethyl] methylphosphonothioate (VX), Phosgene (CG), O-chlorobenzylidene malononitrile (CS), cyanogen chloride (CK), sulfur trioxide (FS), hexachloroethane (HC) smoke, white phosphorous (WP), thermite, and napalm (NUS, 1987).

SWMU 2 occupies approximately 10 acres in the southwest portion of the Chemical Munitions Storage Area (SWMU 11). SWMU 2 contains an oval-shaped burial pit approximately 300 feet long by 60 feet wide. Interpretation of historical aerial photographs shows evidence that around 1974 the area now identified as SWMU 2 was excavated and used as quarry for construction materials. Following

termination as a quarry, the pit was used as a dump site. It is reported that this burial pit was used to dispose of munitions without demilitarization. An aerial photograph from 1981 indicates mounding and stacked material in the western portion of the site.

The only documentation of potential munitions items in SWMU 2 is an employee disposition referenced in the Installation Assessment (USATHAMA, 1979). This disposition, dated 1 April 1959, documents interviews with installation employees indicating that SWMU 2 was used for burial of munitions without demilitarization. No dates of burial are provided in any of the referenced documentation. Potential munitions reportedly buried at the site include M2 ignition cartridges, squibs, hand grenades, blasting caps, M21 Incendiary Bomb Clusters, smoke pots, Tri-nitro Toluene (TNT) blocks, M74 Incendiary Bombs, and M19 Incendiary Bomb Clusters.

Project Progress

Field work was initiated in accordance with Chapter 3 of the approved work plan. Phase one included vegetation removal, site survey, and surficial debris removal. After analysis of the geophysical survey data, phase two was initiated with the intrusive investigation. Digital Geophysical Mapping (DGM) of SWMU 2 was performed in March and April of 2013 utilizing both a Geonics EM61-Mk2 and EM31-Mk2. The EM61-Mk2 is a high-resolution time-domain electromagnetic induction sensor that is capable of detecting both ferrous and non-ferrous metallic objects. The EM31-Mk2 is a terrain conductivity meter which is capable of detecting buried metal as well as mapping subsurface changes across a site. Both instruments utilized real-time kinematic (RTK) global positioning system (GPS) equipment capable of providing horizontal position accuracy of 3 cm. Daily quality control (QC) procedures as described in the Final Work Plan were utilized to ensure that the equipment was functioning properly and that the data collected was valid. After collection, the data was processed and interpreted in order to identify locations for intrusive investigation.

Attachment A displays the mosaic of data collected with the EM61 Mk 2. A system of 100 foot by 100 foot grids is utilized to divide SWMU 2 into smaller areas for better data management. The DGM data indicated that there was an area with a large concentration of subsurface metal within grid F3. This area is commonly known as “The Pit Area”. In addition to The Pit Area, single point anomalies were identified for intrusive investigation throughout the remainder of SWMU 2, utilizing an EM61-Mk2 minimum threshold value of 5 millivolts (mV) above local background. No additional targets or areas of interest were identified with the EM31-Mk2 data alone; however, this data was used to confirm the location of The Pit Area and other high density anomalous areas detected with the EM61-Mk2. All targets that were selected for intrusive investigation were given a unique target ID number, which identifies the grid containing the anomaly as well as a unique number within that grid. All targets were reacquired with an RTK GPS unit and flagged with the respective target ID number for excavation.

Excavation procedures were initiated by locating a target flag and verifying that the information it provided matched the dig sheet. The EM61-Mk2 was then used to pinpoint the location of the anomaly. Intrusive investigations were then performed utilizing manual and/or mechanical excavation methods. Mechanical excavation methods were only used when manual excavation was not feasible, and in these circumstances the excavation would then be completed with manual methods. Upon removing one or more pieces of metal suspected to be the source of the anomaly, the EM61-Mk2 was used to verify that the target was then below the threshold of 5 mV. In the event that the threshold was not initially satisfied, this excavation process continued until the criteria was met.

Intrusive investigation of The Pit Area was initiated with mechanical equipment to remove approximately seven feet of overburden soil and several feet of soil to one side. Under this soil a large number of stacked munitions were identified, including squibs, smoke pots, grenades, candles, fuzes, boosters, and

cluster bomb units (CBUs). All recovered munitions have been consistent with the information referenced in the Installation Assessment. The recovered DMM have been well organized with distinct vertical and horizontal boundaries. There have been no areas in which there was a large gap between the DMM, and no signs of "spillover". A condensed photo log of site operations and intrusive results is presented in Attachment B, with photos 1 through 4 taken of The Pit Area. These photos clearly show the overburden soil and demonstrate the well-defined extent and organization of DMM.

Based on the DGM, a total of 739 single point anomalies were selected for intrusive investigation within 55 grids. The TEAD-S SWMU 2 Progress Chart (Attachment C) displays the grid layout, the number of anomalies identified within each grid, the status of the anomalies, and indicates which grids have been completed including QA/QC. A total of 428 anomalies have been completed which accounts for 57.92% of the anomalies selected for investigation. All single point anomalies that have been intrusively investigated to date have identified only cultural debris. Recovered items include aluminum cans, angle iron, asphalt, bolts, brackets, bucket, cables, cargo hooks, cargo ratchets, c-clamps, concrete, drill bits, fence posts, jackhammer bits, metal bars, metal plates, metal rods, metal scrap, nails, nuts, oil plugs, empty paint cans, pickaxe heads, pipe, railroad spikes, rebar, scrap metal, screws, sheet metal, shovel/sledgehammer heads, spigot handles, vehicle parts, washers, wire, and wrenches. A comprehensive list of the intrusive results for all investigated single point anomalies is included in Attachment D. Photos 5 through 44 in Attachment B show representative cultural debris items recovered throughout SWMU 2. The majority of the cultural debris causing the anomalies was located within 0 to 2 feet of the ground surface. However, there have been several locations where it was necessary to mechanically dig large excavations in order to clear multiple anomalies (Photos 45 and 46). Three excavation areas are identified in Attachment E. Excavation 1 is approximately 40 feet by 30 feet wide and 11 feet deep. This pit contained mostly nails, screws, unidentifiable pieces of metal, and other pieces of cultural debris. Excavation 2 is approximately 50 feet by 40 feet wide and 14 feet deep. This pit contained mostly glass bottles, unidentifiable metal machine parts, and other cultural debris. Excavation 3 was performed on a mounded area in line with and directly west of The Pit Area, and is approximately 190 feet long and between 25 and 50 feet wide. The vertical dimension of Excavation 3 is approximately 18 feet from the ground surface to the top of the mound. This area contained unidentifiable pieces of metal, pipe, and pieces of ammunition boxes such as screws and hinges. The excavated soil was sifted to verify the contents and clear the anomalies, and the sifting operations (see photos 47 through 49 in Attachment B) did not identify any signs of munitions debris. At the time of demobilization, anomalies were still present in all three of these excavations.

Discussion

Based on the intrusive results to date, there is no indication that any DMM are located outside of The Pit Area within SWMU 2. The DMM that has been recovered from The Pit Area has been consistent with the description provided in the Installation Assessment and shows that the munitions were buried in a very organized and systematic manner. The recovered munitions have been neatly stacked with well-defined horizontal and vertical extents. Conversely, the remainder of SWMU 2 has shown no evidence of containing any DMM and appears to be random in its distribution. The EM61-Mk2 mosaic clearly shows a large area of concentrated subsurface metal at The Pit Area, while the remainder of SWMU 2 contains much smaller and randomly located areas of subsurface metal. Given the manner in which the DMM has been discovered within The Pit Area, and therefore the planned and organized manner in which the munitions were placed and buried at the time of disposal, the evidence indicates that additional munitions would not have been buried at other locations within SWMU 2.

While the majority of the single point anomalies were located close to the ground surface, large holes have been excavated which contained cultural debris that is not related to MEC or munitions debris at multiple depths. It is likely that these items were dumped and then covered with soil. Since the

recovered DMM were not demilitarized before burial, disposal of these items would have been conducted in an orderly manner (as evidenced by the organization of The Pit Area) and would not have been consistent with the condition of the recovered cultural debris.

Recommendations

1. The overall approach for the field investigation as discussed in Chapter 3 of the approved work plan remains unchanged.
2. Based on the intrusive results to date, the single point anomalies outside the main burial pit have been found to be non-munitions related debris. In our professional judgment, the remaining 42.08% of the anomalies outside the main burial pit that have not been excavated have a very high probability of being non-munitions related debris also. It is our recommendation that a variance to the approved work plan, Section 3.8.3, Anomaly Excavation, be approved for no additional excavation of anomalies outside of the main burial area beyond what has already been accomplished.
3. All other aspects of the approved work plan remain in force. This includes the complete removal of DMM and waste from the main burial pit area, soil screening of excavated soils, and sampling in accordance with Appendix E of the approved work plan.

As of October 25, 2013, the intrusive team has demobilized from the TEAD-S SWMU 2 site while a standby team remains for bunker inspections. Although an exact mobilization date has not been set, it is anticipated that intrusive operations will resume in early March 2014. Upon return, our intention would be to focus on The Pit Area and eliminate grids outside the pit from further investigation.

Sincerely,

Tracy Bergquist
Program Manager

Copy to:
Kim Meacham
Jeff Gunn
Brian Barker

****

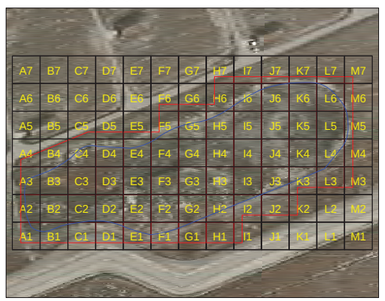
Approved: _____ Date: _____
Allyn Allison

ATTACHMENT A

1396600 1396700 1396800 1396900 1397000 1397100 1397200 1397300 1397400 1397500 1397600 1397700 1397800 1397900

7279100 7279000 7278900 7278800 7278700 7278600 7278500 7278400

A7	B7	C7	D7	E7	F7	G7	H7	I7	J7	K7	L7	M7
A6	B6	C6	D6	E6	F6	G6	H6	I6	J6	K6	L6	M6
A5	B5	C5	D5	E5	F5	G5	H5	I5	J5	K5	L5	M5
A4	B4	C4	D4	E4	F4	G4	H4	I4	J4	K4	L4	M4
A3	B3	C3	D3	E3	F3	G3	H3	I3	J3	K3	L3	M3
A2	B2	C2	D2	E2	F2	G2	H2	I2	J2	K2	L2	M2
A1	B1	C1	D1	E1	F1	G1	H1	I1	J1	K1	L1	M1



Legend

- SWMU 2 (Proposed)
- Area of Investigation
- Saturated Response Area (SRA)
- Culture
- Selected Target (See Target List For Response and Location) (Unique Target ID is A1XXXX, eg. A10002)

0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 100

mV
Channel 2

50 0 50 100 150 200

US survey foot

NAD83 / SPCS83 Utah Central zone (US Survey feet)

UXB-KEMRON Remediation Services, LLC

EM61 Mk2 Bottom Coil
EM61 Data Mosaic
SWMU 2 - Deseret Chemical Depot
Stockton, Utah

Date of Map Creation: 09/04/2013
Dates of Survey: 03/07/2013 - 03/25/2013 & 06/10/2013

ATTACHMENT B

Photo 1

Grid: F3; Stacked DMM with view of overburden soil; typical of all excavations in the Pit Area

Photo 2

Grid: F3; Stacked DMM; typical of all excavations in the Pit Area

Photo 3

Grid: F3; Stacked DMM; typical of all excavations in the Pit Area

Photo 4

Grid: F3; Stacked DMM with view of overburden soil; typical of all excavations in the Pit Area

Photo 5

Grid: C1; Target: C10003; Date: 22 August 2013; Scrap Metal

Photo 6

Grid: C2; Target: C20040; Date: 21 August 2013; Pickaxe Head

Photo 7

Grid: C2 (within Polygon); Target: C20015; Date: 28 August 2013; Nails

Photo 8

Grid: C3; Target: C30073; Date: 18 September 2013; Bracket

Photo 9

Grid: C4; Target: C40006; Date: 23 September 2013; Nails

Photo 10

Grid: D1; Target: D10031; Date: 18 April 2013; Socket Wrench

Photo 11

Grid: D2; Target: D20003; Date: 18 April 2013; 2 Vehicle Axles and Steel Plate

Photo 12

Grid: D3 (within Polygon); Target: D30134; Date: 18 September 2013; Nails

Photo 13

Grid: D4; Target: D40027; Date: 18 September 2013; Metal

Photo 14

Grid: D4; Target: D40005; Date: 19 September 2013; Bolt

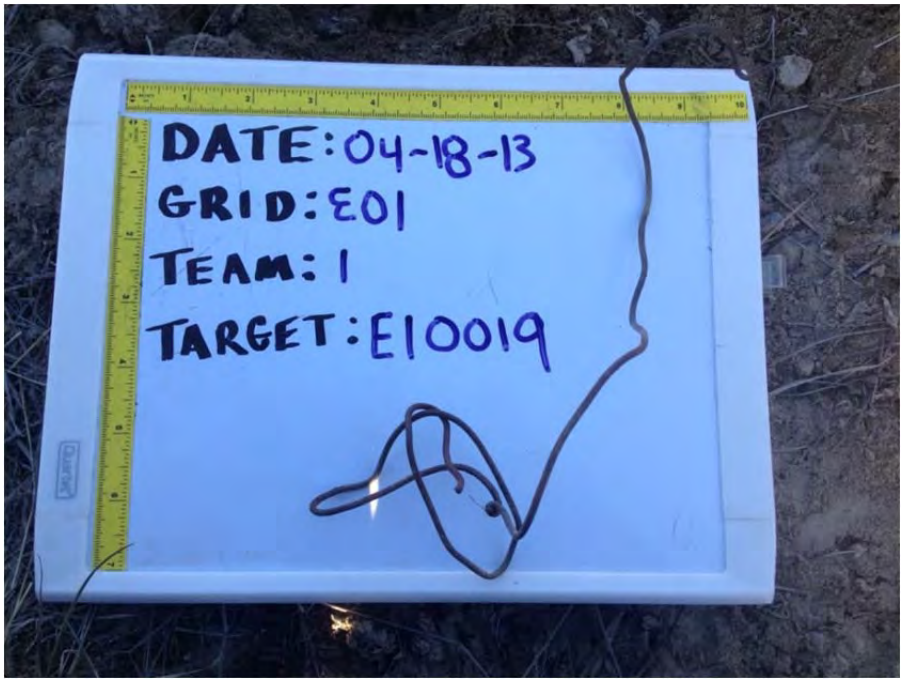


Photo 15
Grid: E1; Target: E10019; Date: 18 April 2013; Wire

Photo 16
Grid: E2; Target: E20029; Date: 18 April 2013; Bracket

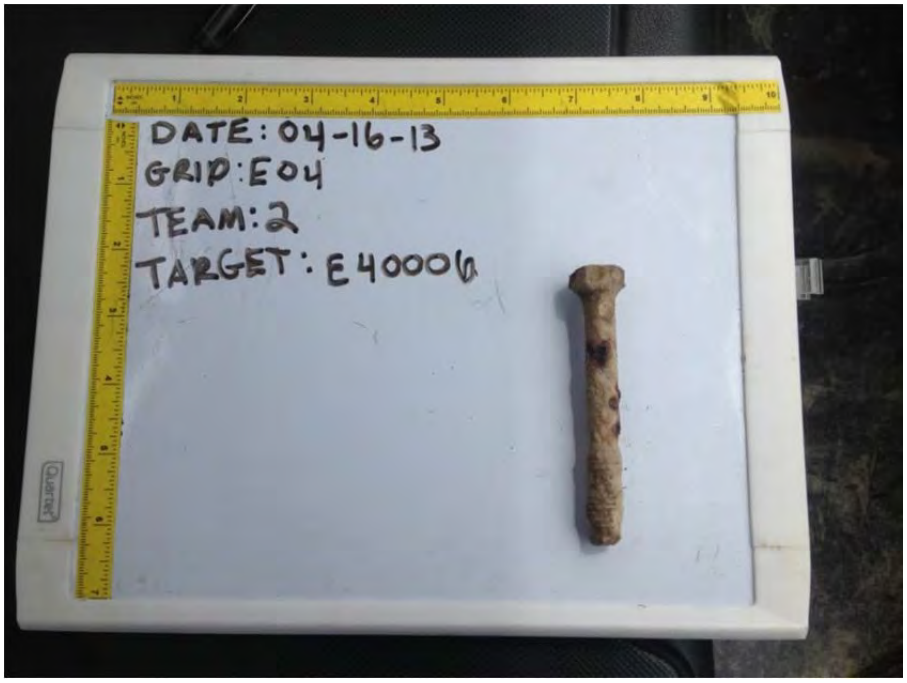


Photo 17

Grid: E4; Target: E40006; Date: 16 April 2013; Bolt

Photo 18

Grid: F1; Target: F10020; Date: 17 April 2013; Wire

Photo 19

Grid: F2; Target: F20001; Date: 17 April 2013; Sign Post Base

Photo 20

Grid: F3; Target: F30003; Date: 16 April 2013; Empty Paint Can

Photo 21
Grid: F4; Target: F40005; Date: 16 April 2013; Cable

Photo 22
Grid: G2; Target: G20008; Date: 17 April 2013; Wire

Photo 23
Grid: G3; Target: G30009; Date: 17 April 2013; Vehicle Part

Photo 24
Grid: G4; Target: G40020; Date: 15 April 2013; Sheet Metal

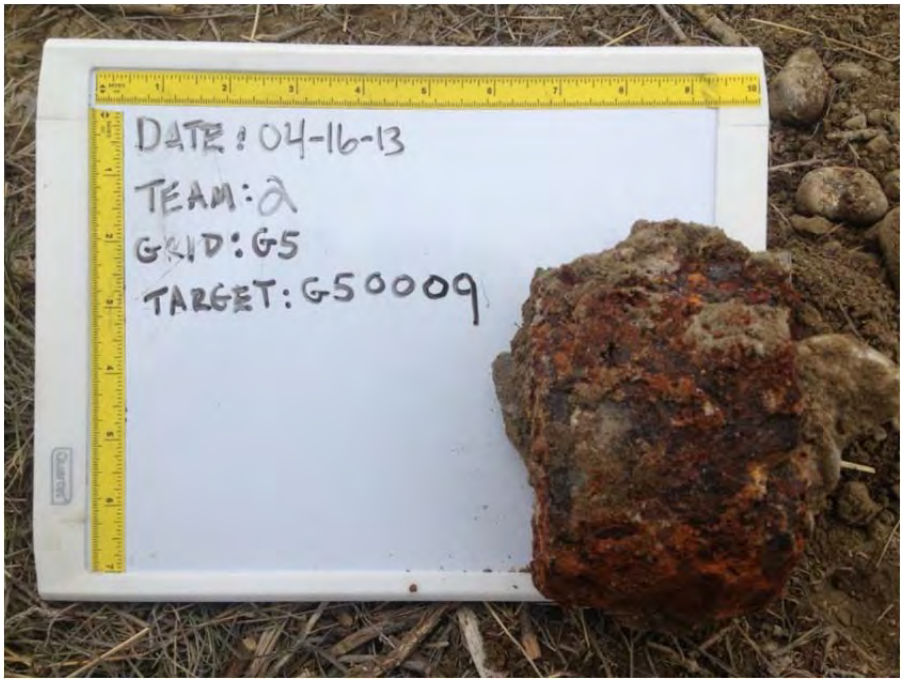


Photo 25
Grid: G5; Target: G50009; Date: 16 April 2013; Scrap Metal

Photo 26
Grid: H2; Target: H20013; Date: 17 April 2013; Wire

Photo 27

Grid: H3; Target: H30002; Date: 17 April 2013; Cable

Photo 28

Grid: H4; Target: H40010; Date: 15 April 2013; Wood with Nails

Photo 29

Grid: H5; Target: H50003; Date: 11 April 2013; Aluminum Scrap

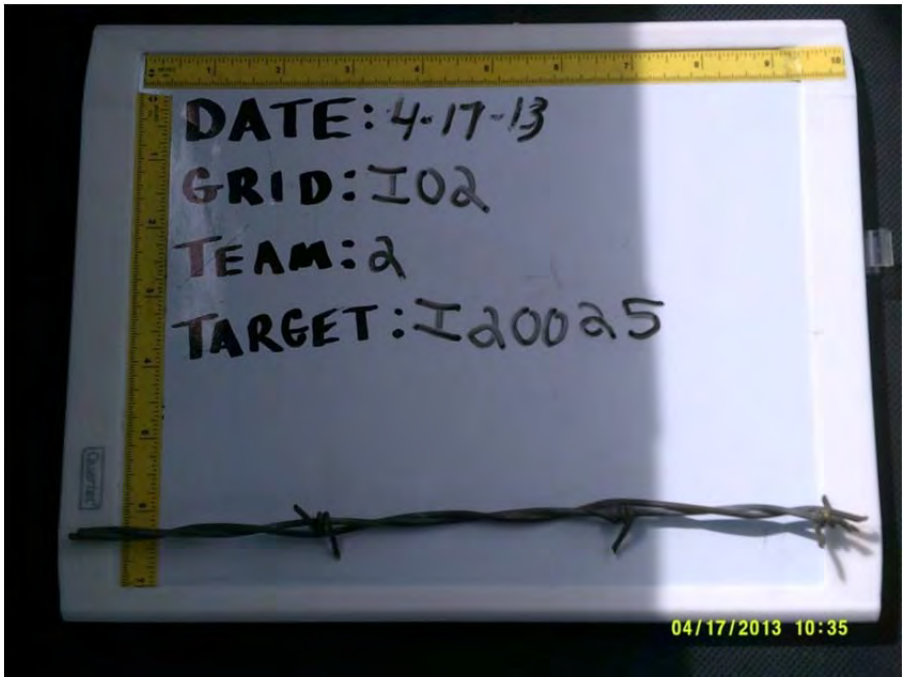


Photo 30

Grid: I2; Target: I20025; Date: 17 April 2013; Wire

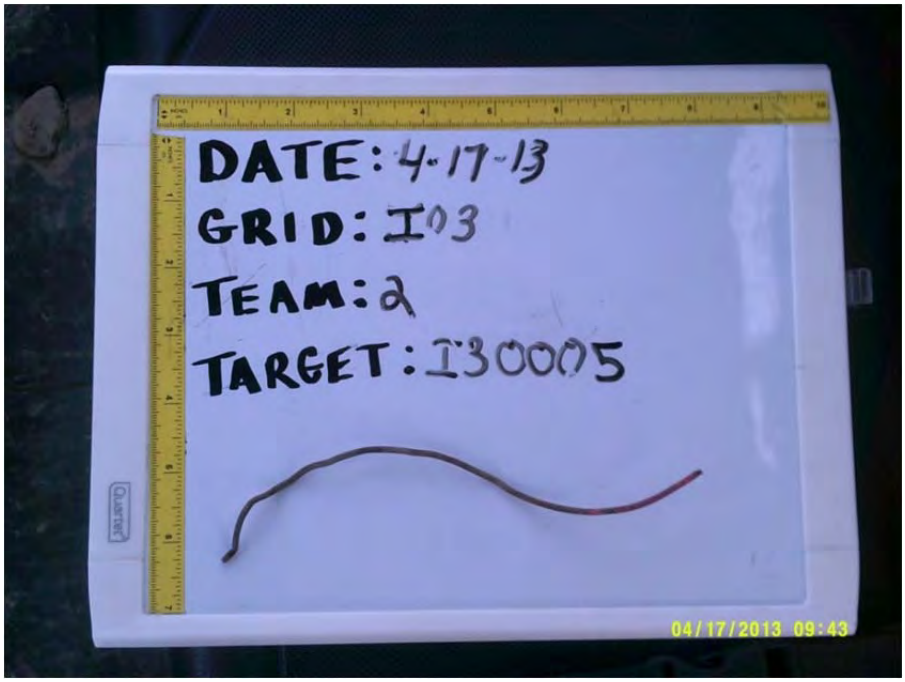


Photo 31

Grid: I3; Target: I30005; Date: 17 April 2013; Wire

Photo 32

Grid: I4; Target: I40009; Date: 11 April 2013; Scrap Metal

Photo 33

Grid: I5; Target: I50003; Date: 11 April 2013; Scrap Metal

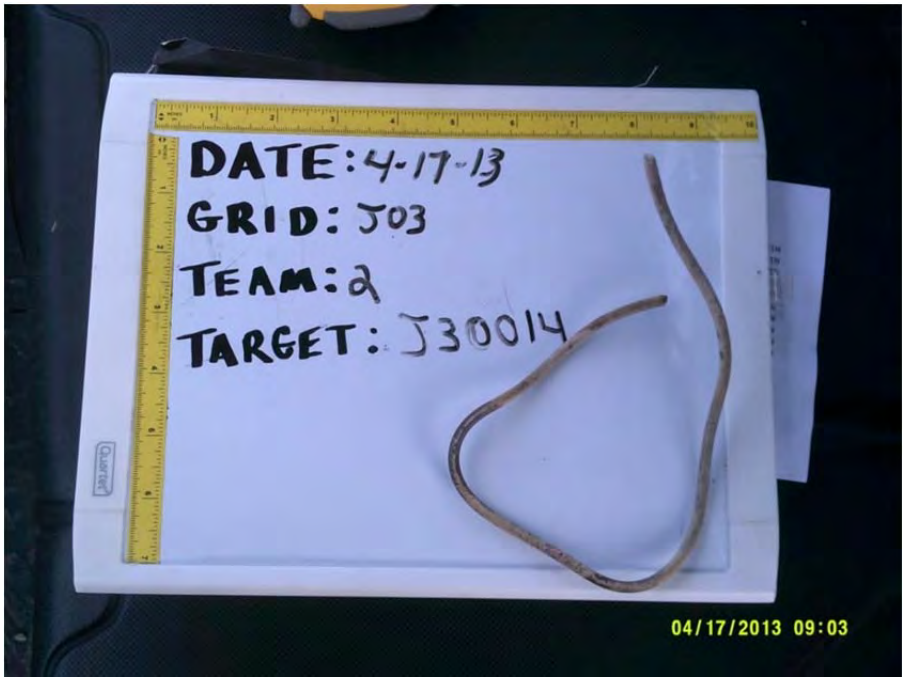


Photo 34

Grid: J3; Target: J30014; Date: 17 April 2013; Wire

Photo 35
Grid: J4; Target: J40002; Date: 10 April 2013; Nails

Photo 36
Grid: J5; Target: J50001; Date: 10 April 2013; Steel Plate

Photo37

Grid: J6; Target: J60001; Date: 10 September 2013, Angle Iron

Photo 38

Grid: K3; Target: E30016; Date: 16 April 2013; Nails

Photo 39

Grid: K4; Target: K40004; Date: 10 April 2013; Wire, Nails, and Railroad Spike

Photo 40

Grid: K5; Target: K50002; Date: 10 April 2013; Vehicle Leaf Spring

Photo 41

Grid: K6; Target: K60002; Date: 4 September 2013; Steel Cable

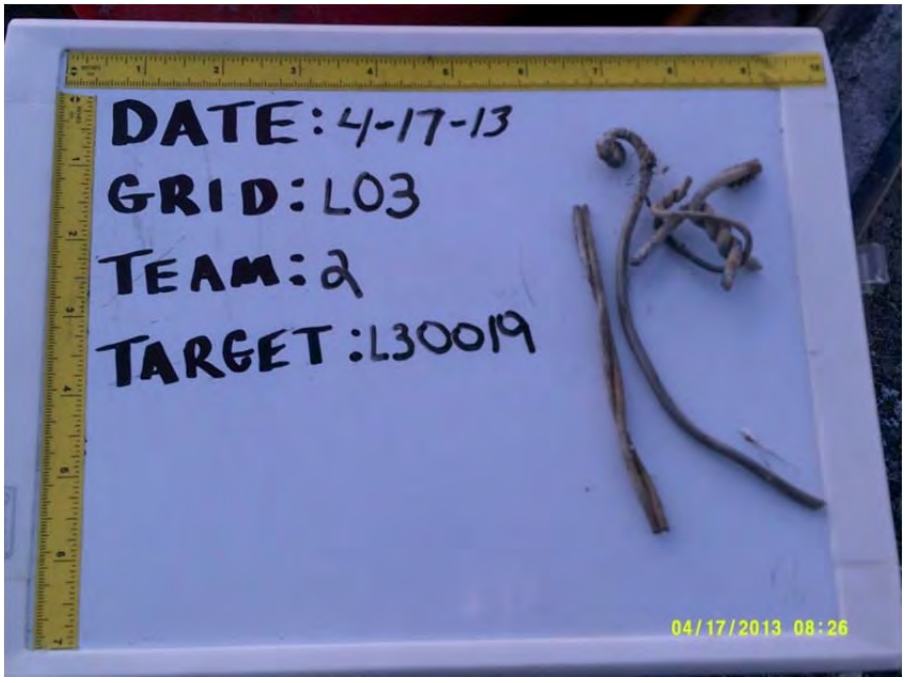


Photo 42

Grid: L3; Target: L30019; Date: 17 April 2013; Wire

Photo 43

Grid: L4; Target: L40016; Date: 5 September 2013; Metal Fence

Photo 44

Grid: L5; Target: L50001; Date: 4 September 2013; Fence Post

Photo 45
Large excavation containing trash, cultural debris

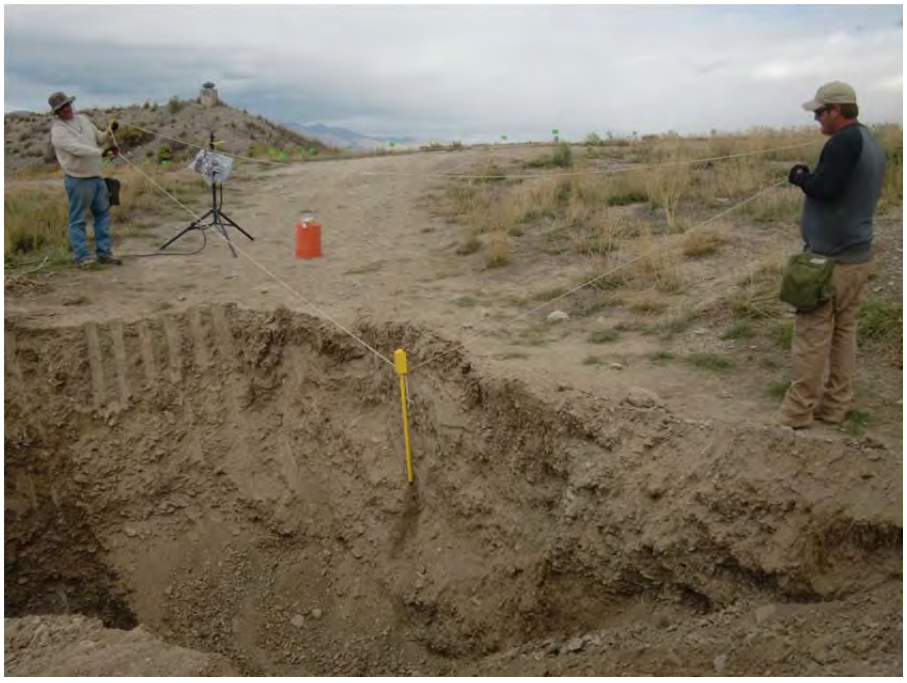


Photo 46
Large excavation containing trash, cultural debris

Photo 47
Sifting operations for large cultural debris excavations

Photo 48
Sifting operations for large cultural debris excavations

Photo 49

Sifting operations for large cultural debris excavations, The Pit Area is visible in the top left corner of the picture

ATTACHMENT C

DCD SWMU 2 Progress Chart

Updated as of: 11/1/2013

Grid Row	A	B	C	D	E	F	G	H	I	J	K	L	M
7											0 0		
6								0 0	0 0	2 2	3 3	1 1	0 0
5						1 1	11 10	3 3	5 5	2 2	26 25	2 2	0 0
4		1 0	57 10	55 44	8 4	23 15	40 32	51 51	21 19	7 7	25 25	13 10	0 0
3	18 0	26 0	19 1	59 0	12 0	22 3	16 7	5 5	5 5	1 1	1 1	2 2	
2	15 0	12 0	27 19	53 48	37 31	8 8	7 4	1 1	4 4				
1	0 0	9 0	2 1	16 11	2 2	3 3	0 0						

Grid Column

1 Grid = 100(ft) x 100(ft)

Anomalies for Excavation | # Anomalies Completed

#	#
#	#

No Contact

Color Legend

- Work Not Started
- Work in Progress
- QC Complete, UXB
- QA Complete, USAESCH
- Mechanical Grid (Pit Area)

Total Anomies Selected for Excavation:	739
Anomalies Completed:	428
Percent Complete, Anomaly Investigations	57.92%

ATTACHMENT D

Anomaly QC Results Summary

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
C01								
	C10003	8/22/2013	457.83	CD	scrap metal	5.00		
	C10022	8/22/2013	10.98	CD	bolt	0.25		
	C10024	8/22/2013	10.48	CD	wire	0.25		
	C10024	8/22/2013	10.48	CD	scrap metal	0.25		
	C10035	8/22/2013	5.31	CD	bolt	0.20		
C02								
	C20014	8/22/2013	2594.14	CD	bucket lid	0.50		
	C20020	8/27/2013	1020.19	CD	scrap metal	20.00		
	C20040	8/21/2013	310.26	CD	pickaxe head	5.00		
	C20063	8/21/2013	139.63	CD	spring	2.00		
	C20076	8/21/2013	82.81	O	same as C20040	0.00		
	C20079	8/21/2013	72.18	CD	wire	0.25		
	C20095	8/22/2013	36.03	CD	scrap metal	1.00		
	C20107	8/27/2013	23.96	CD	scrap metal	1.50		
	C20109	8/22/2013	22.63	CD	wire	0.25		
	C20112	8/21/2013	16.97	CD	nut and bolt	0.25		
	C20118	8/22/2013	11.34	CD	scrap metal	0.25		
	C20123	8/22/2013	9.61	CD	scrap metal	0.25		
	C20127	8/21/2013	8.23	NC	No Find	0.00		
	C20128	8/22/2013	8.23	CD	scrap metal	0.00		
	C20130	8/21/2013	7.73	CD	meral chunk	0.50		

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	C20132	8/22/2013	6.84	CD	same as C20014	0.00		
	C20135	8/22/2013	5.92	CD	scrap metal	0.25		
	C20139	8/22/2013	5.61	CD	scrap metal	0.25		
	C20140	8/22/2013	5.09	CD	scrap metal	0.25		
C03B								
	C3B0073	9/18/2013	9.68	CD	bracket	0.50		
C04B								
	C40004	9/23/2013	25.54	CD	wire	0.00	1	Pass
	C4B0006	9/23/2013	22.34	CD	nails	0.00	1	Pass
	C4B0008	9/23/2013	20.31	CD	nails	0.00	1	Pass
	C4B0009	9/23/2013	18.07	CD	nails	0.00	1	Pass
	C4B0010	9/23/2013	16.68	CD	wire	0.00	1	Pass
	C4B0016	9/23/2013	10.47	CD	nails	0.00	0	Pass
	C4B0024	9/23/2013	8.10	CD	nails	0.00	0	Pass
	C4B0038	9/23/2013	6.28	CD	nails	0.00	1	Pass
	C4B0051	9/23/2013	5.58	CD	nail	0.00	0	Pass
	C4B0055	9/23/2013	5.33	CD	nails	0.00	0	Pass
D01								
	D10010	4/18/2013	330.03	CD	steel plate	5.00		
	D10012	4/18/2013	208.25	CD	plate steel	4.00		
	D10016	4/18/2013	64.37	O	same as D20020	0.00		
	D10017	4/18/2013	64.35	CD	scrap metal	1.50		
	D10019	4/18/2013	50.79	CD	steel plate	2.00		
	D10020	4/18/2013	50.28	CD	scrap metal	2.00		

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	D10023	4/18/2013	42.80	O	same as D10019	0.00		
	D10027	4/18/2013	27.65	O	same as D10029	0.00		
	D10028	4/18/2013	26.64	CD	scrap metal	4.00		
	D10029	4/18/2013	25.44	CD	nails and banding	3.00		
	D10031	4/18/2013	20.53	CD	socket wrench	0.50		
D02								
	D20002	4/22/2013	2803.74	CD	bucket blade	25.00		
	D20003	4/18/2013	1101.99	CD	2 vehicle axles and steel	75.00		
	D20005	4/22/2013	886.93	CD	wheels and wire	25.00		
	D20006	4/18/2013	750.11	CD	vehicle leaf spring	10.00		
	D20008	4/22/2013	465.45	CD	pipe 2ft	30.00		
	D20010	4/18/2013	386.90	CD	angle iron	6.00		
	D20014	4/18/2013	111.06	O	same as D20015	0.00		
	D20015	4/18/2013	110.92	CD	angle iron and bolt	3.00		
	D20017	4/18/2013	94.15	CD	bolt railroad spike wire c	3.00		
	D20019	4/18/2013	63.54	O	same as D10017	0.00		
	D20020	4/18/2013	63.48	CD	scrap metal	3.00		
	D20021	4/18/2013	53.80	CD	bolt with nut	0.30		
	D20022	4/22/2013	46.46	CD	banding	0.02		
	D20023	4/22/2013	45.48	CD	nail	0.01		
	D20023	9/3/2013	45.48	CD	spike	0.00		
	D20024	4/22/2013	44.27	CD	banding	0.30		
	D20024	9/3/2013	44.27	CD	nails	0.25		
	D20025	4/22/2013	43.64	CD	nails	0.30		

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	D20025	9/3/2013	43.64	CD	nails	0.00		
	D20026	4/22/2013	43.25	CD	banding	0.03		
	D20026	9/3/2013	43.25	CD	spike	1.00		
	D20028	4/22/2013	37.68	CD	banding	0.02		
	D20029	4/22/2013	36.43	CD	banding and nails	0.30		
	D20030	4/22/2013	36.01	CD	wire cable	0.40		
	D20031	4/18/2013	35.36	CD	scrap metal	1.00		
	D20032	4/22/2013	27.39	CD	banding and plate	0.40		
	D20033	4/22/2013	25.55	CD	nails and banding	0.30		
	D20033	9/3/2013	25.55	CD	nails	0.00		
	D20034	4/22/2013	23.93	CD	banding and plate	0.50		
	D20036	4/18/2013	23.15	CD	scrap metal	2.50		
	D20038	4/22/2013	20.35	CD	wire and banding	0.02		
	D20039	4/22/2013	19.50	CD	banding	0.20		
	D20040	4/18/2013	18.86	CD	wire and pin and bolt	0.50		
	D20041	4/22/2013	18.68	CD	banding	0.00		
	D20043	4/22/2013	17.98	CD	wire	0.02		
	D20047	4/18/2013	16.84	CD	wire	0.10		
	D20048	4/18/2013	15.12	CD	bolt and cap	0.75		
	D20049	4/22/2013	14.53	CD	wire	0.02		
	D20050	4/22/2013	13.12	CD	nails	0.30		
	D20050	9/3/2013	13.12	CD	nails	0.00		
	D20051	4/18/2013	12.62	CD	bolt and nut	0.20		
	D20052	4/18/2013	11.58	O	same as D20059	0.00		

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	D20053	4/22/2013	11.29	CD	nails	0.20		
	D20055	4/22/2013	10.91	CD	wire	0.20		
	D20057	4/18/2013	10.74	CD	scrap metal	3.00		
	D20059	4/18/2013	8.83	CD	wire	0.10		
	D20060	4/18/2013	8.25	CD	metal rod	2.00		
	D20063	4/18/2013	8.08	CD	nails	0.50		
	D20064	4/18/2013	7.72	O	same as D20060	0.00		
	D20065	4/22/2013	7.69	CD	banding	0.03		
	D20065	9/3/2013	7.69	CD	nail	0.25		
	D20066	4/18/2013	6.26	CD	nails and banding	1.00		
	D20067	4/22/2013	6.04	CD	banding and bolt	0.00		
	D20068	4/22/2013	5.15	CD	banding	0.10		
	D20069	4/22/2013	5.12	CD	nail	0.01		
D04B								
	D4B0002	9/19/2013	67.07	CD	bolt	0.50	1	Pass
	D4B0003	9/19/2013	66.19	CD	wire	0.25		Continue
	D4B0004	9/19/2013	62.09	CD	wire	0.50		Continue
	D4B0005	9/19/2013	53.36	CD	bolt	0.50	1	Pass
	D4B0006	9/18/2013	47.72	CD	bracket	2.00	4	Pass
	D4B0007	9/18/2013	39.21	CD	metal	0.50	1	Pass
	D4B0008	9/17/2013	37.74	CD	bracket	0.50	3	Pass
	D4B0010	9/17/2013	31.88	CD	bolt	1.00	1	Pass
	D4B0011	9/17/2013	31.58	CD	metal	0.25	2	Pass
	D4B0011	9/18/2013	31.58	CD	wire	0.25	2	Pass

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	D4B0012	9/18/2013	26.99	CD	wire	0.25	1	Pass
	D4B0013	9/18/2013	25.89	CD	rebar	3.00	0	Pass
	D4B0014	9/17/2013	24.03	CD	wire	0.25	2	Pass
	D4B0015	9/17/2013	22.32	CD	metal	0.50	3	Pass
	D4B0016	9/18/2013	21.89	CD	rebar	3.00	1	Pass
	D4B0017	9/17/2013	20.39	CD	metal	1.00	3	Pass
	D4B0017	9/18/2013	20.39	CD	wire	0.25	3	Pass
	D4B0018	9/17/2013	18.56	CD	wire	0.25		Continue
	D4B0019	9/17/2013	17.99	CD	metal banding	0.25	4	Pass
	D4B0020	9/17/2013	16.78	CD	bracket	1.00	2	Pass
	D4B0020	9/18/2013	16.78	CD	metal	0.50	2	Pass
	D4B0021	9/17/2013	16.65	CD	wrench	2.00	1	Pass
	D4B0021	9/18/2013	16.65	CD	wire	0.25	1	Pass
	D4B0022	9/17/2013	16.00	CD	nails	0.25	2	Pass
	D4B0023	9/17/2013	13.46	CD	wire	0.25	2	Pass
	D4B0024	9/17/2013	12.49	CD	washer	1.00	3	Pass
	D4B0024	9/18/2013	12.49	CD	wire	0.25	3	Pass
	D4B0025	9/17/2013	12.01	CD	metal banding	0.25	3	Pass
	D4B0027	9/18/2013	10.88	CD	metal	0.50	1	Pass
	D4B0028	9/17/2013	10.76	CD	metal	0.75	2	Pass
	D4B0030	9/18/2013	10.39	CD	nails	0.00	2	Pass
	D4B0031	9/17/2013	10.00	CD	wire	0.25	2	Pass
	D4B0032	9/19/2013	9.22	CD	wire	0.25		Continue
	D4B0034	9/17/2013	8.56	CD	rebar	0.50	2	Pass

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	D4B0035	9/17/2013	7.74	CD	wire	0.25	2	Pass
	D4B0036	9/18/2013	7.74	CD	nail	0.00	0	Pass
	D4B0037	9/17/2013	7.67	CD	wire	0.25	3	Pass
	D4B0038	9/19/2013	7.56	CD	wire	0.25		Continue
	D4B0040	9/17/2013	6.81	CD	wire	0.25	2	Pass
	D4B0043	9/19/2013	6.49	CD	wire	0.25	3	Pass
	D4B0044	9/17/2013	6.38	CD	wire	0.25	1	Pass
	D4B0045	9/17/2013	6.26	CD	wire	0.25	3	Pass
	D4B0046	9/18/2013	6.02	CD	wire	0.25	2	Pass
	D4B0047	9/18/2013	5.87	CD	wire	0.25	2	Pass
	D4B0048	9/18/2013	5.78	CD	wire	0.25	0	Pass
	D4B0048	9/18/2013	5.78	CD	nails	0.25	0	Pass
	D4B0049	9/18/2013	5.72	CD	wire	0.25	2	Pass
	D4B0051	9/19/2013	5.59	CD	metal	0.50	0	Pass
	D4B0052	9/18/2013	5.42	CD	wire	0.25	2	Pass
	D4B0054	9/18/2013	5.18	CD	nail	0.00	3	Pass
E01								
	E10019	4/18/2013	15.26	CD	wire	0.10	1	Pass
	E10022	4/18/2013	11.48	O	same as E20017	0.00	0	Pass
E02								
	E20001	4/18/2013	1090.46	CD	bolt	0.10		
	E20002	5/2/2013	424.21	CD	Sign	50.00		
	E20003	5/2/2013	80.90	O	same as E20002	0.00		
	E20005	5/2/2013	42.07	CD	nails	3.00		

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	E20006	5/2/2013	35.01	CD	nails	0.50		
	E20007	4/18/2013	34.84	CD	bracket	0.50		
	E20008	4/18/2013	33.65	CD	banding	1.00		
	E20009	5/2/2013	33.61	CD	nails	0.50		
	E20010	4/18/2013	32.14	CD	banding bracket	0.25		
	E20011	5/2/2013	22.67	CD	nails	0.25		
	E20012	4/18/2013	17.27	CD	railroad spike	1.00		
	E20013	4/18/2013	16.71	CD	banding	0.50		
	E20013	5/2/2013	16.71	CD	wire	5.00		
	E20014	4/18/2013	16.70	CD	wire	0.10		
	E20014	4/18/2013	16.70	CD	nails	0.25		
	E20017	4/18/2013	13.70	CD	scrap metal	0.25	0	Pass
	E20018	4/18/2013	13.33	CD	banding	0.25		
	E20019	5/2/2013	10.71	CD	nail	0.10		
	E20020	5/2/2013	9.99	CD	nails	1.00		
	E20021	4/18/2013	9.59	O	same as E10019	0.00	0	Pass
	E20022	5/2/2013	8.96	CD	nails	5.00		
	E20023	5/2/2013	8.70	CD	nails	3.00		
	E20026	5/2/2013	8.07	CD	nail	0.10		
	E20027	4/18/2013	7.96	O	same as E20028	0.00		
	E20028	4/18/2013	7.10	CD	nails	0.25		
	E20029	4/18/2013	7.09	CD	bracket	0.10		
	E20029	5/2/2013	7.09	CD	banding	0.25		
	E20030	5/2/2013	6.99	CD	nails	0.25		

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	E20031	5/2/2013	6.45	CD	nails	0.10		
	E20032	4/18/2013	6.28	CD	nails	0.25		
	E20033	4/18/2013	6.15	CD	nail	0.00		
	E20034	4/18/2013	5.60	CD	nail	0.10		
	E20034	5/2/2013	5.60	CD	nails	0.10		
	E20035	4/18/2013	5.55	CD	nail	0.01		
	E20036	4/18/2013	5.17	CD	banding	0.25		
E04								
	E40006	4/16/2013	12.52	CD	bolt	0.10		
	E40007	4/16/2013	9.29	CD	nail	0.10		
	E40008	4/16/2013	8.53	CD	cable	2.00		
	E40009	4/16/2013	6.08	NC	No Find	0.00		
F01								
	F10012	4/17/2013	37.04	NC	No Find	0.00	0	Pass
	F10020	4/17/2013	7.32	CD	wire	0.10	0	Pass
	F10022	4/17/2013	6.55	CD	wire	0.10	1	Pass
F02								
	F20001	4/17/2013	1838.33	CD	sign post base	20.00	0	Pass
	F20002	5/2/2013	656.53	CD	steel beam	45.00	0	Pass
	F20003	4/17/2013	147.32	CD	enigeer stake piece	0.50	2	Pass
	F20004	4/17/2013	23.92	CD	wire	0.00	1	Pass
	F20005	4/17/2013	22.01	CD	nail	0.10	2	Pass
	F20006	4/17/2013	9.48	CD	nails	0.25	1	Pass
	F20007	4/17/2013	7.31	CD	wire	0.10	1	Pass

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	F20008	4/17/2013	5.06	CD	nails	0.25	3	Pass
F03								
	F30001	4/16/2013	915.62	O	same as F40011	0.00		
	F30003	4/16/2013	138.96	CD	paint can	3.00		
	F30011	4/16/2013	13.80	O	same as F40017	0.00		
F04								
	F40001	4/16/2013	510.21	CD	oil can	2.00	1	Pass
	F40002	4/16/2013	506.01	CD	scrap metal	5.00	0	Pass
	F40003	4/16/2013	224.46	CD	cargo ratchet	2.00	1	Pass
	F40004	4/16/2013	180.60	CD	cargo ratchet	2.00	0	Pass
	F40005	4/16/2013	107.94	CD	cable	0.00	2	Pass
	F40006	4/16/2013	106.68	CD	jackhammer bit	8.00	3	Pass
	F40011	4/16/2013	42.38	CD	paint can	2.00	3	Pass
	F40015	4/16/2013	12.43	O	same as F30003	0.00		
	F40016	4/16/2013	10.63	NC	No Find	0.00		
	F40017	4/16/2013	9.13	CD	nail	0.10	3	Pass
	F40018	4/16/2013	8.21	CD	nail	0.10	2	Pass
	F40019	4/16/2013	7.30	CD	nail	0.10	2	Pass
	F40020	4/16/2013	6.70	CD	nail	0.10		
	F40021	4/16/2013	6.23	NC	No Find	0.00		
	F40022	4/16/2013	5.84	CD	cable	20.00	2	Pass
	F40023	4/16/2013	5.36	O	same as F40020	0.00		
F05								
	F50002	5/2/2013	11.33	CD	steel cable	25.00	3	Pass

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
G02								
	G20008	4/17/2013	21.52	CD	wire	0.10		
	G20011	4/17/2013	8.45	NC	No Find	0.00		
	G20013	4/17/2013	6.19	CD	aluminum can	0.25		
	G20014	4/17/2013	5.76	CD	wire	0.10		
G03								
	G30001	4/17/2013	2705.81	O	same as H30002	0.00	2	Pass
	G30002	4/17/2013	900.74	NC	No Find	0.00		
	G30004	4/17/2013	537.42	CD	bolt	0.25		
	G30009	4/17/2013	57.41	CD	vehicle part	1.00	1	Pass
	G30010	4/17/2013	30.31	O	same as H30002	0.00	2	Pass
	G30014	4/17/2013	7.40	O	same as H30002	0.00	0	Pass
	G30015	4/17/2013	5.53	NC	No Find	0.00	1	Pass
G04								
	G40001	4/16/2013	4281.65	CD	Range sign (LIP)	0.00	3	Pass
	G40002	4/24/2013	1268.15	CD	scrap and cable	20.00	1	Pass
	G40003	4/16/2013	647.32	CD	screws	0.10	1	Pass
	G40004	4/15/2013	298.61	CD	paint bucket	3.00	3	Pass
	G40004	4/23/2013	298.61	CD	wire trash	0.00	3	Pass
	G40005	4/16/2013	208.21	CD	cargo ratchet	1.00	0	Pass
	G40006	4/23/2013	194.25	CD	wire mesh, scrap, junk	35.00	3	Pass
	G40006	4/24/2013	194.25	CD	wire	35.00	3	Pass
	G40008	4/24/2013	167.57	CD	scrap metal	20.00	3	Pass
	G40009	4/22/2013	148.59	CD	large metal plate	20.00	2	Pass

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	G40010	4/24/2013	137.08	CD	nails	0.25	0	Pass
	G40011	4/24/2013	91.62	CD	wire mesh	15.00	2	Pass
	G40013	4/16/2013	65.36	CD	railroad spike	0.25	1	Pass
	G40014	4/23/2013	63.90	O	same as G50007	0.00	1	Pass
	G40015	4/22/2013	56.25	CD	wire cable	2.00		Continue
	G40016	4/15/2013	42.56	CD	large bolt	6.00	1	Pass
	G40017	4/15/2013	36.71	O	same as G40016	0.00	1	Pass
	G40018	4/16/2013	24.19	CD	railroad spike	0.25	0	Pass
	G40019	4/16/2013	20.69	CD	cargo hook	0.50	0	Pass
	G40020	4/15/2013	20.07	CD	sheet metal	2.00	4	Pass
	G40020	4/24/2013	20.07	CD	nails	0.50	4	Pass
	G40021	4/23/2013	19.42	O	same as G50004	0.00	2	Pass
	G40023	4/16/2013	15.34	CD	boot	0.25	0	Pass
	G40025	4/16/2013	15.07	CD	spike	0.25	1	Pass
	G40025	4/24/2013	15.07	CD	steel plate	1.50	1	Pass
	G40026	4/16/2013	12.56	CD	metal rod	1.50	2	Pass
	G40026	4/24/2013	12.56	CD	railway spike	5.00	2	Pass
	G40027	4/16/2013	11.52	CD	nail	0.10	1	Pass
	G40028	4/22/2013	10.66	O	same as G50009	0.00	2	Pass
	G40029	4/16/2013	10.30	O	same as G40023	0.00	0	Pass
	G40030	4/15/2013	10.18	CD	nail	0.01	0	Pass
	G40030	4/22/2013	10.18	CD	copper wire	0.20	0	Pass
	G40030	4/24/2013	10.18	CD	railroad spike	1.50	0	Pass
	G40031	4/23/2013	9.42	CD	cable	0.50	1	Pass

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	G40032	4/16/2013	9.12	CD	wire	0.10	2	Pass
	G40035	4/16/2013	6.27	NC	No Find	0.00	1	Pass
	G40036	4/16/2013	6.19	NC	No Find	0.00	2	Pass
	G40038	4/16/2013	5.84	CD	nails	0.20	1	Pass
	G40039	4/16/2013	5.78	NC	No Find	0.00	1	Pass
G05								
	G50001	4/22/2013	284.72	O	same as G40009	0.00	2	Pass
	G50002	4/23/2013	159.04	CD	scrap metal	65.00	3	Pass
	G50003	4/22/2013	139.19	CD	metal frame	20.00	2	Pass
	G50003	4/23/2013	139.19	CD	angle iron, trash, shovel	80.00	2	Pass
	G50003	4/24/2013	139.19	CD	scrap	25.00	2	Pass
	G50004	4/23/2013	66.96	CD	scrap metal	6.00	2	Pass
	G50005	4/24/2013	59.89	CD	scrap metal	2.00	0	Pass
	G50006	4/16/2013	28.55	O	same as G40016	0.00	1	Pass
	G50007	4/23/2013	21.56	CD	scrap metal	8.00	1	Pass
	G50008	4/16/2013	16.73	CD	Steel triangle	5.00	0	Pass
	G50009	4/16/2013	10.54	CD	scrap metal	3.00	2	Pass
	G50009	4/22/2013	10.54	CD	railroad spikes	1.00	2	Pass
	G50010	4/22/2013	7.73	CD	steel bar	4.00	0	Pass
	G50010	4/24/2013	7.73	CD	railroad spike	0.50	0	Pass
H02								
	H20013	4/17/2013	6.73	CD	wire	0.10	0	Pass
H03								
	H30001	4/15/2013	16.24	CD	nails	0.10	0	Pass

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	H30002	4/17/2013	15.72	CD	cable	8.00	0	Pass
	H30003	4/17/2013	7.75	NC	No Find	0.00	2	Pass
	H30004	4/17/2013	6.16	NC	No Find	0.00	1	Pass
	H30005	4/17/2013	5.51	NC	No Find	0.00	2	Pass
H04								
	H40001	4/24/2013	11830.63	CD	scrap	56.00	2	Pass
	H40002	4/24/2013	10234.59	CD	large steel plate	200.00	4	Pass
	H40003	4/15/2013	869.32	CD	sheet metal	2.00	1	Pass
	H40003	4/24/2013	869.32	CD	railway spikes	2.00	1	Pass
	H40004	4/15/2013	687.85	CD	metal scrap	5.00	3	Pass
	H40004	4/25/2013	687.85	CD	scrap metal	0.50	3	Pass
	H40005	4/15/2013	582.29	CD	scrap metal	10.00	2	Pass
	H40006	4/15/2013	386.18	O	same as H40007	0.00	0	Pass
	H40007	4/15/2013	334.17	CD	metal bar	8.00	0	Pass
	H40008	4/29/2013	296.41	CD	scrap metal	5.00	1	Pass
	H40009	4/15/2013	272.03	CD	metal roller	5.00	2	Pass
	H40010	4/15/2013	211.30	CD	wood with nails	45.00	2	Pass
	H40011	4/24/2013	157.52	CD	metal and rubber expos	0.00	1	Pass
	H40012	4/24/2013	124.07	CD	sheet metal	0.00	0	Pass
	H40013	4/15/2013	101.21	CD	sledgehammer head	8.00	0	Pass
	H40014	4/15/2013	98.13	CD	steel bar	5.00	1	Pass
	H40015	4/15/2013	84.25	CD	scrap metal	2.00	1	Pass
	H40015	4/25/2013	84.25	CD	nail and drill bit	0.10	1	Pass
	H40016	4/15/2013	70.95	O	same as H40014	0.00	0	Pass

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	H40016	4/25/2013	70.95	CD	nail and scrap	0.10	0	Pass
	H40017	4/29/2013	66.90	CD	metal plate	25.00	1	Pass
	H40018	4/24/2013	51.13	CD	Cable	0.00	4	Pass
	H40019	4/29/2013	49.98	CD	metal plate	5.00	2	Pass
	H40020	4/15/2013	45.28	CD	pick head	7.00	3	Pass
	H40021	4/30/2013	42.62	CD	poles	8.00	0	Pass
	H40022	4/15/2013	37.32	CD	wire	0.10	1	Pass
	H40023	4/15/2013	31.56	CD	nail	0.10	0	Pass
	H40023	4/29/2013	31.56	CD	nail	0.25	0	Pass
	H40024	4/15/2013	31.39	CD	nails and spike	0.50	3	Pass
	H40024	4/25/2013	31.39	CD	nails	3.00	3	Pass
	H40025	4/15/2013	29.99	CD	cap	0.10	1	Pass
	H40025	4/29/2013	29.99	CD	bolts and washer	0.50	1	Pass
	H40026	4/15/2013	28.50	CD	nail	0.10	0	Pass
	H40027	4/15/2013	27.18	CD	nail	0.10	1	Pass
	H40027	4/29/2013	27.18	CD	nail and wire	0.25	1	Pass
	H40028	4/15/2013	24.56	CD	nails and spike	0.50	2	Pass
	H40029	4/25/2013	23.15	CD	nails	0.00	2	Pass
	H40030	4/25/2013	19.66	CD	wood and nails	10.00	4	Pass
	H40031	4/15/2013	16.79	CD	wrench	2.00	1	Pass
	H40032	4/15/2013	14.14	O	same as H30001	0.00	2	Pass
	H40033	4/25/2013	13.91	CD	wire and nail	0.30	1	Pass
	H40034	4/15/2013	12.42	O	same as H40026	0.00	0	Pass
	H40035	4/15/2013	12.29	CD	railroad spike	0.25	2	Pass

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	H40036	4/25/2013	11.50	CD	nails	0.50	2	Pass
	H40037	4/15/2013	11.43	CD	nails and bolt	0.50	2	Pass
	H40038	4/15/2013	11.29	CD	nails	0.10	3	Pass
	H40039	4/15/2013	9.41	CD	metal ring	0.50	2	Pass
	H40040	4/15/2013	9.30	CD	bolt	0.50	2	Pass
	H40041	4/15/2013	9.08	O	same as H40031	0.00	3	Pass
	H40042	4/15/2013	7.59	CD	angle iron	0.50	2	Pass
	H40042	4/29/2013	7.59	CD	scrap metal	3.00	2	Pass
	H40043	4/24/2013	7.20	CD	metal and rubber expos	0.00	2	Pass
	H40044	4/15/2013	6.52	CD	bolt	0.10	3	Pass
	H40045	4/30/2013	6.17	CD	wire	1.50	0	Pass
	H40046	4/24/2013	6.11	CD	metal	10.00	2	Pass
	H40047	4/25/2013	5.88	CD	handle with chain	1.50	2	Pass
	H40048	4/24/2013	5.28	CD	metal	10.00	0	Pass
	H40049	4/30/2013	5.14	O	same as H40045	0.00	1	Pass
	H40050	4/25/2013	5.06	CD	metal rod	2.00	3	Pass
	H40051	4/15/2013	5.00	CD	nails	0.10	1	Pass
H05								
	H50001	4/11/2013	23.04	CD	metal bracket	0.25	1	Pass
	H50002	4/11/2013	8.67	CD	nail	0.10	0	Pass
	H50003	4/11/2013	8.53	CD	aluminum scrap	1.00	0	Pass
I02								
	I20024	4/17/2013	8.70	CD	wire	0.10	1	Pass
	I20025	4/17/2013	8.29	CD	wire	0.10	3	Pass

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	I20029	9/11/2013	5.66	CD	wire	0.25	1	Pass
	I20030	4/17/2013	5.55	CD	wire	0.10	0	Pass
	I20030	9/11/2013	5.55	CD	wire	0.25	0	Pass
I03								
	I30001	9/11/2013	237.30	CD	metal	5.00	2	Pass
	I30002	4/17/2013	27.27	CD	metal cap	0.20	1	Pass
	I30003	9/11/2013	8.12	CD	wire	0.25	1	Pass
	I30004	4/17/2013	5.68	CD	wire	0.10	1	Pass
	I30005	4/17/2013	5.25	CD	wire	0.10	0	Pass
I04								
	I40001	9/10/2013	669.34	CD	metal	200.00	2	Pass
	I40001	9/11/2013	669.34	CD	metal	10.00	2	Pass
	I40002	4/11/2013	564.60	CD	pipe	10.00	0	Pass
	I40003	4/11/2013	254.24	CD	scrap metal	5.00	0	Pass
	I40003	9/11/2013	254.24	CD	bolt	0.00	0	Pass
	I40004	4/11/2013	91.21	CD	wire	2.00	3	Pass
	I40005	4/11/2013	56.32	O	same as I40004	0.00	3	Pass
	I40006	9/11/2013	56.06	CD	metal grate	50.00	3	Pass
	I40007	4/11/2013	30.05	CD	nails	1.00	0	Pass
	I40007	9/11/2013	30.05	CD	nails	0.00	0	Pass
	I40008	4/11/2013	24.71	CD	wire	0.10	2	Pass
	I40008	9/11/2013	24.71	CD	wire	0.25	2	Pass
	I40009	4/11/2013	15.78	CD	scrap metal	4.00	3	Pass
	I40010	4/11/2013	14.90	CD	wire	0.10	2	Pass

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	I40010	9/11/2013	14.90	CD	wire	0.25	2	Pass
	I40011	9/11/2013	13.56	CD	cable	20.00	1	Pass
	I40011	9/11/2013	13.56	CD	shovel head	3.00	1	Pass
	I40013	4/11/2013	8.68	CD	c-clamp	0.10	2	Pass
	I40013	9/11/2013	8.68	CD	metal	0.25	2	Pass
	I40014	9/11/2013	8.03	CD	metal braket	10.00	2	Pass
	I40016	4/11/2013	6.28	CD	nut	0.10	0	Pass
	I40017	9/12/2013	5.95	CD	pickaxe	10.00	2	Pass
	I40018	4/11/2013	5.71	CD	bolts	0.20	0	Pass
	I40018	9/11/2013	5.71	CD	wire	0.00	0	Pass
	I40019	4/11/2013	5.54	CD	bolt	0.20	1	Pass
	I40020	4/11/2013	5.10	NC	No Find	0.00	1	Pass
	I40021	4/11/2013	5.06	O	same as I40019	0.00	1	Pass
I05								
	I50001	4/11/2013	418.56	O	same as I40002	0.00	1	Pass
	I50002	4/11/2013	152.62	CD	scrap	0.20	1	Pass
	I50003	4/11/2013	74.26	CD	scrap metal	0.20	0	Pass
	I50004	4/11/2013	19.29	CD	scrap metal	0.50	1	Pass
	I50005	4/11/2013	5.16	CD	nail	0.01	0	Pass
J03								
	J30014	4/17/2013	7.76	CD	wire	0.10	3	Pass
J04								
	J40001	9/10/2013	15.14	O	same as J40007 (09-10-2	0.00	3	Pass
	J40002	4/10/2013	9.68	CD	nails	0.50	0	Pass

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	J40003	4/10/2013	8.18	CD	rubber with metal	2.00	1	Pass
	J40004	4/10/2013	7.85	CD	nails	0.25	0	Pass
	J40005	4/10/2013	6.81	O	same as J40004	0.00	1	Pass
	J40006	4/10/2013	5.65	NC	No Find	0.00	0	Pass
	J40007	9/10/2013	5.46	CD	wire	10.00	2	Pass
J05								
	J50001	4/10/2013	131.32	CD	steel plate	1.50	1	Pass
	J50002	4/10/2013	5.61	CD	can	0.25	0	Pass
J06								
	J60001	4/8/2013	10.85	CD	angle iron	1.50	0	Pass
	J60001	9/10/2013	10.85	CD	metal	3.00	0	Pass
	J60002	4/8/2013	10.39	CD	clamp for shipping	1.00	0	Pass
	J60002	9/10/2013	10.39	CD	metal	2.00	0	Pass
K03								
	K30016	4/17/2013	6.01	CD	nails	0.10	1	Pass
K04								
	K40001	9/4/2013	1011.95	CD	concrete	2500.00	3	Pass
	K40002	4/10/2013	635.96	CD	scrap	2.00	0	Pass
	K40003	4/10/2013	383.12	CD	nails	3.00	3	Pass
	K40004	4/10/2013	96.02	CD	wire,nails and railroad s	2.50	3	Pass
	K40005	9/5/2013	50.67	CD	cable	10.00	3	Pass
	K40006	4/10/2013	41.31	CD	nails and railroad spike	0.00	2	Pass
	K40007	4/10/2013	38.79	CD	wire and nails	2.00	4	Pass
	K40008	4/10/2013	28.34	CD	scrap metal with nails	25.00	1	Pass

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	K40009	4/10/2013	23.08	CD	nails and wire and scrap	2.50	3	Pass
	K40010	4/10/2013	22.74	CD	nails and wire	0.25	3	Pass
	K40011	4/10/2013	22.55	CD	scrap metal	1.00	1	Pass
	K40012	4/10/2013	18.34	CD	nails and scrap	2.00	2	Pass
	K40013	4/10/2013	13.37	CD	railroad spike	0.50	0	Pass
	K40014	4/8/2013	11.51	O	same as L40007	0.00	1	Pass
	K40015	4/10/2013	9.32	CD	nails	0.10	2	Pass
	K40016	4/10/2013	6.92	O	scrap metal, same as K4	0.00	1	Pass
	K40017	4/10/2013	6.71	NC	No Find	0.00	2	Pass
	K40018	4/10/2013	6.30	CD	nails	0.25	0	Pass
	K40019	4/10/2013	6.24	NC	No Find	0.00	2	Pass
	K40020	4/10/2013	5.90	NC	No Find	0.00	3	Pass
	K40021	4/10/2013	5.84	NC	No Find	0.00	2	Pass
	K40022	4/10/2013	5.78	NC	No Find	0.00	2	Pass
	K40023	4/10/2013	5.43	NC	No Find	0.00	2	Pass
	K40024	4/10/2013	5.31	NC	No Find	0.00	1	Pass
	K40025	4/10/2013	5.10	NC	No Find	0.00	2	Pass
K05								
	K50001	4/11/2013	915.90	CD	metal plate	15.00	1	Pass
	K50002	4/11/2013	614.58	CD	vehicle leaf spring	15.00	3	Pass
	K50002	9/5/2013	614.58	CD	metal	20.00	3	Pass
	K50003	4/11/2013	549.27	CD	vehicle leaf spring	15.00	0	Pass
	K50003	9/5/2013	549.27	CD	wire	0.25	0	Pass
	K50004	4/11/2013	519.45	O	same as K50003	0.00	1	Pass

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	K50005	4/11/2013	126.28	CD	vehicle leaf spring	2.00	3	Pass
	K50006	4/10/2013	97.03	CD	nails	1.00	3	Pass
	K50007	4/11/2013	88.90	CD	scrap metal and nail	2.00	0	Pass
	K50008	4/11/2013	67.49	CD	scrap metal and wire	1.00	1	Pass
	K50009	4/11/2013	60.88	CD	metal brackets	0.50	2	Pass
	K50010	4/11/2013	54.37	CD	scrap metal	1.00	1	Pass
	K50010	9/5/2013	54.37	CD	wire	0.25	1	Pass
	K50011	4/11/2013	48.57	CD	metal bracket	4.00	2	Pass
	K50011	9/5/2013	48.57	CD	metal	20.00	2	Pass
	K50012	4/11/2013	34.38	CD	metal bracket	0.50	0	Pass
	K50013	4/11/2013	25.62	CD	scrap metal	0.10	1	Pass
	K50014	4/11/2013	14.99	CD	nails and can	3.00	2	Pass
	K50015	4/10/2013	13.36	CD	railroad spike	0.50	2	Pass
	K50016	4/10/2013	12.81	CD	wire	0.20	3	Pass
	K50017	4/11/2013	10.03	O	same as K50014	0.00	1	Pass
	K50018	4/11/2013	8.56	CD	nails	0.10	2	Pass
	K50020	4/11/2013	7.57	CD	wire	0.10	1	Pass
	K50021	9/5/2013	7.37	CD	metal	2.00	3	Pass
	K50022	4/11/2013	6.73	CD	wire (04-11-2013)	0.00	1	Pass
	K50023	4/10/2013	6.73	CD	railroad spike	0.50	2	Pass
	K50024	4/11/2013	6.58	CD	metal bracket	0.50	0	Pass
	K50025	4/11/2013	6.46	CD	nails and oil plug	0.30	1	Pass
	K50026	4/11/2013	6.13	CD	nails	0.10	3	Pass

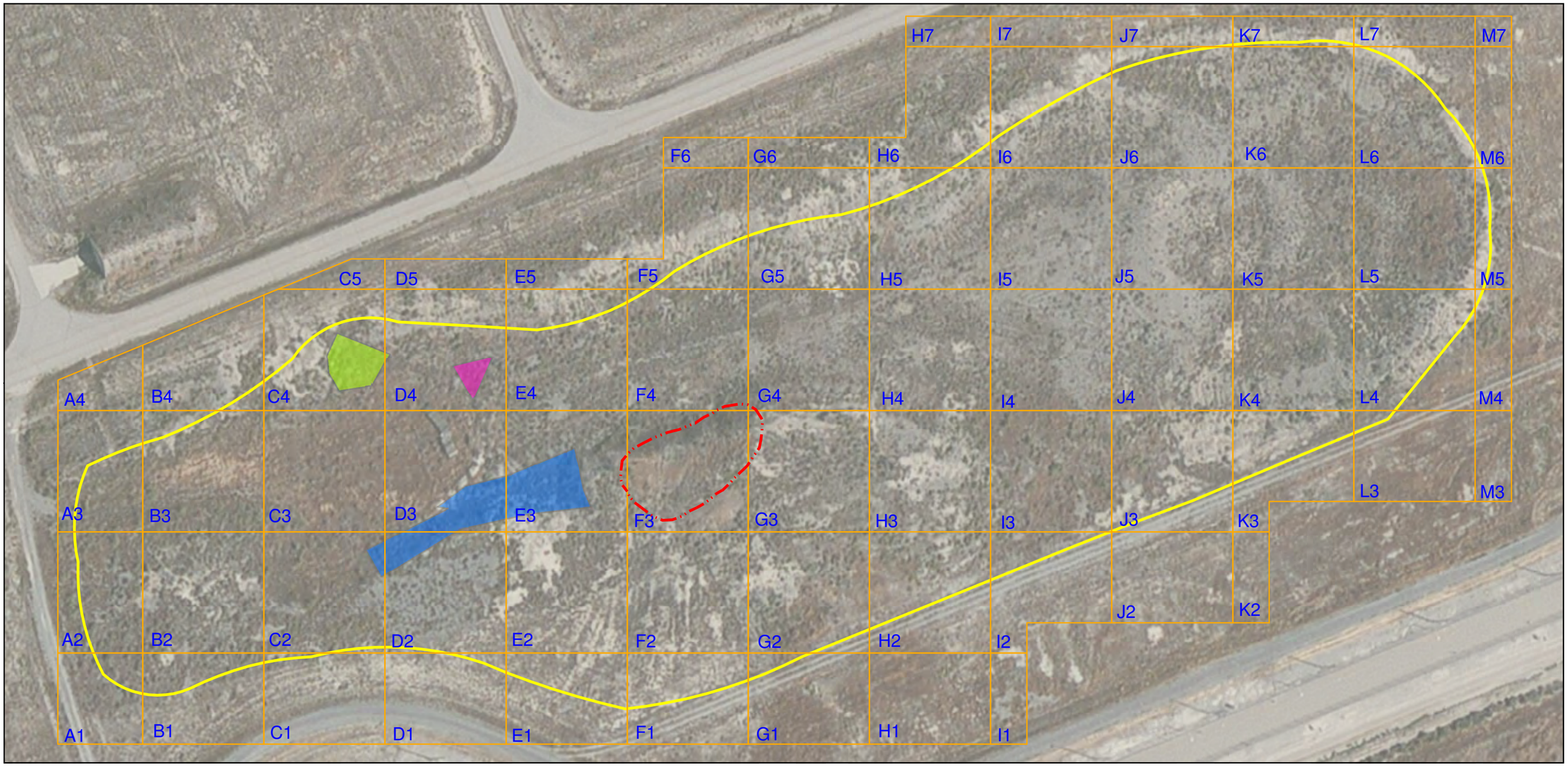
K06

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	K60001	4/8/2013	9.72	CD	wire	0.25	0	Pass
	K60002	4/8/2013	7.57	CD	steel cable	8.00	0	Pass
	K60002	9/4/2013	7.57	CD	cable	20.00	0	Pass
	K60003	4/8/2013	5.19	CD	flat metal	0.50	1	Pass
L03								
	L30019	4/17/2013	10.31	CD	wire	0.25	0	Pass
	L30023	4/8/2013	5.90	O	same as L40008	0.00	0	Pass
L04								
	L40007	4/8/2013	10.98	CD	railroad spike	0.25	2	Pass
	L40008	4/8/2013	7.28	CD	wire	0.10	1	Pass
	L40009	4/8/2013	6.83	NC	No Find	0.00	4	Pass
	L40010	4/8/2013	6.65	O	same as L40015	0.00	3	Pass
	L40012	4/8/2013	6.00	NC	No Find	0.00	1	Pass
	L40013	4/8/2013	5.81	NC	No Find	0.00	3	Pass
	L40014	4/8/2013	5.60	O	same as L40015	0.00	0	Pass
	L40015	4/8/2013	5.57	CD	wire	0.10	1	Pass
	L40016	9/5/2013	5.54	CD	metal fence	20.00	1	Pass
	L40018	4/8/2013	5.52	NC	No Find	0.00	2	Pass
	L40019	4/8/2013	5.49	O	same as L40008	0.00	0	Pass
L05								
	L50001	9/4/2013	351.33	CD	fence post	5.00	1	Pass
	L50002	4/8/2013	6.37	CD	stake w/asphalt (04-08-	0.00	3	Pass
L06								
	L60001	4/8/2013	5.04	NC	No Find	0.00	1	Pass

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
POLYGON								
	C20013	8/22/2013	3289.21	CD	scrap	0.25		
	C20038	8/27/2013	338.05	CD	scrap metal	20.00		
	C20071	8/27/2013	110.87	CD	same as C20038	0.00		
	C20086	8/22/2013	47.58	CD	bolt	0.25		
	C20110	8/22/2013	21.67	CD	scrap metal	0.50		
	C20110	8/26/2013	21.67	CD	nails	0.75		
	D20012	4/18/2013	181.46	CD	angle iron	4.00		
	D20027	4/18/2013	39.33	CD	metal ring	3.00		
	D20035	4/18/2013	23.30	CD	spigot handle	1.00		
	D20058	4/18/2013	10.46	CD	Asphalt	0.00		
	D3B0134	9/18/2013	10.80	CD	NAILS	0.00		
POLYGON								
	B20002	8/27/2013	2102.77	O	same as C20016	0.00		
	B20027	8/22/2013	27.61	CD	banding	3.00		
	B20033	8/22/2013	12.28	CD	same as C20125	0.00		
	C20015	8/22/2013	2441.72	O	same as C20013	0.00		
	C20015	8/27/2013	2441.72	CD	nails	10.00		
	C20016	8/27/2013	1771.15	O	same as C20015	0.00		
	C20017	8/27/2013	1757.67	CD	scrap metal	5.00		
	C20018	8/27/2013	1507.44	O	same as C20015	0.00		
	C20026	8/27/2013	628.02	CD	scrap metal	5.00		
	C20030	8/27/2013	435.43	CD	banding and scrap	2.50		
	C20031	8/28/2013	426.23	CD	scrap metal	2.00		

Grid	Target ID	Dig Date	Amplitude (mV)	Type	Description	Est. Weight (lb)	QC Response (mV)	QCStatus
	C20033	8/27/2013	361.89	CD	scrap metal	5.00		
	C20035	8/27/2013	357.08	CD	banding and scrap	2.00		
	C20042	8/27/2013	282.33	CD	scrap metal	5.00		
	C20054	8/27/2013	179.12	CD	scrap metal	2.00		
	C20057	8/27/2013	159.08	CD	steel cable	3.50		
	C20061	8/27/2013	145.95	CD	banding and scrap	2.50		
	C20066	8/27/2013	130.45	O	same as C20057	0.00		
	C20070	8/27/2013	114.39	CD	scrap metal	1.00		
	C20077	8/22/2013	76.80	CD	banding	0.00		
	C20080	8/22/2013	64.80	CD	scrap metal	1.00		
	C20080	8/27/2013	64.80	O	same as C20057	0.00		
	C20081	8/22/2013	58.25	CD	scrap metal	0.50		
	C20083	8/27/2013	57.09	CD	banding	0.50		
	C20096	8/22/2013	35.86	O	same as C20080	0.00		
	C20096	8/27/2013	35.86	CD	same as C20057	0.00		
	C20100	8/27/2013	31.52	O	same as C20100	0.00		
	C20101	8/22/2013	30.41	CD	scrap metal	0.50		
	C20101	8/27/2013	30.41	CD	scrap metal	2.50		
	C20121	8/22/2013	10.52	O	same as C20081	0.00		
	C20125	8/22/2013	8.82	CD	scrap metal	0.25		
	C20138	8/22/2013	5.63	CD	scrap metal	0.25		

ATTACHMENT E



0 62.5 125 250 375 500 Feet

N

Grid Pattern Layout for IRA

SWMU 2 Boundary

Approximate Boundary of the Pit Area

Excavation 1

Excavation 2

Excavation 3

EXCAVATION LOCATIONS

SWMU 2 INTERIM REMEDIAL ACTION
TOOELE ARMY DEPOT - SOUTH, UTAH

U.S. ARMY
CORPS OF ENGINEERS
HUNTSVILLE CENTER

FIGURE NUMBER: 1

UXB - KEMRON
Remediation Services, LLC

UXB-KEMRON Remediation Services, LLC
1359-A Ellsworth Industrial Blvd, N.W., Atlanta, GA 30318
Tel: 404.636.0928 Fax: 404.636.7162

March 9, 2014

U.S. Army Engineering and Support Center, Huntsville
Attn: Allyn Allison
White Tiger Building
4820 University Square
Huntsville, AL 35816-1822

Subject: Field Change Request to approved Work Plan dated October 15, 2012
Interim Remedial Action, SWMU 2, Tooele Army Depot – South, Utah

Dear Mr. Allison,

UXB-KEMRON Remediation Services, L.L.C. (JV) formally submits a Work Plan Field Change Request to remove the restriction of only utilizing the embedded Geophysicist to operate EM61-MK2 for anomaly QC procedures. This FCR will allow us flexibility in the field while maintaining all project quality objectives.

Current Paragraph 3.8.3.2.8
"Once the suspected anomaly (or anomalies) has been removed from the excavation, final clearance/QC of the excavation will be performed by the embedded QC Geophysicist using the EM61-MK2 to ensure that no signal remains equivalent to or greater than the anomaly selection criteria."

Proposed Revised Paragraph 3.8.3.2.8
"Once the suspected anomaly (or anomalies) has been removed from the excavation, final clearance/QC of the excavation will be performed by a dedicated/qualified operator using the EM61-MK2 to ensure that no signal remains equivalent to or greater than the anomaly selection criteria."

Please provide your concurrence and approval in the space provided below for this Work Plan Field Change Request. Should you require any additional information or clarification regarding this request, please do not hesitate to contact me at 770.329.1745, or via email at tbergquist@kemron.com.

Sincerely,

Tracy Bergquist, PMP
Project Manager

Copy to:
Cathy Etheredge
Jeff Gunn
Brian Barker

****

Approval: _____ Date: 13 Mar 2014
Allyn Allison, COR

UXB-KEMRON Remediation Services, LLC
1359-A Ellsworth Industrial Blvd, N.W., Atlanta, GA 30318
Tel: 404.636.0928 Fax: 404.636.7162

March 20, 2014

U.S. Army Engineering and Support Center, Huntsville
Attn: Allyn Allison
White Tiger Building
4820 University Square
Huntsville, AL 35816-1822

Subject: Field Change Request
Open Burn Procedure for Cluster Bomb Units (CBUs)
Interim Remedial Action, SWMU 2, Tooele Army Depot – South, Utah

Dear Mr. Allison,

As discussed on the TEAD-S conference call on February 25th, 2014, below is a brief description of the procedure for conducting open burn (OB) of CBUs. This description is intended to clarify the use of Flex Linear Shape Charge (FLSC) during OB operations, explain the need to remove shipping containers after the CBUs are placed in the burn pan, and request a change to the Work Plan (WP).

FLSC will not be used for detonation of the CBUs, but will instead be utilized in small quantities to remotely remove the straps that hold the CBU together. Removal of these straps is necessary to open the CBU and release the sub-munitions to facilitate complete burning of the fuel and byproducts in the sub-munitions. Without the use of FLSC, the straps on the CBUs would have to be manually removed. This process would involve securing flammable straps around the CBU, then manually cutting the metal straps. It is much more desirable to use FLSC in order to limit the handling of the CBU prior to initiating the open burn. The small quantity of FLSC to be used as a cutting charge will allow the successful removal of the straps without risking kick-out of the sub-munitions and burning to be accomplished in the safest manner possible.

Section 3.9.6.1.1 of the WP indicates that “If the Cluster Bombs have not been removed from their shipping container, the containers will be removed before the bombs are placed into the burn pan”. Knowing now that the shipping containers have degraded to a point in which it would not be safe to remove them prior to placing them in the burn pan, we are compelled to request this change to ensure the safest OB procedure for this operation is utilized. Although it is anticipated that the majority of the shipping containers will be in a condition which will allow them to be safely removed inside of the burn pan, it is inevitable that some containers are in such a condition that would prevent this operation. In certain instances, it may be necessary to use FLSC to ensure safe removal of the shipping container (concurrently with removal of CBU straps with FLSC).

It is noted that although Table 1-1 of the Chemical Safety Submission (CSS) identifies FLSC as an anticipated Donor Explosive, the text of the document does not specifically allow for its use. Additionally, the CSS indicates that shipping containers will be removed before CBUs are placed in the burn pan. A modification to the CSS will be submitted separately that reflects the following requested changes to the Work Plan.

Current WP text:

3.9.6.1.1 TNT, cluster bombs, bomblets, and other explosives recovered from SWMU-2 will be disposed of via burning in a constructed burn pan located in SWMU 25. This pan's dimensions will allow for burning up to one cluster bomb at a time. The pan sides and floor will be made of 1 inch mild steel. Two layers of chain link fence will cover the opening when burning any cluster bombs, bomblets, or TNT. Hooks will be welded to the outside of the pan to hold the chain link in place if there is a detonation. The pan will be constructed as to prevent diesel fuel from soaking into the ground. The sides will be three to four feet high. The pan will be set onto spacers which will support the pan above ground level. Dunnage in the form of untreated lumber will be placed on the floor of the pan. If the cluster bombs have not been removed from their shipping container, the containers will be removed before the bombs are placed into the burn pan. Heavy equipment such as a backhoe will be utilized to lower the bomb cluster onto the dunnage.

3.9.6.1.2 Once the bomb is set in the burn pan, three six-foot pieces of 20 gran Flex Linear Shape Charge (FLSC) will be placed along the bodies of each bomb cluster so that two charges are located on the sides and one on the top of the bomb(s). Chain link fence will be placed over the burn pan and secured to help contain any small explosion that may occur. Sensitized detonation cord will be used to initiate the FLSC. An electric squib will be placed into a bag of smokeless powder to initiate the diesel fuel. Fuel will be added and the shot will be initiated per UXB SOP 3-08.4 (See Appendix D, Enclosure 4). After it has been determined by the SUXOS and UXOSO to be safe to enter the burn pan EZ, personnel will inspect the pan for items that may not have burned. Any MEC/MPPEH remaining after the burn will be assessed by the SUXOS and UXOSO and a determination will be made based upon whether to repeat the burn process or to dispose by detonation.

Requested WP change:

3.9.6.1.1 TNT, cluster bombs, bomblets, and other explosives recovered from SWMU-2 will be disposed of via burning in a constructed burn pan located in SWMU-25, or a dedicated burn area for SWMU-2 (to be submitted separately). This pan's dimensions will allow for burning up to one cluster bomb at a time. The pan sides and floor will be made of thick mild steel. Two layers of chain link fence will cover the opening when burning any cluster bombs, bomblets, or TNT. Hooks will be welded to the outside of the pan to hold the chain link in place if there is a detonation. The pan will be constructed as to prevent diesel fuel from soaking into the ground. The sides will be three to four feet high. The pan will be set onto gravel which will support the pan above ground level. Dunnage in the form of untreated lumber will be placed on the floor of the pan. The cluster bombs will be placed into the burn pans with any shipping containers and/or packaging still present. Heavy equipment such as a heavy lift forklift will be utilized to lower the bomb cluster onto the dunnage.

3.9.6.1.2 The process for open burn of the CBUs is as follows:

1. CBU will be moved to burn site in current packaging.
2. Dunnage consisting of untreated wood will be placed on the floor of the burn pan.
3. CBU will be placed into burn pan on top of dunnage for unwrapping and inspection.
4. Shipping container parts will be removed in one of two methods.
    a. Shipping container parts will be removed manually if safe to do so.
    b. 250 grains/foot Flex Linear Shape Charge (FLSC) will be placed as required on the CBU container and connected with detonation cord and initiated remotely in conjunction with steps 5, 6 and 8.
5. FLSC will be placed as required on the CBU in a quantity necessary to cut the banding straps (combination of FLSC from steps 4b and 5 not to exceed 18 feet) and connected with detonation cord and initiated remotely in conjunction with steps 4b, 6, and 8.
6. An electric squib will be placed into a bag of smokeless powder to initiate the accelerant in step 7.
7. Accelerant (diesel) will then be added to the pit.
8. Personnel will retreat to a safe area and initiate the OB remotely.

Please provide your concurrence and approval in the space provided below for this Work Plan Field Change Request. Should you require any additional information or clarification regarding this request, please do not hesitate to contact me at 314-440-3332, or via email at jgunn@kemron.com

Sincerely,

Jeff Gunn
Project Manager

Copy to:
Tracy Bergquist
Cathy Etheredge
Brian Barker

****

Approval: _____ Date: _____
Allyn Allison, COR

KEMRON ENVIRONMENTAL SERVICES
1359-A Ellsworth Industrial Boulevard ■ Atlanta, GA 30318 ■ Telephone (404) 636-0928 ■ FAX (404) 636-7162 ■ http://www.kemron.com

April 1, 2014

U.S. Army Engineering and Support Center, Huntsville
Attn: Allyn Allison
White Tiger Building
4820 University Square
Huntsville, AL 35816-1822

Subject: Field Change Request to approved Work Plan dated October 15, 2012
Interim Remedial Action, SWMU 2, Tooele Army Depot – South, Utah

Dear Mr. Allison,

KEMRON Environmental Services formally submits Work Plan Field Change Request.
The purpose of this Field Change Request is to augment the current Work Plan (WP) so that it incorporates current standard industry practices for daily Quality Control (QC) testing of analog geophysical instruments.

For edification, Section 8.3-b of EM 1110-1-4009 describes digital and analog systems as follows: *For simplicity, geophysical detectors are grouped into two main families of detectors based on how their data is interpreted. Analog geophysical tools are defined in this document as instruments that produce an audible output, a meter deflection, and/or numeric output, which are interpreted in real-time by the instrument operator. Digital geophysical mapping tools are defined in this document as instruments that digitally record geophysical measurements and where the recorded data can be geo-referenced to where each measurement occurred*.

The geophysical instrument QC procedures as outlined in the current WP were designed to test and validate the entire DGM *system*. This DGM *system* includes the following: geophysical sensor operation, DGPS operation, real-time integration of both the geophysical sensor (Geonics EM61MK2) and DGPS positional data, DGM data recording, DGM data transfer, operator data collection methodologies, data processing, mapping of data, target list generation, as well as the creation (and acceptance) of an Instrument Verification Strip (IVS) report complete with anomaly threshold analysis and/or threshold recommendations. DGM (digital) data collection at Deseret was completed during the 2013 field season and as such this operation is no longer being conducted.

The proposed changes to the WP allow for the inclusion of Geophysical QC (GeoQC) processes as they relate to geophysical instruments that are used in analog mode for target reacquisition and intrusive investigation operations. Note that for the 2014 field season the EM61MK2 system is only being used for these specific operations (target reacquisition and intrusive investigation). The 2014 field season does not include the use of the EM61MK2 system for DGM data collection.

The reason for this request is because the daily IVS QC tests are “dynamic” in nature, meaning that both geophysical sensor and positional data are being collected and are being tested as one unit. During target reacquisition, the anomaly location is being positioned by a stand-alone DGPS unit on a staff that is independent of the EM61MK2 geophysical sensor. The EM61MK2 is then being used in analog mode during target reacquisition to verify that the anomaly exists and that it has a repeatable milliVolt (mV) level. During the intrusive investigation the EM61MK2 geophysical instrument is being used in analog mode to verify that the anomaly (that has been previously located using DGPS) has been removed and that the anomaly location has a mV reading that is below the target threshold. Simply stated, the IVS test does not apply to these operations because the positional aspect (DGPS) of these operations (target reacquisition and intrusive investigation) is independent of the geophysical sensor.

Requested changes to the WP:

Proposed following to the end of Paragraph **3.6.1.2**: Use of the IVS is intended for geophysical instruments that are used for digital operations.

Current Paragraph **3.7.2.1.1**: Acquisition of geophysical data at the GSV/IVS to confirm system capabilities and proper operation.

Proposed Revised Paragraph **3.7.2.1.1**: Acquisition of geophysical data at the GSV/IVS to confirm digital instrument capabilities and proper operation.

Current Paragraph **3.7.2.2**: EM61-MK2 data quality objectives include the following:

Proposed Revised Paragraph **3.7.2.2**: EM61-MK2 data quality objectives for digital systems include the following:

Current Paragraph **4.5.3.1.1**: All items in IVS detected twice daily; and

Proposed Revised Paragraph **4.5.3.1.1**: daily static tests meet DQOs, and.

Removal of Paragraph **4.5.5.3**: Prime Contractor will perform a daily prove-out of the instruments in a designated IVS. Each instrument that is used during the daily activities will be turned on and used to detect a known target within the IVS. The instrument's visual output against the known target will be recorded within the Supervisor's Log. Instruments that do not pass the daily prove out will not be used until repaired and re-checked to assure adequate performance.

Note that the operation described in Section **4.5.3.3** above dictate that instrument responses to IVS items be recorded in the Supervisor's Log. This operation (static instrument check) is already being completed through the use of daily (AM and PM) static checks in which the static data is recorded, evaluated against DQOs as described in Section **3.7.2.2.3**, and can be reanalyzed at any time.

Removal of Paragraph **4.5.5.5**: At the end of each work shift, the instruments used during the daily activities will again be tested in the IVS to ensure that the instrument has remained working within acceptable parameters throughout the work shift. The instrument's visual output against the known target will be recorded within the Supervisor's Log. If an instrument fails the end of shift testing, areas swept that shift using the failed instrument will be re-swept.

Note that the operation described in Section **4.5.5.5** above dictate that instrument responses to IVS items be recorded in the Supervisor's log. This operation (static instrument check) is already being completed through the use of daily (AM and PM) static checks in which the static data is recorded, evaluated against DQOs as described in Section **3.7.2.2.3**, and can be reanalyzed at any time.

This FCR will streamline the field operation while maintaining all project quality objectives.

Please provide your concurrence and approval in the space provided below for this Work Plan Field Change Request. Should you require any additional information or clarification regarding this request, please do not hesitate to contact me at 314-440-3332, or via email at jgunn@kemron.com**.**

Sincerely,

Jeff Gunn
Project Manager

Copy to:
Tracy Bergquist
Cathy Etheredge
Brian Barker

****

Approval: _____ Date: _____
Allyn Allison, COR

KEMRON
ENVIRONMENTAL SERVICES

1359-A Ellsworth Industrial Boulevard ■ Atlanta, GA 30318 ■ Telephone (404) 636-0928 ■ FAX (404) 636-7162 ■ http://www.kemron.com

June 16, 2014

U.S. Army Engineering and Support Center, Huntsville
Attn: Allyn Allison
White Tiger Building
4820 University Square
Huntsville, AL 35816-1822

Subject: Field Change Request
Air Monitoring, Trenching Operations and Sampling
Interim Remedial Action, SWMU 2, Tooele Army Depot – South, Utah

Dear Mr. Allison,

As a result of the letter received from the State of Utah, Mr. Scott T. Anderson, Director, dated April 3, 2014, KEMRON respectfully submits the following procedures which we believe incorporates the responses and intent of the State, TEAD-S and the USACE to accomplish closure of the site. This request is intended to gain concurrence on variance to the approved Work Plan dated October 15, 2012, for this site by describing air monitoring, trenching operations, and sampling procedures within areas of SWMU 2 that are outside of the main burial pit.

Project Authorization

KEMRON Environmental Services, Inc.. (KEMRON) has been contracted by the US Army Engineering and Support Center, Huntsville (USAESCH) under contract W912DY-10-D-0027, Delivery Order (DO) 0006 to perform an Interim Remedial Action (IRA) in SWMU 2 at the Tooele Army Depot - South (TEAD-S) (formerly Deseret Chemical Depot [DCD]), Stockton, Utah.

Project Purpose

The purpose of this project is to conduct Interim Measures to control or eliminate the release or potential release of hazardous wastes or hazardous constituents from SWMU 2 by removing all Discarded Military Munitions (DMM), other military related devices buried, and debris; perform confirmatory sampling and analysis from the bottom of the burial area and soil piles, as needed; and remove contaminated soil, as necessary in accordance with Utah Administrative Code (UAC) R315-101.

Site Summary

TEAD-S has been used since the 1940s for storage, renovation, and disposal of many types of chemical agent munitions. These munitions included mustard (H, HD, and HT), Lewisite (L), Sarin (GB), Tabun (GA), O-ethyl S-[2-(diisopropylamino)ethyl] methylphosphonothioate (VX), Phosgene (CG), O-chlorobenzylidene malononitrile (CS), cyanogen chloride (CK), sulfur trioxide

(FS), hexachloroethane (HC) smoke, white phosphorous (WP), thermite, and napalm (NUS, 1987).

SWMU 2 occupies approximately 10 acres in the southwest portion of the Chemical Munitions Storage Area (SWMU 11). SWMU 2 contains an oval-shaped burial pit approximately 300 feet long by 60 feet wide. Interpretation of historical aerial photographs shows evidence that around 1974 the area now identified as SWMU 2 was excavated and used as quarry for construction materials. It is reported that this burial pit was used to dispose of munitions without demilitarization. An aerial photograph from 1981 indicates mounding and stacked material in the western portion of the site.

The only documentation of potential munitions items in SWMU 2 is an employee disposition referenced in the Installation Assessment (USATHAMA, 1979). This disposition, dated 1 April 1959, documents interviews with installation employees indicating that SWMU 2 was used for burial of munitions without demilitarization. No dates of burial are provided in any of the referenced documentation. Potential munitions reportedly buried at the site include M2 ignition cartridges, squibs, hand grenades, blasting caps, M21 Incendiary Bomb Clusters, smoke pots, Tri-nitro Toluene (TNT) blocks, M74 Incendiary Bombs, and M19 Incendiary Bomb Clusters.

Project Progress

Field work was initiated in accordance with Chapter 3 of the approved work plan. Phase one included vegetation removal, site survey, and surficial debris removal. After analysis of the geophysical survey data, phase two was initiated with the intrusive investigation. Digital Geophysical Mapping (DGM) of SWMU 2 was performed in March and April of 2013 utilizing both a Geonics EM61-Mk2 and EM31-Mk2. The EM61-Mk2 is a high-resolution time-domain electromagnetic induction sensor that is capable of detecting both ferrous and non-ferrous metallic objects. The EM31-Mk2 is a terrain conductivity meter which is capable of detecting buried metal as well as mapping subsurface changes across a site. Both instruments utilized real-time kinematic (RTK) global positioning system (GPS) equipment capable of providing horizontal position accuracy of 3 cm. Daily quality control (QC) procedures as described in the Final Work Plan were utilized to ensure that the equipment was functioning properly and that the data collected was valid. After collection, the data was processed and interpreted in order to identify locations for intrusive investigation.

Figure 1 displays the mosaic of data collected with the EM61 Mk 2. A system of 100 foot by 100 foot grids is utilized to divide SWMU 2 into smaller areas for better data management. The DGM data indicated that there was an area with a large concentration of subsurface metal within grid F3. This area is commonly known as the “Burial Pit Area”. In addition to the Burial Pit Area, single point anomalies were identified for intrusive investigation throughout the remainder of SWMU 2, utilizing an EM61-Mk2 minimum threshold value of 5 millivolts (mV) above local background. No additional targets or areas of interest were identified with the EM31-Mk2 data alone; however, this data was used to confirm the location of the Burial Pit Area and other high density anomalous areas detected with the EM61-Mk2. All targets that were selected for intrusive investigation were given a unique target ID number, which identifies the grid containing the anomaly as well as a unique number within that grid. All targets were reacquired with an RTK GPS unit and flagged with the respective target ID number for excavation.

Excavation procedures were initiated by locating a target flag and verifying that the information it provided matched the dig sheet. The EM61-Mk2 was then used to pinpoint the location of the anomaly. Intrusive investigations were then performed utilizing manual and/or mechanical excavation methods. Mechanical excavation methods were only used when manual excavation was not feasible, and in these circumstances the excavation would then be completed with

manual methods. Upon removing one or more pieces of metal suspected to be the source of the anomaly, the EM61-Mk2 was used to verify that the target was then below the threshold of 5 mV. In the event that the threshold was not initially satisfied, this excavation process continued until the criteria was met.

Intrusive investigation of the Burial Pit Area was initiated with mechanical equipment to remove approximately seven feet of overburden soil and several feet of soil to one side. Under this soil a large number of stacked munitions were identified, including squibs, smoke pots, grenades, candles, fuzes, boosters, and cluster bomb units (CBUs). All recovered munitions have been consistent with the information referenced in the Installation Assessment. The recovered DMM have been well organized with distinct vertical and horizontal boundaries. There have been no areas in which there was a large gap between the DMM.

Approximately 57% of the single point anomalies have been intrusively investigated to date, and all of them have been identified as only cultural debris. Recovered items include aluminum cans, angle iron, asphalt, bolts, brackets, bucket, cables, cargo hooks, cargo ratchets, c-clamps, concrete, drill bits, fence posts, jackhammer bits, metal bars, metal plates, metal rods, metal scrap, nails, nuts, oil plugs, empty paint cans, pickaxe heads, pipe, railroad spikes, rebar, scrap metal, screws, sheet metal, shovel/sledgehammer heads, spigot handles, vehicle parts, washers, wire, and wrenches. The majority of the cultural debris causing the anomalies was located within 0 to 2 feet of the ground surface. However, there have been several locations where it was necessary to mechanically dig large excavations in order to clear multiple anomalies. One excavation (D4) is approximately 40 feet by 30 feet wide and 11 feet deep. This pit contained mostly nails, screws, unidentifiable pieces of metal, and other pieces of cultural debris. Another (C4) is approximately 50 feet by 40 feet wide and 14 feet deep. This pit contained mostly glass bottles, unidentifiable metal machine parts, and other cultural debris. A third excavation (E3) was performed on a mounded area in line with and directly west of The Pit Area, and is approximately 190 feet long and between 25 and 50 feet wide. The vertical dimension of the third excavation is approximately 18 feet from the ground surface to the top of the mound. This area contained unidentifiable pieces of metal, pipe, and pieces of ammunition boxes such as screws and hinges. The excavated soil was sifted to verify the contents and clear the anomalies, and the sifting operations did not identify any signs of munitions debris.

Discussion

Based on the intrusive results to date, there is no indication that any DMM are located outside of the Burial Pit Area within SWMU 2. The DMM that has been recovered from The Pit Area has been consistent with the description provided in the Installation Assessment and shows that the munitions were buried in a very organized and systematic manner. The recovered munitions have been neatly stacked with well-defined horizontal and vertical extents. Conversely, the remainder of SWMU 2 has shown no evidence of containing any DMM and the cultural debris appears to be random in its distribution. The EM61-Mk2 mosaic clearly shows a large area of concentrated subsurface metal at the Burial Pit Area, while the remainder of SWMU 2 contains much smaller and randomly located areas of subsurface metal. Given the manner in which the DMM has been discovered within the Burial Pit Area, and therefore the planned and organized manner in which the munitions were placed and buried at the time of disposal, the evidence indicates that additional munitions would not have been buried at other locations within SWMU 2.

While the majority of the single point anomalies were located close to the ground surface, large holes have been excavated which contained cultural debris that is not related to munitions and explosives of concern (MEC), munitions debris (MD), or hazardous materials at multiple depths. Since the DMM recovered from the Pit area were not demilitarized before burial, disposal of these items would have been conducted in an orderly manner (as evidenced by the organization

of the Burial Pit Area) and would not have been consistent with the condition of the recovered cultural debris.

Recommendations

1. Air Monitoring - KEMRON believes chemical agents, MEC, MD and other hazardous constituents were not disposed outside the main disposal area, however, for general safety reasons and to ensure protection of personnel working in an area of close proximity to the main burial pit which is a potential chemical munitions burial site, if work is being conducted in the main burial pit area, or if work is not actively being conducted but buried items contained within this area are exposed to the environment, area air monitoring will continue to be conducted throughout Solid Waste Management Unit (SWMU) 2 to ensure worker safety.

2. Trenching and confirmation samples - KEMRON proposes that a backhoe (or similar) be used to intrusively investigate a line (trench) across three grids (B2, D3, D4) within the highest density of geophysical readings as shown in Figure 1 (attached). The locations within grids B2, D3, and D4 are based on the geophysical readings and were discussed and agreed upon during a site walk with Division, facility, and KEMRON personnel. The width of the trench will be the width of the equipment bucket/shovel (approximately 2-feet in width). Depth of the investigation will be either to soil undisturbed by historic grading/borrowing activities or until excavation provides a rationale for any remaining signal to a maximum depth of 10 feet which is roughly the depth capability of the EM-61. Additional trenching will be conducted in D4 where some limited investigation has been conducted. The material and soil excavated from these areas will be placed on plastic and will be visually inspected. Alternatively, the trench areas in grids B2, D3, and D4 may be investigated as single point anomalies as described in the approved RIWP.

   If during the trenching process stained soil, odorous soil or waste that could cause soil contamination is identified, a biased soil or waste sample will be collected. If scrap metal, cultural debris and other debris consistent with the debris found during the anomaly investigation is found samples will not be collected.

   It is anticipated that cultural debris and various metal debris consistent with what has been identified to date will be identified in these areas but these items are not deemed RCRA-regulated waste. The data from the single point anomaly investigation, to date, combined with the data to be collected in grids B2, D3, and D4 is assumed to represent all of SWMU 2 (excluding the biased sampling associated with MEC and in the exaction of the main burial pit) for closure decisions.

3. Sampling - Samples collected from locations under the removed DMM and excavated soil within the main burial pit will be collected per the requirements outlined in the work plan. Upon completion of the excavations, locations and numbers of the confirmation samples will be provided for review and approval.

   The remaining area of SWMU 2 consists of a gravel pit where inert cultural debris has been discarded. There is no history indicating that Resource Conservation and Recovery Act- (RCRA) regulated waste, MEC, or chemical warfare materiel (CWM) was ever buried or disposed of in this area. Further, there is no history or photographic evidence to indicate that wastes were ever disposed of on the surface of this area (i.e., dumping of liquids or other waste). This has also been confirmed through review of past employees (as stated in the Site Summary above), where none of them reported waste disposal practices in the gravel pit. Since the overall assumption for the area of the SWMU outside of the burial pit is that this was a gravel pit and the debris is non-

hazardous with no indication of surface disposals, a better approach to evaluating the surface soil is via multi-incremental (MI) sampling. The MI sampling approach will provide sufficient and statistically defensible data to assess surface contamination and demonstrate the surface soil is either below risk-based levels or requires additional actions. The area of SWMU 2 is within an Army-regulated facility, and given the proximity to the igloos in Area 10, it is unreasonable to assume the land would be developed for residential use and assigning a decision unit of 0.5 acres is overly conservative. Rural acreage for MI sampling is typically based on a 3-acre plot (as was used for the confirmation sampling for the closure of Hazardous Waste Management Unit 31 at TEAD-S). As shown on Figure 2 (attached), three decision units have been proposed (outside of the main burial pit) based on the density of the geophysical data. Working left to right on the figure, decision unit #1 (orange outline) is approximately 1.91 acres, decision unit #2 (blue outline) is approximately 1.50 acres and decision unit #3 (green outline) is approximately .92 acres. These acreages conservatively represent rural/industrial use. A standard operating procedure (SOP) for the MI sampling will be provided for review at a later date prior to the collection of samples. In addition, the laboratory selected for the analyses will meet the requirements outlined in the Quality Assurance Project Plan (QAPP) as contained in the work plan and be Utah-certified for SW-846 Method 8330B. For each decision unit, the MI sample will be composed of 30 grab samples. In addition, triplicate samples will be taken for each decision unit. The samples will be analyzed for semi-volatile organic compounds (SVOCs), metals, and explosives. Upon completion of the excavations, locations (map) and numbers of the confirmation samples will be provided for review and approval. (*Note - Written seven-day notification, in accordance with the TEAD-S part B RCRA permit, will be provided for all sampling.

Please provide your concurrence and approval in the space provided below for this Work Plan Field Change Request. Should you require any additional information or clarification regarding this request, please do not hesitate to contact me at 314-440-3332, or via email at jgunn@kemron.com.

Sincerely,

Jeff Gunn
Project Manager

Copy to:
Tracy Bergquist
Cathy Etheredge
Brian Barker

****

Approval: _____ Date: _____
Allyn Allison

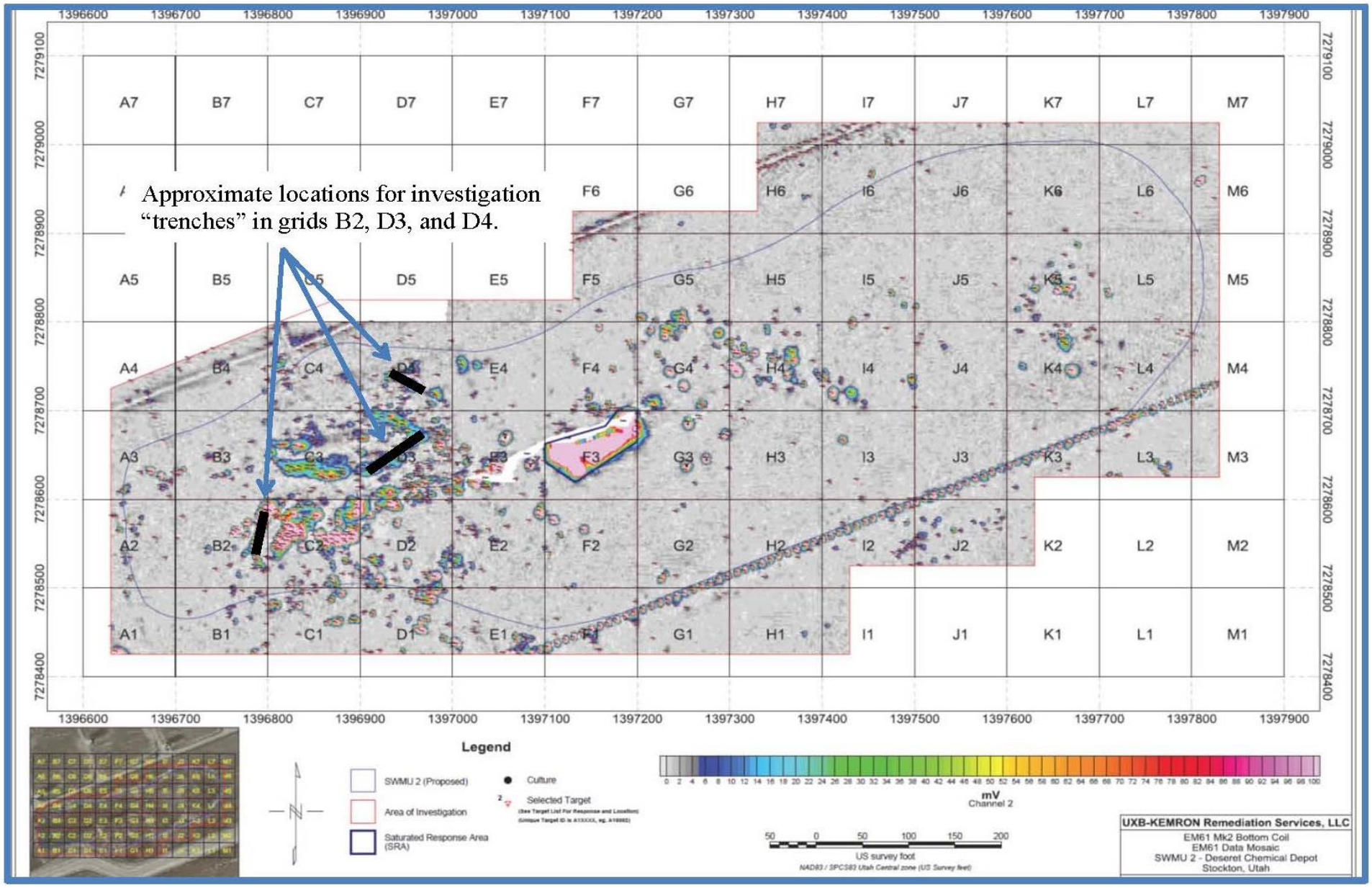


Figure 1 - Proposed Anomaly Investigation Trenches

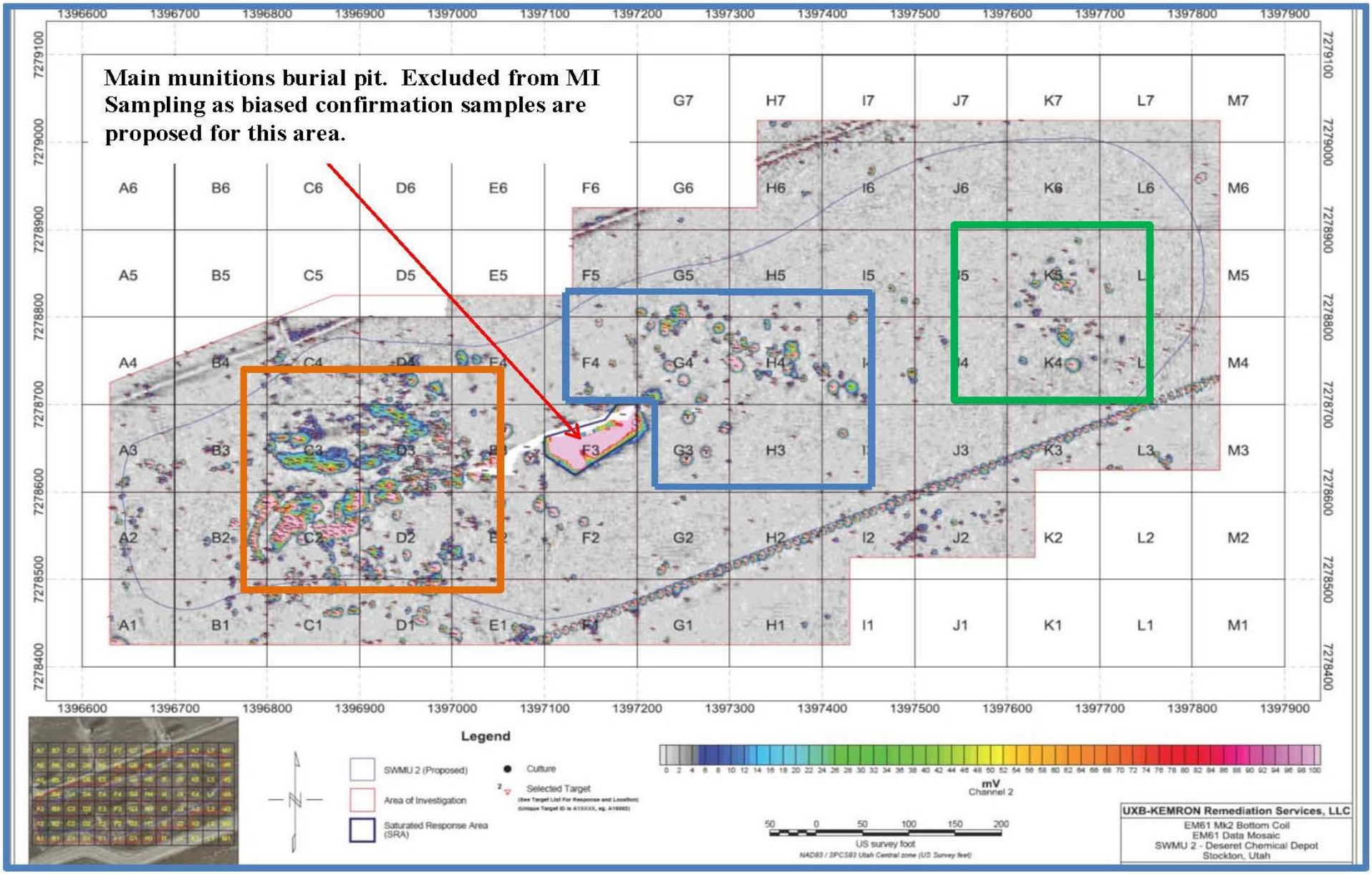


Figure 2 - Proposed Decision Units for Multi-Incremental Sampling