FINAL
WORK PLAN ADDENDUM FOR THE REMEDIAL INVESTIGATION OF THE MUNITIONS RESPONSE AREAS AT THE FORMER YORK NAVAL ORDNANCE PLANT

Prepared for:

Harley-Davidson Motor Company Operations, Inc.
1425 Eden Road
York, Pennsylvania 17402

Prepared by:

EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle
Hunt Valley, Maryland 21031

October 2016

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October 2016

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LIST OF ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
bgs	Below Ground Surface
cm	centimeters
COC	Chain of Custody
CSM	Conceptual Site Model
DDESB	Department of Defense Explosives Safety Board
DFW	Definable Features of Work
DGM	Digital Geophysical Mapping
DNT	2,4- and 2,6- Dinitrotoluene
DoD	Department of Defense
DQO	Data Quality Objective
EA	EA Engineering, Science, and Technology, Inc., PBC
EM	Engineering Manual
EM61	Electromagnetic
EMI	Electromagnetic Induction
FM	Factory Mutual
ft	Feet
fYNOP	Former York Naval Ordnance Plant
GIS	Geographic Information System
GPS	Global Positioning System
H-D	Harley-Davidson
HFD	Hazard Fragment Distance
ISO	Industry Standard Objects
IVS	Instrument Verification Strip
MC	Munitions Constituents
MCL	Maximum Contaminant Levels
MD	Munitions Debris
MDL	Method Detection Limit
MDAS	Material Documented As Safe
MEC	Munitions and Explosives of Concern
MGFD	Munitions with the Greatest Fragmentation Distance
mg/kg	milligrams per kilogram
mm	Millimeter(s)
MPPEH	Material Potentially Presenting an Explosive Hazard
MRA	Munitions Response Area
MRS	Munitions Response Site
MSC	Medium Specific Concentrations
MSD	Minimum Separation Distance
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NAD	North American Datum
NG	Nitroglycerin
NMRD	Non-munition Related Debris
PADEP	Pennsylvania Department of Environmental Protection

LIST OF ACRONYMS AND ABBREVIATIONS

PM	Project Manager
PVC	Polyvinvl chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RAGS	Risk Assessment Guidance
RBC	Risk-Based Concentrations
RCA	Root-Cause Analysis
RI	Remedial Investigation
RSL	Regional Screening Level
SAIC	Science Applications International Corporation
SI	Site Inspection
SOP	Standard Operating Procedure
SSHASP	Site-Specific Health and Safety Plan
SUXOS	Senior Unexploded Ordnance Supervisor
TCRA	Time Critical Removal Action
TNT	Trinitrotoluene
TP	Target Practice
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UTL	Upper Tolerance Limit
UL	Underwriters Laboratories
UXO	Unexploded Ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer
UXO Tech I	Unexploded Ordnance Technician I
UXO Tech II	Unexploded Ordnance Technician II
UXO Tech III	Unexploded Ordnance Technician III
VSP	Visual Sampling Plan
WP	Work Plan

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1. INTRODUCTION

The following is the addendum to the Work Plan for the Remedial Investigation (RI) of the Munitions Response Areas (MRA) at the Former York Naval Ordnance Plant (fYNOP) prepared by EA Engineering, Science, and Technology, Inc., PBC (EA). As a result of interim RI data collection efforts termed Phase I RI activities and completed in the spring of 2015, this addendum was prepared to supplement the information and procedures presented in the original Work Plan (EA 2015) included as Attachment 1 to this submittal.

The additional information provided in this work plan addendum helps to clarify additional planned RI activities based on the results of the initial Phase I RI activities conducted in May and June 2015. As a result of the Phase I RI findings, the following changes were made:

Chapter 1, Introduction: This chapter provides the rationale for the work plan addendum.

Chapter 2, fYNOP Background: A summary of the Phase I RI activities was added to this chapter.

Chapter 3, Technical Management Plan: No changes were made to this chapter.

Chapter 4, Field Investigation Plan: This chapter describes the field methods and procedures planned for the RI, and the approach to risk characterization and analysis.

Chapter 5, Quality Assurance Project Plan (QAPP): An Evaluation of Potential Chemical-Specific Measurement Quality Objectives for Groundwater and soil were added to Chapter 5 along with a revised QC discussion.

Chapter 6, References: No changes were made to this chapter.

Appendices A-F: All appendices to the original Work Plan remain applicable.

The following attachments have been included with the addendum for completeness and to support the Phase II RI activities discussed in this addendum.

Attachment 1 – fYNOP Work Plan - April 2015: Phase I work plan.

Attachment 2 – Munitions Response Remedial Investigation Phase I Update and Path Forward Discussions Former York Naval Ordnance Plant, York, Pennsylvania, July 2015: Presentation of interim findings.

Attachment 3 – Standard Operating Procedures: Includes several new or revised Standard Operating Procedures (SOP) which supersede several SOPs in the April 2015 Work Plan.

Attachment 4 – Additional Field Forms: Includes field forms for the next phase of the RI.

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2. FYNOP BACKGROUND

2.1 SUMMARY OF PHASE I RI ACTIVITIES AND FINDINGS

The RI at the fYNOP is being conducted using a two phased approach. The work conducted during the first phase of RI activities was performed at fYNOP in the spring of 2015. The main work activities completed at the fYNOP during Phase I included surveying and staking of grids, vegetation clearance, magnetometer assisted surface clearance and the investigation of Building 14. The results of the investigation were summarized in a presentation provided to Harley-Davidson in July 2015. An overview of the findings is presented below and the presentation is included as Attachment 2 to the work plan addendum.

The focus of the Phase I RI activities was 20.34 acres that encompass Munitions Response Sites (MRS) 2 through 5 and Area of Concern (AOC) 1 and 2 as shown on Figures 1 and 2. The 20.34 acre area was divided into 117 grids each measuring 100 feet (ft) by 100 ft. The Phase I efforts were performed to: 1) locate and remove surface munitions debris (MD) and munitions and explosives of concern (MEC), if present; 2) identify subsurface anomalies for further investigation during Phase II; and 3) collect data for refining the historical Conceptual Site Model (CSM) regarding Munitions Response Site (MRS) and AOC boundaries.

Grids were staked out vegetation clearance was performed. Magnetometer-assisted surface clearance was then performed to identify MEC, MD, or metallic debris on the surface within accessible areas. During the planning process it was noted that all or portions of 35 grids (as noted below) contained several feet of fill material to include:

- Portions of 7 grids (D11, D12, D13, D14, E11, E12, and E13) associated with a landfill,
- Portions of 30 grids (A4, B4, C4, D4, E4, G4, B5, C5, D5, E5, G5, H5, I5, J5, B6, C6, D6, E6, G6, H6, I6, J6, B7, C7, D7, E7, G7, and H7) which were associated with areas that received several feet of soil/backfill during construction operations onsite.

Based on the presence of the fill material, these grids received varying coverage (less than 100% coverage) in accordance with the RI Work Plan (EA 2015).

The remaining 80 grids received 100% coverage of accessible areas. Items were cleared from the surface and individual grid sheets were populated with information related to subsurface anomalies and density within each of the 117 grids (as shown in Figure 2 and tabulated in Table 2-1). Findings from the surface clearance activities were as follows:

- No MEC items were located.
- 11 items were located and identified as MD from 40-millimeter (mm) training practice (TP) projectiles located in grids B7, G3, H3, H4, and I4. All of the MD items were found on the surface in and around AOC 2 except the item located in grid B7.
- Multiple grids were identified as "saturated" (greater than 1,000 anomalies).
- In portions of grids that extended beyond the designated RI boundary, no MEC or MD was identified beyond the RI boundary during Phase I surface clearance operations..

- 1,228 pounds of non-munition related debris (NMRD) i.e. chains, gears, piping, scrap metal, etc. was collected and subsequently recycled.
- No direct evidence of previously unknown burial areas was found.
- No backstop sand[1] and no breached MEC items were found during the Phase I surface clearance, therefore, no munition constituent (MC) samples were collected.

Anomaly information (including number of anomalies, presence of large anomalies, saturated areas, etc.) along with surface findings were recorded within each grid. The information included on the grid sheets was then evaluated to determine path forward for the next phase of the RI. Based on a quantitative and qualitative assessment of Phase I results, areas were grouped into the following categories:

- High Anomaly Density Areas (> 500 anomalies per grid) - approximately 2.56 acres consisting of all or portions of 25 grids. Main 11 grids include D3, E3, G3, D5, E5, G5, H5, I7, I8, J7, and J8 (as shown in Figure 3),
- Low Anomaly Density Areas (< 500 anomalies per grid) - approximately 13.56 acres consisting of the remaining areas/portions of grids not already included in the High Anomaly Density Area or High Anomaly Density Landfill/Backfill Areas (as shown in Figure 4),
- High Anomaly Density Landfill/Backfill Areas (Areas designated prior to RI Phase I Investigations- not investigated) - approximately 4.22 acres consisting of all or portions of 35 grids identified as A4, B4, C4, D4, E4, G4, B5, C5, D5, E5, G5, H5, I5, J5, B6, C6, D6, E6, G6, H6, I6, J6, B7, C7, D7, E7, G7, H7, D11, D12, D13, D14, E11, E12, and E13 (as shown in Figure 5).

Phase I, surface clearance activities confirmed the presence of MD on the surface in several grids. In addition, subsurface anomalies were found within all the investigation grids. During stakeholder discussions, it was recommended that digital geophysical mapping (DGM) be conducted in portions of 13 grids (D3, E3, G3, H3, H4, D5, E5, G5, H5, I7, I8, J7, and J8) given the anomaly density and MD findings to date. Traditional mag and dig methods in high and low density areas were also recommended to complete nature and extent investigations. Finally MC sampling would be included to complete RI activities. The additional data to include intrusive investigations, DGM, and MC sampling will be collected to help refine the historical CSM regarding presence of MEC and to determine MRS and AOC boundaries. The rationale for performing additional investigations is to confirm anomalies are not MEC and to identify areas which need to be addressed through the use of land use controls, removal actions, etc.

[1] During the RI, the clearance team also looked for piles of sand which could have been associated with the former firing range backstops (Buildings 14 and 16).

2.2 BUILDING 14 INSPECTION

To assess for the potential for MEC or MD, a visual inspection of the firing range and its associated backstop area was performed as part of the Phase I RI. The underground firing range was accessed to visually identify the presence of any MEC, MD, or potential sources of MC. The backstop area of Building 14 was observed to contain sand and MD items. Those items identified through inspection of the sands in the backstop included 20 mm and 40 mm training/practice projectiles (MD). No MEC was found. MC sampling within and around Building 14 was recommenced as a result of the Phase I findings (to be performed as part of this next phase of the RI). The associated media recommended for MC sampling includes the back stop sand, dust associated with the baghouse filters, and pooled water (from groundwater and/or rain water infiltration) located in the elevator shaft) as further discussed in Section 4.8.3.

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Table 2 -1 Summary of Findings Phase I RI Surface Clearance Activities

GRID ID	DATE	ANOMALIES	MD	MEC	MD TYPE	Grid Coverage[1]	NMRD in LBS	LARGE ANOMALIES[2]	HISTORICAL MD FINDINGS	HISTORICAL DESCRIPTION	COMMENTS
A1	5/4/2015	85	--	0	--	>90%	30	3 areas with large anomalies	Unknown	Electromagnetic (EM)31/61 Survey performed during the 2004 Time Critical Removal Action (TCRA) occurred in part of the grid	Coverage reduced due to manmade feature (fencing). Other features include a com wire and a manhole
A2	5/5/2015	49	--	0	--	>90%	1	2 areas with large anomalies	Unknown	EM31/61 Survey performed during the 2004 TCRA in part of the grid	Coverage reduced due to manmade feature (fencing). Other features include a com wire
A3	5/6/2015	47	--	0	--	>90%	0	2 areas with large anomalies	Unknown	Part of MRS 3, EM31/61 Survey performed during the 2004 TCRA in part of the grid	Coverage reduced due to manmade feature (fencing). Other features include a com wire
A4	5/8/2015	82	--	0	--	>90%	19	--	Unknown	EM31/61 Survey performed during the 2004 TCRA in part of the grid	Coverage reduced due to manmade features (poles) and soil pile/fill material in the eastern side of grid
B1	5/4/2015	65	--	0	--	100%	12	3 areas with large anomalies	Unknown	Part of MRS 3, EM31/61 Survey performed during the 2004 TCRA in part of the grid	Manmade features (culvert, piping, road, metal box, electrical poles, and com wire present)
B2	5/5/2015	78	--	0	--	100%	2	1 area with a large anomaly	Unknown	Part of MRS 3, EM31/61 Survey performed during the 2004 TCRA in part of the grid	Manmade features (piping, metal box) present
B3	5/6/2015	56	--	0	--	100%	2	2 areas with large anomalies	Unknown	Part of MRS 3, EM31/61 Survey performed during the 2004 TCRA in part of the grid	Manmade features (piping, manhole lid) present
B4	5/13/2015	173	--	0	--	100%	15	1 very large anomaly area	--	--	Asphalt and gravel covered areas in grid
B5	5/14/2015	--	--	0	--	100%	0	Saturated	--	Part of MRS 4	Part of the grid overlain with soil fill area which is saturated with anomalies, visual search conducted in saturated/fill area
B6	5/14/2015	--	--	0	--	100%	0	Saturated	--	Part of the grid overlain with soil fill area which is saturated with anomalies, visual search conducted in saturated/fill area	Part of the grid overlain with soil fill area which is saturated with anomalies, visual search conducted in saturated/fill area
B7	5/13/2015	119	2	0	40 mm	100%	0	7 areas with large anomalies	--	--	Manmade features (piping, concrete) present
B8	5/18/2015	38	--	0	--	100%	0	--	--	--	Manmade features (piping) present
C1	5/4/2015	83	--	0	--	100%	45	--	MEC and MD	Part of MRS 2 (1993 removal action of pit)	Manmade features (roadways, culvert) present
C2	5/5/2015	93	--	0	--	100%	0	1 area with a large anomaly	MEC and MD	Part of MRS 3, EM31/61 Survey performed during the 2004 TCRA in part of the grid, also contains part of MRS 2 (1993 removal action)	Manmade features (roadways, piping, concrete, and culvert) present
C3	5/6/2015	178	--	0	--	100%	500	4 areas with large anomalies	Unknown	Part of MRS 3, EM31/61 Survey performed during the 2004 TCRA in part of the grid	Manmade features (piping, concrete, and electrical substation) present
C4	5/13/2015	107	--	0	--	100%	--	Eastern part of the grid is saturated, western part has 4 large anomalies	MD	MD observed during 2007 Site Inspection	Manmade features (roads, pole, and concrete) present, soil/concrete fill area which is saturated with anomalies, visual search conducted in saturated/fill area
C5	5/13/2015	153	--	0	--	100%	--	Saturated in landfill area	--	Part of MRS 4; Eastern border overlain with soil fill area	Manmade features (pipe, cement block, road, subsurface storm water, and landfill)
C6	5/14/2015	--	--	0	--	100%	--	Saturated	Unknown	Part of MRS 4	Majority of the grid overlain with soil fill area
C7	5/18/2015	50	--	0	--	100%	--	Saturated in landfill area	--	North edge contains surface soil fill material	Manmade features (asphalt road, dirt road, fire pump, and metal railing)

Table 2 -1 Summary of Findings Phase I RI Surface Clearance Activities

GRID ID	DATE	ANOMALIES	MD	MEC	MD TYPE	Grid Coverage[1]	NMRD in LBS	LARGE ANOMALIES[2]	HISTORICAL MD FINDINGS	HISTORICAL DESCRIPTION	COMMENTS
C8	5/18/2015	46	--	0	--	100%	--	--	--	Northwest corner contains surface fill material	Manmade features (metal gate, dirt road),
C9	5/14/2015	57	--	0	--	100%	--	4 areas with large anomalies	--	--	Manmade features (dirt road)
C10	5/14/2015	41	--	0	--	100%	--	3 large anomalies and entire dirt road saturated	1	MD type unknown	Manmade features (dirt road, subsurface pipeline, electrical pole, and drainage culvert)
C11	5/14/2015	31	--	0	--	100%	5	1 large anomaly and entire dirt road saturated	--		Manmade features (dirt road, subsurface pipeline, drainage culvert)
C12	5/14/2015	29	--	0	--	80%	--	Entire dirt road saturated	--	North edge contains former landfill material	Manmade features (dirt road, telephone pole)
C13	5/14/2015	14	--	0	--	50%	--		--		
C14	5/14/2015	18	--	0	--	50%	1		--		
C15	5/14/2015	27	--	0	--	50%	--	3 areas with large anomalies	--		Manmade features (fence)
D1	5/4/2015	24	--	0	--	100%	15	2 areas with large anomalies	MEC and MD	Part of MRS 2 (1993 removal action of pit)	Manmade features (manhole, fire hydrant, and building debris), Bunker Building 14 present
D2	5/5/2015	78	--	0	--	100%	31	2 areas with large anomalies	MEC and MD	Part of MRS 2 (1993 removal action of pit)	Manmade features (road, telephone pole)
D3	5/6/2015	736	--	0	--	100%	15	6 areas with large anomalies, east side is saturated	--	--	Manmade features (subsurface storm water, and electric substation/poles)
D4	5/13/2015	--	--	0	--	100%	--	Landfill area is saturated	--	Majority of the grid covered with soil fill are	Manmade features (road, subsurface storm water, and landfill)
D5	5/15/2015	420	--	0	--	100%	--	Landfill areas are saturated	--	This grid is in between two landfills	Manmade features (subsurface storm water, two landfills, cement blocks, and cement wall)
D6	5/15/2015	--	--	0	--	100%	--	Saturated	--	Majority of the grid overlain with soil fill area	Manmade features (pipe, landfill)
D7	5/18/2015	44	--	0	--	100%	--	Road areas are saturated	--	Majority of the grid overlain with soil fill area	Manmade features (road, pipe, fire pump, and landfill)
D8	5/19/2015	103	--	0	--	100%	--	Southwest end saturated, 2 areas with large anomalies	--	Southwest end of grid overlain with soil fill area	Manmade features (cement wall), ravine
D9	5/19/2015	79	--	0	--	100%	--	1 large anomaly	--	--	Manmade features (piping, dirt road), ravine, down trees
D10	5/19/2015	67	--	0	--	100%	--	Southeast area saturated	--	Southeast portion of grid covered by a landfill	Manmade features (landfill), ravine, down trees
D11	5/19/2015	--	--	0	--	100%	--	Saturated	--	Majority of the grid covered by a landfill	Manmade features (road, landfill)
D12	5/19/2015	--	--	0	--	100%	--	Saturated	--	Majority of the grid covered by a landfill	Manmade features (road, landfill)
D13	5/19/2015	--	--	0	--	100%	--	Saturated	--	Majority of the grid covered by a landfill	Manmade features (road, landfill)
D14	5/19/2015	--	--	0	--	100%	--	Saturated	--	Majority of the grid covered by a landfill	Manmade features (road, fence, and landfill)
D15	5/19/2015	36	--	0	--	50%	--	2 areas with large anomalies	--	--	Manmade features (well, fence, and telephone pole)
E1	5/4/2015	70	--	0	--	100%	12	6 areas with large anomalies	--	Site Inspection (SI) 2007 Groundwater Sample in southwest corner	Manmade features (retaining wall, storage building 14)
E2	5/5/2015	88	--	0	--	100%	--	1 area with a large anomaly	--	--	Manmade features (road)
E3	5/6/2015	1,264	--	0	--	100%	35	9 areas with large anomalies, saturated	--	Northeast area of the grid overlain with soil fill	Manmade features (pole, subsurface storm water, and landfill)

Table 2 -1 Summary of Findings Phase I RI Surface Clearance Activities

GRID ID	DATE	ANOMALIES	MD	MEC	MD TYPE	Grid Coverage[1]	NMRD in LBS	LARGE ANOMALIES[2]	HISTORICAL MD FINDINGS	HISTORICAL DESCRIPTION	COMMENTS
E4	5/13/2015	--		0					--		Entire grid covered with concrete debris
E5	5/13/2015	--	--	0	--	100%	--	Saturated; 3 areas with large anomalies	--	Grid is in the middle of two landfills	Manmade features (pole, subsurface storm water, landfill, concrete and debris fill)
E6	5/15/2015	--	--	0	--	100%	--	Saturated	--	Majority of the grid overlain with soil fill area	Manmade features (subsurface storm water, and landfill), down trees
E7	5/18/2015	56	--	0	--	100%	--	--	--	Half of the grid overlain with soil fill area	Manmade features (road, pipes, landfill), ravine
E8	5/13/2015	53	--	0	--	100%	--	1 area with a large anomaly	--	--	Manmade features (pipeline, pipe), ravine
E9	5/18/2015	39	--	0	--	100%	--	--	--	--	Manmade features (pipeline), ravine
E10	5/18/2015	40	--	0	--	100%	--	--	--	--	Down trees
E11	5/12/2015	--	--	0	--	100%	0	Saturated in landfill area	--	Southern border of the grid overlain with soil fill area	Manmade features (landfill)
E12	5/18/2015	31	--	0	--	100%	--	Saturated in landfill area	--	Southern border of the grid overlain with soil fill area	Manmade features (broken drains, landfill), down trees; hits were outside of the landfill
E13	5/18/2015	37	--	0	--	100%	--	Saturated in landfill area	--	Southern border of the grid overlain with soil fill area	Manmade features (landfill), down trees; hits were outside of the landfill area
E14	5/18/2015	39	--	0	--	100%	--	--	--	--	Manmade features (landfill material, road), down trees
G1	5/4/2015	87	--	0	--	100%	35	14 areas with large anomalies	--	Two SI 2007 Soil Samples	Manmade features (two signs, Building 14, bunker wall)
G3	5/5/2015	441	1	--	40 mm	100%	11	1 area with a large anomaly	Unknown	Part of AOC 2; southwest corner of the grid overlain with soil fill area	Manmade features (road, subsurface storm water); 40 mm practice M91
G4	5/19/2015	> 250	--	0	--	100%	--	6 areas with large anomalies; landfill area saturated	Unknown	Part of AOC 2; southern half of the grid overlain with soil fill area; two SI 2007 soil samples	Manmade features (2 bunkers, fire pump, and landfill)
G5	5/15/2015	101	--	0	--	100%	75	4 areas with large anomalies; saturated in the east and west	--	In between two landfills	Manmade features (cement wall, landfill)
G6	5/15/2015	--	--	0	--	100%	--	Saturated in landfill area	--	Majority of the grid overlain with soil fill area	Manmade features (landfill), down trees
G7	5/12/2015	83	--	0	--	75%	--	1 area with a large anomaly	--	Part of half of the grid overlain with soil fill area; EM31/61 Survey performed during the 2004 TCRA in part of the grid	Manmade features (landfill)
G8	5/12/2015	112	--	0	--	100%	--	--	--	EM31/61 Survey performed during the 2004 TCRA in part of the grid	Manmade features (cement blocks, pipeline, and ravine), down trees
G9	5/12/2015	93	--	0	--	100%	--	--	--	--	Manmade features (ravine), down trees
G10	5/11/2015	76	--	0	--	100%	--	--	--	--	Down trees
G11	5/11/2015	59	--	0	--	100%	--	--	--	--	--
G12	5/11/2015	37	--	0	--	100%	--	--	--	--	Down trees
G13	5/11/2015	59	--	0	--	100%	--	--	--	--	--
G14	5/13/2015	57	--	0	--	100%	--	--	--	--	Manmade features (road), down trees
G2	5/5/2015	84	--	0	--	100%	10	2 areas with large anomalies	--	One SI 2007 Soil Sample	Manmade features (roads, building, and culvert)
H1	5/4/2015	74	--	0	--	100%	4	6 areas with large anomalies	Unknown	Part of MRS 5; one SI 2007 Soil Sample	Manmade features (well, asphalt road, and Building 14)

Table 2 -1 Summary of Findings Phase I RI Surface Clearance Activities

GRID ID	DATE	ANOMALIES	MD	MEC	MD TYPE	Grid Coverage[1]	NMRD in LBS	LARGE ANOMALIES[2]	HISTORICAL MD FINDINGS	HISTORICAL DESCRIPTION	COMMENTS
H2	5/5/2015	74	--	0	--	100%	2	--	Unknown	Part of MRS 5; one SI 2007 Soil Sample	Manmade features (roads, Building 14, and another building)
H3	5/6/2015	510	5	0	40 mm	100%	60	--	1	Part of AOC 2; 1 SI 2007 Soil Sample; Munitions related items found by Harley-Davidson; 2008 suspect soil pile from Building 16 backstop	Manmade features (pole, asphalt road, and Building 16); Two 40 mm MD items identified as M91 and MK1 40mm. Three other pieces of 40 MM found
H4	5/19/2015	> 400	2	0	40 mm	100%	--	--	--	Part of AOC 2; 3 SI 2007 Soil Sample; Munitions related items found by Harley-Davidson; 2008 suspect soil pile from Building 16 backstop	Manmade features (road, cement wall, Building 16 backstop, pile moved from in front of backstop to area behind the backstop, and subsurface storm water feature). Two additional pieces of MD were removed from the Building 16 Backstop in this Grid. These are not listed in the count in the MD column as they were in the backstop. Based on visual observations, additional MD items are likely present in the backstops; however due to health and safety concerns (steel plate collapsing from the roof), no work was performed in the Building 16 backstops. These will need to be addressed as part of any removal action activities
H5	5/15/2015	112	--	0	--	100%	--	Saturated in the east and west	--	Eastern border of the grid overlain with soil fill area	Manmade features (cement wall, landfill)
H6	5/15/2015	--		0			--	Saturated	--	Majority of the grid overlain with soil fill area	Entire grid covered with concrete debris
H7	5/12/2015	116	--	0	--	100%	--	--	--	Western border of the grid overlain with soil fill area; EM31/61 Survey performed during the 2004 TCRA in part of the grid	Manmade features (pipe, pipeline, ravine, and landfill)
H8	5/11/2015	51	--	0	--		5	--	--	EM31/61 Survey performed during the 2004 TCRA in most of the grid	Down trees
H9	5/11/2015	63	--	0	--	100%	--	--	--	EM31/61 Survey performed during the 2004 TCRA in part of the grid	Manmade features (cement block)
H10	5/8/2015	25	--	0	--	100%	--	--	--	--	--
H11	5/8/2015	11	--	0	--	100%	--	--	--	--	--
H12	5/8/2015	21	--	0	--	100%	--	--	--	--	--
H13	5/8/2015	15	--	0	--	100%	0	--	--	--	--
I1	5/4/2015	87		0	--	100%	10	3 areas with large anomalies	Unknown	Part of MRS 5	Manmade features (road)
I2	5/5/2015	83	--	0	--	100%	100	5 areas with large anomalies	Unknown	Part of MRS 5	Manmade features (road, well, 3 poles)
I3	5/6/2015	154	--	0	--	100%	101	--	--	Part of AOC 2	Manmade features (pipe)
I4	5/6/2015	103	1	0	40 mm	100%	50	--	--	--	Manmade features (cement wall, pole); MD 40 mm practice Mk3
I5	5/15/2015	76	--	0	--	100%	--	1 area with a large anomaly; east area is saturated	--	Eastern half of the grid overlain with soil fill area	Manmade features (cement wall, landfill), steep hill
I6	5/12/2015	103	--	0	--	100%	--	Saturated in landfill area	--	Western 3/4ths of the grid overlain with soil fill area	Manmade features (pipe, electrical lines, ravine, and landfill), down trees; anomalies occurred outside of the fill area
I7	5/12/2015	15	--	0	--	100%	--	Saturated in AOC 1 area	--	Part of AOC 1; EM31/61 Survey performed during the 2004 TCRA in most of the grid	Down trees, drop off; anomalies occurred outside of the area designated as AOC 1

Table 2 -1 Summary of Findings Phase I RI Surface Clearance Activities

GRID ID	DATE	ANOMALIES	MD	MEC	MD TYPE	Grid Coverage[1]	NMRD in LBS	LARGE ANOMALIES[2]	HISTORICAL MD FINDINGS	HISTORICAL DESCRIPTION	COMMENTS
I8	5/12/2015	24	--	0	--	100%	0	Saturated in AOC 1 area	--	Part of AOC 1; 2007 Science Applications International Corporation (SAIC) Investigation Anomaly identified as munitions debris, MD type unknown; EM31/61 Survey performed during the 2004 TCRA in the grid	Anomalies occurred outside of the area designated as AOC 1
I9	5/8/2015	108	--	0	--	100%	--	1 area with a large anomaly; loud area near fence	--	EM31/61 Survey performed during the 2004 TCRA in the grid	Manmade features (fence, large metal plate), down trees
I10	5/7/2015	14	--	0	--	100%	0	--	--	EM31/61 Survey performed during the 2004 TCRA in most of the grid	Down trees
I11	5/7/2015	26	--	0	--	100%	0	--	--	EM31/61 Survey performed during the 2004 TCRA in some of the grid	--
I12	5/7/2015	17	--	0	--	100%	0	--	--	--	--
J1	5/5/2015	45	--	0	--	100%	20	2 areas with large anomalies	--	--	Manmade features (pipe)
J2	5/5/2015	17	--	0	--	100%	1	--	--	--	Manmade features (6-in. pipe)
J3	5/5/2015	2	--	0	--	100%	0	1 area with a large anomaly	--	--	--
J4	5/6/2015	91	--	0	--	100%	0	--	--	--	Manmade features (pipe)
J5	5/15/2015	97	--	0	--	100%	--	2 areas with large anomalies	--	Southeastern border overlain with soil fill area; EM31/61 Survey performed during the 2004 TCRA in a small portion of the grid	Manmade features (pipeline, ravine, and landfill), down trees
J6	5/18/2015	68	--	0	--	100%	--	1 area with a large anomaly	--	Southwestern border overlain with soil fill area; EM31/61 Survey performed during the 2004 TCRA in most of the grid	Manmade features (pipeline, ravine, and landfill), down trees
J7	5/12/2015	25	--	0	--	100%	--	Saturated in AOC 1 area	--	Part of AOC 1; EM31/61 Survey performed during the 2004 TCRA in the grid	Down trees, steep hill; anomalies occurred outside of the area designated as AOC 1
J8	5/12/2015	48	--	0	--	100%	--	Saturated in AOC 1 area	1	Part of AOC 1; 2007 SAIC investigation anomalies identified as cultural debris; 2007 SAIC anomalies identified as MD; 2 SI 2007 soil samples; EM31/61 Survey performed during the 2004 TCRA in the grid	Down trees, steep hill; anomalies occurred outside of the area designated as AOC 1
J9	5/7/2015	11	--	0	--	100%	1	--	--	EM31/61 Survey performed during the 2004 TCRA in the grid	--
J10	5/7/2015	18	--	0	--	100%	--	--	--	2007 SAIC investigation anomalies identified as cultural debris; EM31/61 Survey performed during the 2004 TCRA in most of the grid	--
J11	5/7/2015	11	--	0	--	100%	0	--	--	EM31/61 Survey performed during the 2004 TCRA in a small portion of the grid	--
K1	5/11/2015	23	--	0	--	100%	--	--	--	EM31/61 Survey performed during the 2004 TCRA in a small portion of the grid	--
K2	5/11/2015	32	--	0	--	100%	--	--	--	EM31/61 Survey performed during the 2004 TCRA in majority of the grid	Down trees

Table 2 -1 Summary of Findings Phase I RI Surface Clearance Activities

GRID ID	DATE	ANOMALIES	MD	MEC	MD TYPE	Grid Coverage[1]	NMRD in LBS	LARGE ANOMALIES[2]	HISTORICAL MD FINDINGS	HISTORICAL DESCRIPTION	COMMENTS
K3	5/11/2015	43	--	0	--	100%	--	--	--	Part of AOC 1; 2007 SAIC investigation anomalies identified as cultural debris; EM31/61 Survey performed during the 2004 TCRA in majority of the grid	Down trees
K4	5/11/2015	53	--	0	--	100%	--	--	--	Part of AOC 1; SI 2007 Soil Sample; EM31/61 Survey performed during the 2004 TCRA in the grid	--
K5	5/7/2015	29	--	0	--	100%	0	--	--	EM31/61 Survey performed during the 2004 TCRA in the grid	--
K6	5/7/2015	10	--	0	--	100%	0	1 area with a large anomaly	--	EM31/61 Survey performed during the 2004 TCRA in most of the grid	Anomaly occurred outside of the RI Boundary
L1	5/12/2015	43	--	0	--	100%	--	--	--	EM31/61 Survey performed during the 2004 TCRA in a small portion of the grid	Down trees
L2	5/11/2015	40	--	0	--	100%	--	--	--	EM31/61 Survey performed during the 2004 TCRA in most of the grid	Down trees
L3	5/7/2015	14	--	0	--	100%	0	--	--	EM31/61 Survey performed during the 2004 TCRA in half of the grid	--
M1	5/7/2015	3	--	0	--	100%	2	--	--	EM31/61 Survey performed during the 2004 TCRA in a small portion of the grid	Manmade features (well)
M2	5/7/2015	1	--	0	--	100%	1	--	--	EM31/61 Survey performed during the 2004 TCRA in a small portion of the grid	--

1 Grid Coverage was affected by manmade features to include fencing, roads, buildings, fill material, and terrain. The percentage noted refers to magnetometer coverage.
2. The term 'large anomaly' is somewhat subjective usually defined as having a magnetometer response greater than two feet from an anomaly center.

3. TECHNICAL MANAGEMENT PLAN

No changes to Section 3 of the Work Plan as a result of this addendum.

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4. FIELD INVESTIGATION PLAN

4.1 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are both qualitative and quantitative statements that define the type, quality, and quantity of data necessary to support the decision-making process during project activities. The DQO process used for this project follows the United States Environmental Protection Agency (USEPA) QA/G-4 guidance (USEPA 2006) and uses the following seven-step DQO development process to ensure the environmental data used in the decision making are appropriate for their intended application:

1. State the problem. Describe concisely the problem to be studied.

2. Identify the goals of the study. State the decisions to be made to solve the problem.

3. Identify information inputs. Identify information and supporting measurements needed to make the decisions and describe the source(s) of the information.

4. Define the boundaries of the study. Specify conditions (i.e., time periods and spatial locations).

5. Develop the analytic approach.

6. Specify performance or acceptance criteria.

7. Develop the plan for obtaining data. Evaluate the results of the previous steps and develop the most resource-efficient design for data collection.

The following section describes the DQOs for the fYNOP. Individual suspected MEC items and disposal areas will be the targets of the RI; however, they will be evaluated in the context of the extent of MEC across any particular area (i.e., the investigation will focus on identifying patterns or the density of items across the MRSs and AOCs and surrounding areas to determine nature and extent as opposed to trying to locate individual items for disposal).

The DQO process outlined in the USEPA 2006 guidance document entitled “Guidance on Systematic Planning Using the Data Quality Objectives Process” was used to support development of site-specific DQOs for this project. As Phase I of the RI has been completed, the following sections focus on DQOs specific to Phase II (revised from the original April 2015 work plan). The DQOs for Phase I were listed in Section 4.2 of the original Work Plan document. Each of the seven planned steps for Phase II is included in Table 4-1 below.

Table 4-1. Data Quality Objectives for the fYNOP (Revised)

Step		DQO
1.	State the Problem	MEC (unfired practice rounds removed in 1993 during a removal action by an Explosive Ordnance Disposal unit) and MD associated with 3-inch rounds, 20 mm Target Practice projectiles, 40 mm anti-aircraft practice projectiles, and 37 mm inert projectiles, have been identified/removed from fYNOP. During the Site Inspection (SI), MC (including antimony, barium, copper, lead, nickel, and zinc) were detected onsite at concentrations exceeding human health screening criteria. MEC and MD have historically been found outside the designated MRSs and AOCs. No MEC was found during the surface clearance performed as part of the 2015 Phase I RI; however, MD was found in and around the MRSs/AOCs. The nature and extent of remaining MEC and potential risk from MC have not been characterized at the fYNOP. The overall objective of this RI is to collect data that will be used to define the nature and extent of MEC and potential risk from MC along with the fate and transport of MC in and around the MRSs and AOCs associated with historical munitions use.
2.	Identify the Goals of the Study	The investigation will focus on the high and low density areas identified onsite to achieve the following goals: • Assess the nature and extent of MEC within the High Anomaly and Low Anomaly Density Areas as identified during the Phase I RI (Figures 3 and 4). • Assess presence / absence (in any newly discovered disposal areas) along with nature and extent and fate and transport of MC contamination (to include select metals [antimony, barium, copper, lead, nickel, and zinc] and explosives, if appropriate) in soil • Assess presence / absence (in any newly discovered disposal areas) along with nature and extent and fate and transport of MC contamination (to include select metals [antimony, barium, copper, lead, nickel, and zinc] and explosives, if appropriate) in groundwater within the RI study area if a potentially complete pathway is identified for groundwater (pathway analysis is discussed in Step 3 below). • Assess risk from MEC using the MEC Hazard Assessment (if MEC is identified) or assess risk from potential MEC (if no MEC is identified) using the MEC Probability Assessment. • Assess potential risk from MC to human health. [2]

[2] The 2015 Work Plan noted that an ecological risk screening assessment may be performed as part of this RI effort. However, as discussed in Section 2.1, based on a review of PADEP guidance, none of the criteria have been met for an ecological risk assessment to be required for our areas of investigation. Therefore no ecological assessment will be performed. This rationale will be included in the RI report.

Table 4-1. Data Quality Objectives for the fYNOP (Revised)

Step		DQO
3.	Identify Information Inputs	Historical MEC and MC data and receptor information as obtained from historical records, historical munitions-related reports, and previous environmental studies will be compiled from the following reports: • TCRA Report (Plexus 2004). • Site Inspection Report for the York Naval Ordnance Plant (Alion 2008). • Supplemental Remedial Investigations Soil Report - Former York Naval Ordnance Plant (SAIC 2009). • Soil Risk Assessment-Former York Naval Ordnance Plant (Groundwater Sciences Corporation, 2012). • Miscellaneous fYNOP backup documents and reports. • RI Phase I surface clearance results (as summarized in Attachment 2 and Table 2-1). MEC Information Inputs: Additional subsurface data will be obtained using hand held analogue and digital geophysics as well as conducting intrusive investigations. Locations and approach rationale for conducting the geophysics and selecting subsurface investigation locations using the results of the analogue and digital geophysics is presented below in Section 4.2. MC Information Inputs: Soil and groundwater data from the MMRP SI and HTRW RI were used in conjunction with the results of the Phase I RI investigations to develop the initial plan for MC sampling. A review of SI data shows a potentially complete pathway for soils (Table 4-3) in three grids (G2, G4 and J8 shown on Figure 7) and an incomplete pathway for groundwater (Table 4-4) based on limited GW sampling. An initial plan for soil sampling in specific locations for the RI is outlined in step 5 below. Data collected during the RI investigation will be used to evaluate the presence/absence of MC (in some cases) or nature of MC and the extent/ risk in selected MRSs/AOCs where SI data showed a release above RI screening criteria (Table 4-3) or where intrusive investigations identify additional areas for MC sampling. Groundwater sampling would be proposed for those locations where a potentially complete pathway is found to exist based on the review of the soil sampling results with stakeholders. The following conditions would be indicative of a potentially complete groundwater pathway: If there are exceedances of the soil to groundwater criteria and 1) vertical delineation is not achieved (i.e. the buffer distance from the bottom of the contamination to groundwater or bedrock (which ever one comes first) is not achieved, or

Table 4-1. Data Quality Objectives for the fYNOP (Revised)

Step		DQO
		2) Karst is present within 100 ft of the soil to groundwater exceedance(s). If the groundwater pathway is determined to be potentially complete, groundwater sampling data would be collected and used to evaluate nature and extent of groundwater impact. The new MC data will supplement the data that was gathered during previous investigations or serve as the primary data to evaluate potential risk for a specific area. Soil and groundwater samples will be analyzed for antimony, barium, copper, lead, nickel, and zinc using USEPA Method 6020A and potentially for 2,4-dinitrotoluene (DNT), 2,6-DNT, and nitroglycerin (NG) using USEPA Method 8330A if MEC is found. Also, soil beneath a breached MEC item will be analyzed for a tailored suite of explosives (i.e. Trinitrotoluene (TNT) and degradation products, if anticipated) based on item identified via USEPA Method 8330 A.[3] Additional Information Inputs: Soils - Pennsylvania Department of Environmental Protection (PADEP) direct contact medium specific concentrations (MSCs), PADEP Direct Contact MSCs for 2-15 feet, and USEPA non-residential soil Regional Screening Levels, and PADEP Soil-to-Groundwater Numeric Values for Non-Residential, Used Aquifers (TDS <= 2,500) will dictate the action levels for MC in soils and be used to determine whether or not a risk assessment is warranted. The human health action levels are provided in the original QAPP (Section 5.0 Attachment 1). The detection limits associated with these methods are below the action levels that will be used for these analytes as presented in Attachment 1. Groundwater - USEPA Maximum Contaminant Levels (MCLs) and PADEP MSCs - PADEP Residential, Used Aquifer will dictate the action levels for MC in groundwater and will be used to determine whether or not a risk assessment is warranted. The human health action levels are provided in Section 5.0. The detection limits associated with these methods are expected to be well below the action levels that will be used for these analytes as presented in Section 5.0.

[3] MC identified is based on the CSM developed during the SI that identified inert projectiles and small arms ammunition being used onsite in the proof ranges.

Table 4-1. Data Quality Objectives for the fYNOP (Revised)

Step		DQO
4.	Define the Boundaries of the Study	**Specifying the target population.** For MEC, the target population consists of all metallic anomalies across the entire study area. A MEC sampling unit would consist of one magnetic anomaly. For MC, the target population consists of soil or groundwater samples that comprise the soil column across a specific MRS or AOC. An MC sampling unit would correspond to a discrete soil sample of sufficient volume or groundwater sample to be analyzed for metals and/or explosives as presented in Step 3. **Specifying spatial and temporal boundaries and other practical constraints.** The spatial boundaries consist of the study area boundaries, a portion of the approximately 20.34 acres, which are presented in Figures 3 and 4 and discussed in detail below. Horizontal site boundaries have been defined in a practical way for the project and are expected to contain the full extent of MEC/MD items associated with historic use. Vertical boundaries include the depth of MEC/MD items and MC in soil and/or groundwater and may have changed in certain areas over time due to disposal practices, site grading, or erosional/depositional processes. **Specifying the scale of inference for decision making:** The study area (approximately 20.34 acres) has been divided into High Anomaly Density and Low Anomaly Density study areas based on observations during the first phase of the RI to facilitate more extensive investigations within areas that likely pose higher risk. The additional data required for each area Anomaly Density Area takes into account the type of findings (MEC or MD), the size of the area and the number of anomalies as found during the Phase I RI.
5.	Develop the Analytic Approach	**For MEC the following decision rules were developed for fYNOP:** 1. If MEC, MD, or material potentially presenting an explosive hazard (MPPEH) is found at the fYNOP, then the UXO team will determine the nature of the item (MEC vs. MD). 2. If MEC, significant amounts of MD, or evidence of potential disposal areas (i.e., are identified at the fYNOP, the boundaries of the MRSs, AOCs, and/or newly identified areas will be evaluated and redrawn as appropriate in the RI Report, which will be provided for review and concurrence by stakeholders. 3. If no new MEC items, significant areas of MD, or potential disposal areas (i.e., concentrated areas of anomalies or MD) are found at the

Table 4-1. Data Quality Objectives for the fYNOP (Revised)

Step		DQO
		fYNOP, the boundaries of the MRSs, and AOCs will be evaluated and redrawn as appropriate in the RI Report. 4. If MEC is found at the fYNOP, then a MEC Hazard Assessment will be completed for the fYNOP using the both historical and new data gathered at the fYNOP. 5. If no MEC is found at the fYNOP, then a MEC Probability Assessment will be completed for the fYNOP using both historical and new data gathered at the fYNOP. **For MC the following decision rules developed for the fYNOP:** 1. If a breached MEC item is identified, then a discrete soil sample will be collected beneath the item for a tailored suite of MC based on the MEC item identified. 2. If new areas of concern are identified following the Phase II intrusive investigation, soil and groundwater samples may be proposed for collection and analysis for MC within the areas of concern. 3. Initial soil sampling grid locations have been identified from existing MRSs/AOCs to include areas where previous sampling results showed exceedance of RI screening criteria in grids G2, G4, and J8 (Figure 4-6). After completing the intrusive investigations, a table and figure(s) will be developed confirming soil sampling locations based on initial exceedances and findings related to the intrusive investigations. Soil sampling locations will be confirmed with stakeholders prior to sampling. MC results will be used to characterize risk. If there are exceedances of RI screening criteria. 4. If MC concentrations in soil exceed project screening criteria, then additional environmental media sampling (follow-on phase) may be recommended to further delineate nature and extent prior to completing the RI report. 5. Groundwater sampling (as a second follow-on phase) would be proposed for those locations where a potentially complete pathway for groundwater exists. The following conditions would be indicative of a potentially complete groundwater pathway: • If there are exceedances of the soil to groundwater criteria and o vertical delineation is not achieved (i.e. the buffer distance from the bottom of the contamination to groundwater or bedrock (which ever one comes first) is not achieved, or o Karst is present within 100 ft of the soil to groundwater exceedance(s). o Existing groundwater wells are shown on Figure 4-7, these wells may be sampled or additional wells may be installed in or downgradient of

Table 4-1. Data Quality Objectives for the fYNOP (Revised)

Step		DQO
		potential source areas. The need for groundwater wells will be determined after completing the intrusive investigations and nature and extent soil sampling to determine if a groundwater pathway exists. After confirming a pathway, a table and figure(s) will be developed confirming proposed groundwater sampling locations based on soil exceedances and findings related to the intrusive investigations. Groundwater sampling locations will be confirmed with stakeholders prior to completing wells and sampling. MC results will be used to characterize risk. 6. If MC concentrations in soil/groundwater at the fYNOP exceed action levels and are found to represent unacceptable risk after a formal human health risk assessment, then further action may be recommended. 7. If MC concentrations in groundwater or soil at the fYNOP exceed screening criteria, but are found to represent acceptable risk after a formal human health risk assessment, then they pose acceptable risk to human health and no further action is necessary for MC.
6.	Specify Performance or Acceptance Criteria	**MEC Performance or Acceptable Criteria:** Reacquisition and subsurface investigation of anomalies identified during Phase I, and digital geophysical mapping (DGM), reacquisition, and subsurface investigation of DGM anomalies. The results of the data collection will be acceptable if the quality control processes described in Section 5 (Table 5-3), confirm the work was performed in accordance with this plan. **MC Performance or Acceptable Criteria:** Performance and acceptance criteria assessing the nature and extent of MC will be met using a judgmental plan. A direct comparison of soil and groundwater data will be made to action levels. One or more exceedance of an action level (PADEP MSCs and EPA RBCs) will trigger a human health risk assessment.
7.	Develop the Plan for Obtaining Data	The MEC and MC sampling design are based on the data gathered during previous investigations and the first phase of the RI. The MEC intrusive investigation and MC sampling will be phased with scheduled interim data review periods (i.e. after mowing and digital geophysical mapping but before intrusive investigations, after intrusive investigations but before soil nature and extent investigations, etc.) to allow for stakeholder interaction and review of interim results.

Table 4-1. Data Quality Objectives for the fYNOP (Revised)

Step		DQO
		Digital geophysical mapping (DGM) in 13 grids (discussed in Section 4.2) and intrusive data will be collected within identified boundaries of the MRSs and AOCs and the results of the subsurface data collection efforts will be combined with the data collected from previous investigations to include Phase I to determine the nature and extent of MEC contamination and complete a MEC hazard assessment. Alternatively, if MEC is not identified during the Phase II RI field effort, EA will complete a MEC probability assessment as discussed in Section 4.11. Limited sampling is planned during the intrusive investigations, for scenarios where MEC is found. MEC sampling data, if collected, would be combined with the findings of the intrusive investigation, and the existing data (MC exceedances of screening criteria in AOC 1, AOC 2, and MRS 5 as noted in Table 4-3 [grid locations G2, G4 and J8 in Figure 4-6]) to develop a specific MC sampling plan for soil. After completing the intrusive investigations, the proposed MC sampling locations and rationale will be memorialized in a table which identifies location, depths, and sampling rationale along with a figure. The table and figure will be circulated to stakeholders for input prior to collecting soil samples. If exceedances of soil to groundwater criteria are found and the groundwater pathway is determined to be potentially complete, then groundwater samples may be collected. The proposed MC sampling locations and rationale will be memorialized in a table which identifies well location (existing or new), sample depths, and rationale with a figure. The table and figure will be circulated to stakeholders for input prior to installing wells and collecting groundwater samples. Soil data and groundwater data (if collected) will be used to the evaluate nature and extent and complete a human health risk assessment. Refer to the remaining sections of Chapter 4 (below) for additional details regarding the MEC and MC data collection process.

4.2 PHASE II REMEDIAL INVESTIGATION TECHNICAL APPROACH

EA used Visual Sampling Plan (VSP) software in order to develop a statistically valid sampling approach for the intrusive investigations in both the High and Low Anomaly Density Areas, VSP is a statistical software tool developed by the Pacific Northwest National Laboratory that supports the development of a defensible sampling plan based on statistical sampling theory and the statistical analysis of sample results to support confident decision-making. Use of VSP supports the project objective of ensuring that the right type, quality, and quantity of data are gathered to support decisions.

EA used the tool/module within the VSP program known as "Presumptively Clean/Verification Sampling Approach" to identify a number of locations for intrusive investigation of subsurface anomalies. This module uses the estimated density of anomalies in an area of interest and calculates the number of anomalies that need to be investigated to achieve a certain user defined confidence that a certain user defined percentage of anomalies are not MEC.[4] This module was used to analyze the data collected during Phase I of the RI for both the High and Low Anomaly Density Areas. The following inputs and outputs apply to both the High and Low Anomaly Density Areas for the Presumptively Clean/Verification Sampling Approach Module:

- VSP Input parameters are as follows:
    - Number of anomalies to investigate based on total number of anomalies within each area type. The number of anomalies in the Low Density and High Density Areas were tabulated using the grid sheets to estimate the number of anomalies within each area.
    - Determine confidence threshold that anomalies are not MEC. The following decisions statement was generated: "Demonstrate that 99% of remaining anomalies are not MEC with 95% level of confidence".
- VSP Output parameters are as follows:
    - VSP identifies a number of anomalies to investigate based on the number of anomalies in the area of concern and the desired confidence level. The module reached a maximum of approximately 294 anomalies rounded up to 300 anomalies for each area (Low Density and High Density Areas) for a total of 600 anomalies.

Based on the VSP output, EA plans to intrusively investigate approximately 300 targeted and randomly selected anomalies from the High Density Area (approximately 30 anomalies per full grid and 14 anomalies per partial grid will be intrusively investigated) and approximately 300 targeted and randomly selected anomalies from Low Density Areas (approximately 5 anomalies per grid) will be intrusively investigated based on DGM results to achieve confidence that remaining anomalies are not MEC.

The Phase II RI technical approach includes the use of DGM in 13 grids (D3, E3, G3, H3, H4, D5, E5, G5, H5, I7, I8, J7, and J8), collection of analog geophysical data, and statistical sampling to intrusively investigate subsurface anomalies. The approach also includes MC soil Sampling and potentially groundwater (based on pathway analysis to be completed after soil

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[4] EA considered using the "Area-Based" VSP sampling approach (i.e. for a target area). However, this approach assumes no prior knowledge of anomaly density and would require investigating a high percentage of saturated areas. This is not consistent with our CSM for fYNOP; therefore, this approach was not used.

sampling as discussed below). A subset of the intrusive investigations will focus on the investigation of disposal pit features (e.g. large anomalies, saturated areas) identified during the Phase I RI investigations. DGM will be done in accessible areas of the high density grids where individual anomalies can be selected in accordance with discussions during the July 2015 meeting. DGM targets proposed for intrusive investigation will be documented on a proposed dig list and provided to stakeholders for review and acceptance prior to intrusive investigations.

DGM data collection in high density grids will be performed using an EM61-MK2 to further define target anomalies for intrusive investigation. The EM61-MK2 is a high-resolution, time domain electromagnetic induction sensor capable of detecting both ferrous and non-ferrous metallic objects. The grids, which were established during the first phase of the RI, will be used during the second phase to establish and reference work areas. The field team will perform 100% DGM of accessible areas within 9 grids identified as grids D3, E3, G3, H3, H4, D5, E5, G5, and H5) along with a portion of 4 grids (I7, I8, J7, and J8) inclusive of AOC 1 consisting of approximately 2.2 acres (it is noted that the actual acreage may be slightly more or less based on observed field conditions due to accessibility). These are grids containing a high density of anomalies as noted in Figure 3. The DGM anomaly data will be used to generate maps for initial review by the Project Manager (PM), Senior Unexploded Ordnance Supervisor (SUXOS) and Project Geophysicist. The target selection for DGM areas follows DGM guidance where targets matching criteria discussed in Section 4.6.2 will be identified for investigation. In areas where no DGM is being performed (i.e. low density areas) anomalies will be identified using the Phase I surface clearance data and by using the following hierarchy for selection:

1) Prioritize Large Anomalies and Saturated Areas for investigation

2) Prioritize those areas where MD or backstop sand was found on the surface

3) If targeted amount (approximately 5 anomalies per grid) is not achieved based on priorities 1 and 2, remaining targets will be randomly selected by the field crew based on ferrous-detecting instrument-assisted (Schonstedt magnetometer or equivalent) survey/sweep.

The team will use both the surface clearance grid sheets and DGM results to identify and intrusively investigate potential disposal areas (e.g., suspect location of 20 mm disposal pit southwest of AOC 1). Prior to intrusive investigations, dig lists (with locations and associated rationale) along with supporting DGM maps will be presented to and discussed with stakeholders for input in order to reach concurrence on anomalies to investigate.

The field team will reacquire select anomalies, as identified on the dig lists using hand held analog geophysics (magnetometers). The selected anomalies will be intrusively investigated and the results recorded in field log books and on the dig sheets as discussed in SOPs 5 and 7, respectively. This process will be used to characterize the nature and extent of MEC in the subsurface. Both general and specific work activities are further described below.

4.3 GENERAL FIELD ACTIVITIES

All field work associated with the RI is anticipated to occur five days a week, Monday through Friday, up to 10 hours per day (typically 07:00 to 17:00; however, the SUXOS in coordination with Harley-Davidson may adjust hours) as weather conditions and available daylight permit. At the conclusion of daily field activities, EA will remove all project materials and solid wastes from the project site. Hand excavations will be backfilled with the displaced soil and re-graded to the prior contours.

4.3.1 Facility Access and Utility Clearance

All onsite workers will complete Harley-Davidson's contractor onboarding process prior to initiating field work. Copies of completed onboarding process documents will be provided to Harley-Davidson.

Existing utilities were identified prior to the Phase I survey based on engineering drawings and Geographic Information System (GIS), as provided by Harley-Davidson. Several utilities were confirmed during Phase I activities as documented on the Grid Sheets. Prior to initiating any intrusive activities during the second phase of RI field work, EA will complete the requirements of Harley-Davidson's "Subsurface Protocol and Utility Clearance" work instruction (YS2.03.300.01). Pursuant to the work instruction, EA will clearly mark out and identify areas of proposed intrusive activities and review them with the Harley-Davidson Project Champion or designated plant engineer prior to initiating subsurface activities. Additionally, EA will clear utilities in accordance with EA SOP 003 (Attachment 3). As all of the RI activities will occur on security/access controlled Harley-Davidson property, a separate call will not be required to Miss-Utility – Pennsylvania.

4.3.2 Mobilization and Set-Up

A facility entrance briefing and site safety meeting will be conducted by the SUXOS, UXOQCS/ UXOSO[5], and PM during the commencement of field work. This meeting will include a review of this work plan and review and acknowledgment of the Site-Specific Health and Safety Plan (SSHASP) by all site personnel. Project set-up activities will include:

- Identify/procure, package, ship, and inventory project equipment
- Coordinate with local agencies, including facility security, hospital, and fire department, as appropriate
- Coordinate communications with logistical support
- Finalize field schedules
- Test and inspect equipment

[5] The role of UXOSO and UXOQCS is filled by one person as it was during the first phase of the RI.

- Assemble and transport the work force
- Conduct site-specific training on the work plan, SSHASP, data collection procedures, and MEC procedures and hazards
- Verify that all forms and project documentation are in order and project team members understand their responsibilities with regard to completion of project reporting requirements.

The locked portion of the underground firing range at Building 14 will be used to store equipment. The building lock will be removed daily by the Site Manager and replaced at the conclusion of each work day. A Port-a-Pot will be placed inside the automated security gate at the entrance to the work area. This placement will allow for ease of service and separation from the contractor staging area.

No dust and emission control is required for this project due to the heavy vegetation. However, should fugitive dust be generated during vegetation clearance activities (see Section 2.5), work shall stop, the Project Manager contacted, and dust suppression techniques be implemented (i.e. water misting).

No spill control and prevention plan is required; however, portable, Underwriters Laboratories (UL) or Factory Mutual (FM) approved, 75-gallon truck bed mounted diesel fuel service tank will be used for fueling the skid steer used for vegetation clearance. Fuel will be dispensed to the equipment using a dedicated, hose with oil absorbent pads placed under the fueling location. A spill kit will also be available onsite.

4.3.3 Work Exclusion Zones

Historically MEC (misfire pit) and MD from the following munitions have been observed at the fYNOP:

- 3-inch rounds
- 20 mm Target Practice (TP) projectiles
- 40 mm anti-aircraft TP projectiles
- 37 mm inert projectiles.

During intrusive activities exclusion zones are set up at the hazard fragment distance (HFD) for the selected munitions with the greatest fragmentation distance (MGFD) for each MRS/AOC. With fYNOP, munitions used onsite are expected to be training practice projectiles containing tracer elements; therefore, the only energetic material expected (if MEC is found) is likely to a propellant associated with the MEC item. Practice rounds do not require an HFD be established. In addition, because the site is considered low risk, no shielding of equipment is required. However, to be consistent with past practices during the TCRA, a 200-ft exclusion zone will be used when performing excavations (Figure 2). Since access to the RI area is controlled and the site is fenced, EA mapped out locations, which could impact Harley-Davidson operations. Only one scenario (intrusive investigations in Grids A1 thru A4, B1 thru B4, C1 thru C4, and D1 thru D4) falls within the 200-ft exclusion zone. During intrusive operations in these grids EA will coordinate with Harley-Davidson to ensure personnel shelter is in place. Specific work exclusion zones will not be set up during intrusive investigations in the other grids, but EA will coordinate with Harley-Davidson to restrict access to the fenced area during excavations.

In the event MEC is located and identified as not being a TP item, work will stop and the item will be flagged and the Harley-Davidson Project Champion and EA Project Manager will be notified. The field team will consult Technical Paper 16 and the Department of Defense Explosives Safety Board (DDESB) Fragmentation database to reevaluate and adjust the revised exclusion zones (site wide) using the HFD identified for the Munition with the Greatest Fragmentation Zone (MGFD).

Only one UXO team is currently planning to be onsite during intrusive investigations. In the event a second team is used a minimum separation distance of 200-ft will be used between teams.

4.4 SURVEYING AND STAKING OF GRIDS

Survey control were established using a known benchmark Pennsylvania South State Plane, North American Datum of 1983 (NAD 83), coordinate system, to the nearest 1 foot. Using a global positioning system (GPS) unit (e.g. Trimble GeoXH GPS with Floodlight Technology), the survey team, consisting of one UXO Technician II and a survey technician, marked the fYNOP study area boundaries and the four corners of the accessible 100-ft by 100-ft grid network during the Phase I activities (refer to Figure 2). EA will review site conditions and re-establish grid stakes as necessary to complete the planned RI Phase II activities.

4.5 VEGETATION CLEARANCE

The site was mowed/cleared of vegetation during the Phase I; therefore, no large-scale clearance operations are planned for Phase II. Select grids will require clearance to facilitate access during the DGM investigation and/or anomaly investigation. If mowing is required, vegetation clearance will be conducted in accordance with EA SOP 011 (Attachment 3). Prior to initiating work, the area within the grid will be reviewed by the SUXOS/Site Supervisor who will determine the type of vegetation clearance needed. The removal of vegetation will be limited to the degree necessary to safely access the site for DGM or intrusive investigation. During vegetation removal operations, EA personnel will search the area to ensure the area is free of any debris and that utilities are marked. Vegetation removal personnel may cut the brush using a combination of hand and power tools. If heavy equipment is required (i.e. track-mounted skid steer), a spotter will be used. All brush and trees (four inches in diameter or less) will be cut to grade and no roots or stumps that might contain MEC will be removed. If MEC or MPPEH is discovered, the UXO Technician will stop work immediately, direct the vegetation removal crews to leave the immediate area and contact the SUXOS. The UXO Team will assess the item as described in SOP 012 (Attachment 3).

4.6 DIGITAL GEOPHYSICAL MAPPING

Digital Geophysical Mapping (DGM) will be performed in 100% of accessible areas within 9 grids identified as grids D3, E3, G3, H3, H4, D5, E5, G5, and H5) and within a portion of 4 grids (I7, I8, J7, and J8) inclusive of AOC 1. Total area consists of approximately 2.2 acres (it is noted that the actual acreage may be slightly more or less based on observed field conditions due to accessibility) (Figure 3). This section provides details of the equipment, approaches, methods, operational procedures, and quality control (QC) procedures that will be used during the geophysical survey. The overall purpose of the geophysical survey is to identify anomalies that may represent subsurface MEC. The following sub-sections and SOPs 65, 66, 67, and 68 in Attachment 3 provide additional details of the geophysical surveying process.

4.6.1 Geophysical Instruments

Based on industry experience, the most appropriate geophysical technique to employ is electromagnetic induction (EMI). The following subsections detail the DGM instrument to be used during the survey.

EM61-MK2. The standard EM61-MK2 consists of two 0.5-m by 1.0-m coils, separated vertically by a distance of 28 centimeters (cm), set on a pair of wheels 40 cm above the ground. The EM61-MK2 device generates an electromagnetic pulse that triggers eddy currents in the subsurface. The eddy current decay produces a secondary magnetic field that is measured by a receiving coil or coils. These secondary magnetic fields are received as data and stored in a data logger until they can be downloaded to a personal computer for interpretation. The EM61-MK2 data logger collects data at automatic time intervals determined by the user to about 15 times per second. For this project the EM61-MK2 sensors will be set to mode “4” in which four time gates are recorded by the bottom coil to help determine anomaly decay attributes, which may help in the classification of anomalies.

4.6.2 Data Acquisition, Processing, and Interpretation

The sections below describe procedures during data acquisition including field documentation, and discuss how the geophysical data will be interpreted, processed, and reported.

Data Acquisition Procedures

Prior to data acquisition, the DGM Team will utilize the previously installed survey stakes to mark DGM survey grids. The DGM Team will begin data acquisition by performing all specified pre-mapping instrument checks. Once the equipment has been demonstrated to be operating properly, geophysical data collection will be accomplished by carrying the EM61-MK2 over each survey grid. The DGM Team will move around any major obstacles, including trees or steep/dangerous terrain. EM61-MK2 data will be collected within the survey area along parallel lines spaced approximately 2.5 feet apart.

For navigation of the DGM equipment, tape measures and non-metallic pin flags, or lead-free spray paint will be utilized to ensure each acquisition line is straight and data gaps are eliminated. Data will be collected along each survey line, in alternate directions, until 100 percent of the accessible portion of each selected high density grid has been surveyed. EM61-MK2 data will be positioned using the “fiducial” methodology where the instrument readings are interpolated between known points.

The DGM Team will document survey procedures that will include information such as field team, survey area, grid identification, survey type, terrain, vegetation, weather, file names, time, equipment serial numbers, instrument battery voltages, and any other comments that may be important such as obstacles or detailed information regarding areas where they were unable to collect data. These data will be recorded manually on field data sheets or in a field log book. EM61-MK2 data will be collected in accordance with SOP 66 (Attachment 3).

Data Processing

Geophysical data reduction, analyses, and interpretation activities will be completed subsequent to data collection on a daily basis to verify that the survey objectives are met and to aid in the planning or modification, if necessary, of the next day's field activities. Upon completion of the geophysical survey each day, DGM data will be downloaded from the field data logging systems to a field computer.

Geophysical data will be processed and interpreted using instrument-specific software (Geonics' DAT61 MK2) in conjunction with Geosoft Oasis Montage v 8.0 software. Several steps will be implemented to process the geophysical data prior to analysis and interpretation. These steps include the following: proper positioning/translation of geophysical sensor data; shifting of sensor data to a common, relative background; and QC checks of the processed data. Upon completion of processing, high resolution color coded image maps depicting subsurface anomalies will be generated for each grid surveyed with the data displayed in appropriate measurements (e.g., millivolts).

The general processing steps that may be performed on the data include, but are not limited to the following:

- Positional offset correction
- Translation of local coordinate positions to project coordinates (e.g., State Plane system)
- Sensor bias, background leveling and/or standardization adjustment
- Sensor drift removal
- Latency or lag correction
- Geophysical noise identification and removal (spatial, temporal, motional, terrain induced)
- Gridding, and
- Map generation.

Data Interpretation

The Project Geophysicist will consider the following criteria for selecting and locating anomalies, supplemented by site and system specific criteria established during instrument verification:

- Maximum amplitude of the response with respect to local background conditions
- Footprint
- Decay curve characteristics
- Location of the response with respect to land features, cultural features, or utilities within or adjacent to the survey area
- Previous findings including the results of the Phase I investigation.

The attributes of an anomaly (shape and magnitude) are dependent upon the size, shape, orientation, depth, and electrical and magnetic properties of the subsurface object, along with the physical and chemical parameters of the surrounding soils. These attributes are also somewhat dependent upon the degree of cultural interference influencing the observed data. EM61-MK2 data will be processed and interpreted in accordance with SOP 67 (Attachment 3). Approximately 5 times the RMS background, as determined during the IVS, will be used to determine the depth to which a 37 mm can be detected in a horizontal orientation.

4.6.3 DGM Reporting

The RI report will include a summary of the data acquisition and processing activities and present the results of the DGM survey. Color-coded maps showing DGM anomaly locations will be generated using Geosoft for review by stakeholders during the target selection process and to be included in the RI report.

Also as part of the RI report, all geophysical field data will be provided in ASCII formatted files that include raw and processed data with delineated fields as x, y, z, v1, v2, and so on, where x and y are Pennsylvania South State Plane Coordinates in Easting (ft) and Northing (ft), and v1, v2, v3, and so on are the instrument readings. The last data field will be a time stamp. Each data field will be separated by a comma or tab. DGM maps will be output as ArcView shape files and georeferenced tagged image format files that can easily be imported to the project GIS.

4.7 ANOMALY INVESTIGATION

As discussed in Section 4.2, intrusive investigations will be conducted in the areas/locations identified on the accepted dig sheet. Investigations will be conducted using hand tools and up to a seven (7) person UXO team which would include three UXO Tech I's, one UXO Tech II, one UXO Tech III who will perform intrusive operations along with the SUXOS and one QC/Safety person (UXOQCS).

The UXO team will conduct a ferrous-detecting instrument-assisted (Schonstedt magnetometer or equivalent) survey/sweep within each of the lanes in the identified grids to reacquire the selected anomalies and mark the locations in each grid for intrusive investigation. During the intrusive investigation, if the team encounters Material Potentially Presenting an Explosive Hazard (MPPEH), the SUXOS and UXOQCS/UXOSO will inspect the item to determine condition of the item and to determine if the item is safe to move. If the item is determined to be MD, the SUXOS will direct the UXO Tech II or I to recover the MD and it will be removed from the area and stockpiled with other MD. If it determined that the item is MEC or cannot be certified as material documented as safe (MDAS), the SUXOS will mark and record the location of the item and the UXOQCS/ UXOSO will then notify the Harley-Davidson Project Champion with all the details and recommend a course of action for approval by Harley-Davidson. GPS coordinates will be collected and recorded for each intrusively investigated anomaly.

The locations will be mapped with GPS using electronic field tablets and coordinates will be transmitted by the Task Manager to the GIS Specialist who will incorporate the data into the master GIS. Data will be reviewed for completeness and accuracy. All GIS data will be provided to Harley-Davidson and the Leidos ArcGIS database manager for incorporation into the Harley-Davidson database.

4.7.1 High Density Areas

High Density Areas (Figure 3) includes approximately 15 grids including 6 full grids D3, E3, G3, H3, G5, and E5 (1.4 acres) along with 9 partial grids G4, H4, C5, D5, H5, I7, I8, J7, and J8 (approximately 1.95 acres). Based on the number of anomalies identified in Phase I, approximately 300 anomalies within the high density areas will be targeted for investigation. Approximately 30 anomalies per full grid and 14 anomalies per partial grid will be intrusively investigated. DGM and Phase I results will be used to target anomalies for intrusive investigations. The dig list and associated maps will be circulated to stakeholders prior to intrusive investigations for input.

4.7.2 Low Density Areas

The low density areas (Figure 4) includes about 14 acres covering remaining areas except areas where fill material (soils or landfill material) has been placed as discussed in Section 4.7.3. Based on the number of anomalies identified in Phase I, approximately 300 anomalies will be targeted for investigation in low density areas including 21 anomalies per acre and approximately 5 anomalies per grid for a full grid with less on partial grids. Anomaly counts and large diameter anomalies (which may be indicative of a disposal area) identified during the Phase I RI were noted on grid sheets. These large diameter anomalies will be targeted (biased) along with random anomalies in each grid. The dig list and associated maps will be circulated to stakeholder prior to intrusive investigations for input.

4.7.3 High Density - Landfill/Backfill Areas

The high density landfill/backfill areas consist of approximately 4.22 acres consisting of all or portions of 35 grids identified as A4, B4, C4, D4, E4, G4, B5, C5, D5, E5, G5, H5, I5, J5, B6, C6, D6, E6, G6, H6, I6, J6, B7, C7, D7, E7, G7, H7, D11, D12, D13, D14, E11, E12, and E13 (as shown in Figure 5). No intrusive investigations will be conducted in grids B5 and B6 as well as those portions of grids A4, B4, C4, D4, E4, G4, A5, C5, D5, E5, G5, H5, I5, J5, A6, C6, D6, E6, G6, H6, I6, J6, B7, C7, D7, E7, G7, H7, D11, D12, D13, D14, E11, E12, and E13 which are covered by fill.

4.7.4 Additional Anomaly Investigations

The only MEC found onsite were unfired or misfired inert items which were removed in 1993 from an area identified as the "misfire" pit. If MEC is encountered, the current conceptual site model will change and additional intrusive investigations may be necessary in one or more grids. The confidence is high that intrusive investigations for additional anomalies would not need to be completed; however, if MEC is found the project team will be contacted and a proposed path forward will be suggested. The path forward will likely suggest additional anomaly investigations in specific grids to determine nature and extent of the MEC. A letter WP addendum would be issued for review and approval based on the proposed path forward discussions.

4.8 MC SAMPLING

4.8.1 MC Soil Sampling

The objective of soil and groundwater sampling during Phase II of the RI is to characterize the vertical and horizontal extent of potential contamination within the fNYOP RI study area and to provide sufficient data to support a human health risk assessment, if needed. A review of Table 4-2 reveals that the areas sampled during the SI mainly had exceedances of background and ecological screening criteria as compared to SI screening criteria. A comparison of the results to the proposed RI screening criteria is presented in Table 4-3. Lead and Antimony exceed the PADEP Soil-to-Groundwater Numeric Values for Non-Residential, Used Aquifers (TDS <= 2,500) for AOC 1 and 2, and lead exceeded the same criteria in MRS 5. Lead also exceeded the EPA RSL Industrial Soil (mg/kg) in AOC 1; therefore, additional MC sampling is planned as part of the RI effort in AOC 1, AOC 2, and MRS 5. Additional locations may be added based on the results of the intrusive investigations.

The planned number of samples for MRS 5, AOC 1 and AOC 2 will be identified at the completion of the intrusive phase of the investigation. Sources used to identify sampling locations include the sample results from the SI (EA 2007), the results of the Phase I RI, the findings from the intrusive investigation, and the potential future site use. .

Based on historic munitions identified at the fYNOP study area, samples will be analyzed for select metals including antimony, barium, copper, lead, nickel, and zinc using USEPA Method 6020A. No MC associated with propellant or high explosive containing munitions have been identified at fYNOP; however, if items containing explosives are identified during the second phase of the RI, select explosives including 2,4-DNT, 2,6-DNT, and NG (by USEPA Method 8330A) can be added to the list of analyses. In the event an unexpected MEC/MD item is identified which is different from items previously encountered, a soil sample may be collected and analyzed for a different/tailored suite of explosives based on the item identification. The field team would contact Harley-Davidson and report the finding and request approval to expand the list of analytes. Additionally, since the nature of the anomalies identified during the Phase I RI is unknown, the potential exists that the proposed sample locations AOC 1, AOC 2 and MRS 5 may be expanded after intrusive investigations. Prior to conducting soil sampling, a sampling table with recommendations and associated rationale along with a figure will be presented to stakeholders for input/concurrence.

Soil sampling results will be screened against EPA RSL Industrial Soil (mg/kg), PADEP Direct Contact MSCs for surface soil 0-2 ft Industrial (mg/kg), PADEP Direct Contact MSCs for 2-15 feet, PADEP Soil-to-Groundwater Numeric Values for Non-Residential, Used Aquifers (TDS <= 2,500).

In accordance with Act 2 PA Law Section 50.311. 'Evaluation of ecological receptors' Section a, EA conducted an evaluation of the site to determine if the RI is required to assess impacts to ecological receptors from exposure to MC. EA completed the Pennsylvania Natural Diversity Inventory (PNDI) Coordination using the PADEP website (http://www.gis.dcnr.state.pa.us/hgis-er/PNDI_Introduction.aspx) to determine if any of the following are present in the MMRP response area:

(1) Individuals of threatened or endangered species as designated by the United States Fish and Wildlife Service under the Endangered Species Act (16 U.S.C.A. § § 1531—1544),
(2) Exceptional value wetlands as defined in § 105.17 (relating to wetlands),
(3) Habitats of concern,
(4) Species of concern.

The PNDI Coordination response indicates that no threatened or endangered species, exceptional value wetlands, habitats of concern, or species of concern are located on the MMRP site. A copy of the response is included in Attachment 5.

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Table 4-2 Summary of SI Soil Sampling Results Screened against Background and SI Screening Criteria

Analyte – Metals	**CAS**	**Unit**	USEPA Region III RBC Screening Value (1)	Ecological Screening Values	YNO-BG-SS-02-01	YNO-BG-SS-02-02	YNO-SW-SS-02-01	YNO-SW-SS-02-02	DUP#3 (Parent = YNO-SW-SS-02-02	YNO-TB-SB-12-01	YNO-TB-SS-02-01	YNO-TB-SS-02-02	**YNO-TB-SS-02-05(3)**	**YNO-TB-SS-02-06(3)**
					7/12/2007	7/12/2007	7/12/2007	7/12/2007	7/12/2007	7/12/2007	7/12/2007	7/12/2007	7/13/2007	7/12/2007
					SI Background Data	SI Background Data	AOC 1	AOC 1	AOC 1	AOC 2	AOC 2	AOC 2	AOC 2	AOC 2
ALUMINUM	7429-90-5	mg/kg	100000	pH > 5.5	10900	10700	9840	10000	1720	11100	1230	1240	538	1540
ANTIMONY	7440-36-0	mg/kg	41	0.27	0.3 UL	*0.35 L*	*0.3 L*	0.28 UL	*29.6 L*	2.3 L	*1.3 L*	*7.1 L*	***14800 L***	*18.9 L*
BARIUM	7440-39-3	mg/kg	20000	330	149	121	110	159	315	167	129	*983*	***377***	246
COPPER	7440-50-8	mg/kg	4100	28	8.2	7.9	8.7	7.2	*196*	76.2	*81.7*	*472*	***85700***	*314*
IRON	7439-89-6	mg/kg	72000	NUT	12900	13900	16800	17500	3250	29400	3950	13700	9280	4070
LEAD	7439-92-1	mg/kg	800	11	*27.6*	*22*	*29.4*	*36.3*	***964***	485	*36.7*	*305*	***122000***	*576*
NICKEL	7440-02-0	mg/kg	2000	38	8.2	6.3	7.5	8.5	33.4	27.4	23.1	8.7	*149*	20.7
ZINC	7440-66-6	mg/kg	31000	50	41.2 J	34.9 J	36.1 J	31.3 J	*215 J*	479 J	48.1 J	*1110 J*	***10000 J***	*179 J*

(1) USEPA Risk-Based Concentrations (RBCs) Table, USEPA, April 2007. For non-carcinogens, value shown is equal to 1/10 the industrial soil RBC value. For carcinogens the value shown is equal to the industrial soil RBC value. The lead screening value does not show up in the USEPA Region III RBC table, however under Frequently Asked Questions (FAQ) for the USEPA Region III RBC website (Found at http://www.epa.gov/reg3hwmd/risk/human/info/faq.htm) FAQ No. 6 specifically addresses the question of screening lead because no values are shown on their table. EPA's recommendation is to utilize the IEUBK blood lead model for soil, and the MCL of 15 ug/L for water. It is on the basis of this FAQ that the industrial screening value based on blood lead levels in unborn children (the EPA adult lead model) has been used to establish the lead screening value.

(2) Subsurface soil results (denoted with an SB in the label) were not screened against ecological screening criteria in accordance with risk screening guidance.

(3) Sample SS-02-05 was collected from a pile of dust material associated with the former firing range air handling system which has since been removed from the site.

SB=subsurface soil
SS=surface soil
J=Analyte is present. Reported value may not be accurate or precise.
L=Analyte is present. Reported value may be biased low. Actual value is expected to be higher.
U=Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
UL=Not detected, quantitation limit is probably higher.
mg/kg=milligrams per kilogram
CAS=Chemical Abstract Service
NA=not available
NSL=No Screening Level
NUT=Essential Nutrient
CAS=Chemical Abstract Service

Notes:
Shaded and bolded values represent exceedance of human health screening criteria.
Shaded and italicized values represent exceedance of ecological screening criteria.
Shaded, bolded and italicized values represent exceedance of both human health and ecological screening criteria.
Pink designates max detections greater than screening criteria for an MRS or AOC (dust sample not included).

Table 4-2 Summary of SI Soil Sampling Results Screened against Background and SI Screening Criteria

Analyte – Metals	**CAS**	**Unit**	USEPA Region III RBC Screening Value [(1)]	Ecological Screening Values	YNO-BG-SS-02-01	YNO-BG-SS-02-02	YNO-DU-SB-12-01	YNO-DU-SS-02-01	YNO-DU-SS-02-02	YNO-MP-SB-60-01	YNO-MP-SB-60-02	DUP#2 (parent = YNO-MP-SB-60-02)	YNO-TB-SB-12-02	YNO-TB-SS-02-03	YNO-TB-SS-02-04
					7/12/2007	7/12/2007	7/12/2007	7/12/2007	7/12/2007	7/13/2007	7/13/2007	7/13/2007	7/12/2007	7/12/2007	7/12/2007
					SI Background Data	SI Background Data	MRS 3	MRS 3	MRS 3	MRS 2	MRS 2	MRS 2	MRS 5	MRS 5	MRS 5
ALUMINUM	7429-90-5	mg/kg	100000	pH > 5.5	10900	10700	10600	13700	8270	11100	14600	15400	14400	8560	14600
ANTIMONY	7440-36-0	mg/kg	41	0.27	0.3 UL	*0.35 L*	0.27 UL	*0.41 L*	*0.88 L*	0.25 UL	*0.35 L*	0.29 UL	0.26 UL	*1.4 L*	*0.63 L*
BARIUM	7440-39-3	mg/kg	20000	330	149	121	143	106	98.4	66.1	77.6	79.4	87.9	*347*	120
COPPER	7440-50-8	mg/kg	4100	28	8.2	7.9	*49.7*	19.6	13	7.3	9.4	10	9.1	*444*	17.9
IRON	7439-89-6	mg/kg	72000	NUT	12900	13900	15600	22300	12800	13000	15100	15300	17200	24300	24600
LEAD	7439-92-1	mg/kg	800	11	*27.6*	*22*	*101*	*66.9*	*54.3*	19.9	11.5	12.3	16.4	*746*	*45.7*
NICKEL	7440-02-0	mg/kg	2000	38	8.2	6.3	7.9	12.1	8.7	9.7	7.6	8	7.6	13.2	12.8
ZINC	7440-66-6	mg/kg	31000	50	41.2 J	34.9 J	*68.8 J*	*87.8 J*	*65.2 J*	24 J	23.6 J	25.7 J	31.8 J	*923 J*	*69.8 J*

(1) USEPA Risk-Based Concentrations (RBCs) Table, USEPA, April 2007. For non-carcinogens, value shown is equal to 1/10 the industrial soil RBC value. For carcinogens the value shown is equal to the industrial soil RBC value. The lead screening value does not show up in the USEPA Region III RBC table, however under Frequently Asked Questions (FAQ) for the USEPA Region III RBC website (Found at http://www.epa.gov/reg3hwmd/risk/human/info/faq.htm) FAQ No. 6 specifically addresses the question of screening lead because no values are shown on their table. EPA's recommendation is to utilize the IEUBK blood lead model for soil, and the MCL of 15 ug/L for water. It is on the basis of this FAQ that the industrial screening value based on blood lead levels in unborn children (the EPA adult lead model) has been used to establish the lead screening value.

(2) Subsurface soil results (denoted with an SB in the label) were not screened against ecological screening criteria in accordance with risk screening guidance.
SB=subsurface soil
SS=surface soil
J=Analyte is present. Reported value may not be accurate or precise.
L=Analyte is present. Reported value may be biased low. Actual value is expected to be higher.
U=Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
UL=Not detected, quantitation limit is probably higher.
mg/kg=milligrams per kilogram
CAS=Chemical Abstract Service
NA=not available
NSL=No Screening Level
NUT=Essential Nutrient
CAS=Chemical Abstract Service

Notes:
Shaded and bolded values represent exceedance of human health screening criteria.
Shaded and italicized values represent exceedance of ecological screening criteria.
Shaded, bolded and italicized values represent exceedance of both human health and ecological screening criteria.
Pink designates max detections greater than screening criteria for an MRS or AOC (dust sample not included).

Table 4-3 Summary of SI Soil Sampling Results fYNOP Screened against Current Screening Criteria

Analyte – Metals (1)	CAS	Unit	EPA RSL Industrial Soil (mg/kg)(2)	PADEP Direct Contact MSCs for surface soil 0-2 ft Industrial (mg/kg) (3)	PADEP Direct Contact MSCs for 2-15 feet(3)	PADEP Soil-to-Groundwater Numeric Values for Non-Residential, Used Aquifers (TDS <= 2,500) (3)	YNO-SW-SS-02-01	YNO-SW-SS-02-02	DUP#3 (Parent = YNO-SW-SS-02-02	YNO-TB-SB-12-01	YNO-TB-SS-02-01	YNO-TB-SS-02-02	YNO-TB-SS-02-05(4)	YNO-TB-SS-02-06(4)
							7/12/2007	7/12/2007	7/12/2007	7/12/2007	7/12/2007	7/12/2007	7/13/2007	7/12/2007
							AOC 1	AOC 1	AOC 1	AOC 2	AOC 2	AOC 2	AOC 2	AOC 2
ANTIMONY	7440-36-0	mg/kg	470	1,100	190,000	27	0.3 L	0.28 UL	**29.6 L**	2.3 L	1.3 L	7.1 L	**14800 L**	18.9 L
BARIUM	7440-39-3	mg/kg	220,000	190,000	190,000	8,200	110	159	315	167	129	983	377	246
COPPER	7440-50-8	mg/kg	47,000	100,000	190,000	43,000	8.7	7.2	196	76.2	81.7	472	85700	314
LEAD	7439-92-1	mg/kg	800	1,000	190,000	450	29.4	36.3	**964**	**485**	36.7	305	**122000**	**576**
NICKEL	7440-02-0	mg/kg	22,000	56,000	190,000	650	7.5	8.5	33.4	27.4	23.1	8.7	149	20.7
ZINC	7440-66-6	mg/kg	350,000	190,000	190,000	12,000	36.1 J	31.3 J	215 J	479 J	48.1 J	1110 J	10000 J	179 J

Notes:

(1) Aluminum and Iron were removed from the original list of SI results for this comparison as these are essential nutrients. Explosives were non-detect so these are not shown.

(2) USEPA Regional Screening Level (RSL), for industrial sites effective November 2015.

(3) Pennsylvania Act 1995-2, known as "Act 2", established a program for recycling existing industrial and commercial sites. Values are from Chapter 250 of the Pennsylvania Code, "Administration of Land Recycling Program", Subchapter C, "Statewide Health Standards", "Medium-Specific Concentrations" (MSC) and Soil to Groundwater values effective 1/8/2011.

(4) Sample SS-02-05 was collected from a pile of dust material associated with the former firing range air handling system which has since been removed from the site.

SB=subsurface soil
SS=surface soil
J=Analyte is present. Reported value may not be accurate or precise.
L=Analyte is present. Reported value may be biased low. Actual value is expected to be higher.
U=Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
UL=Not detected, quantitation limit is probably higher.
mg/kg=milligrams per kilogram
CAS=Chemical Abstract Service
CAS=Chemical Abstract Service
Shaded and bolded values represent exceedance of one or more screening criteria.

Table 4-3 Summary of SI Soil Sampling Results fYNOP Screened against Current Screening Criteria

Analyte – Metals(1)	CAS	Unit	EPA RSL Industrial Soil (mg/kg)(2)	PADEP Direct Contact MSCs for surface soil 0-2 ft Industrial (mg/kg)(3)	PADEP Direct Contact MSCs for 2-15 feet(3)	PADEP Soil-to-Groundwater Numeric Values for Non-Residential, Used Aquifers (TDS <= 2,500)(3)	YNO-DU-SB-12-01 7/12/2007 MRS 3	YNO-DU-SS-02-01 7/12/2007 MRS 3	YNO-DU-SS-02-02 7/12/2007 MRS 3	YNO-MP-SB-60-01 7/13/2007 MRS 2	YNO-MP-SB-60-02 7/13/2007 MRS 2	DUP#2 (parent = YNO-MP-SB-60-02) 7/13/2007 MRS 2	YNO-TB-SB-12-02 7/12/2007 MRS 5	YNO-TB-SS-02-03 7/12/2007 MRS 5	YNO-TB-SS-02-04 7/12/2007 MRS 5
ANTIMONY	7440-36-0	mg/kg	470	1,100	190,000	27	0.27 UL	*0.41 L*	*0.88 L*	0.25 UL	*0.35 L*	0.29 UL	0.26 UL	*1.4 L*	*0.63 L*
BARIUM	7440-39-3	mg/kg	220,000	190,000	190,000	8,200	143	106	98.4	66.1	77.6	79.4	87.9	*347*	120
COPPER	7440-50-8	mg/kg	47,000	100,000	190,000	43,000	*49.7*	19.6	13	7.3	9.4	10	9.1	*444*	17.9
LEAD	7439-92-1	mg/kg	800	1,000	190,000	450	*101*	*66.9*	*54.3*	19.9	11.5	12.3	16.4	*746*	*45.7*
NICKEL	7440-02-0	mg/kg	22,000	56,000	190,000	650	7.9	12.1	8.7	9.7	7.6	8	7.6	13.2	12.8
ZINC	7440-66-6	mg/kg	350,000	190,000	190,000	12,000	*68.8 J*	*87.8 J*	*65.2 J*	24 J	23.6 J	25.7 J	31.8 J	*923 J*	*69.8 J*

Notes:

(1) Aluminum and Iron were removed from the original list of SI results for this comparison as these are essential nutrients. Explosives were non-detect so these analytes are not shown.
(2) USEPA Regional Screening Level (RSL), for industrial sites effective November 2015.

(3) Pennsylvania Act 1995-2, known as "Act 2", established a program for recycling existing industrial and commercial sites. Values are from Chapter 250 of the Pennsylvania Code, "Administration of Land Recycling Program", Subchapter C, "Statewide Health Standards", "Medium-Specific Concentrations" (MSC) and Soil to Groundwater values effective 1/8/2011.
SB=subsurface soil
SS=surface soil
J=Analyte is present. Reported value may not be accurate or precise.
L=Analyte is present. Reported value may be biased low. Actual value is expected to be higher.
U=Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
UL=Not detected, quantitation limit is probably higher.
mg/kg=milligrams per kilogram
CAS=Chemical Abstract Service
Shaded and bolded values represent exceedance of one or more screening criteria.

MC soil sample locations will be mapped with GPS and coordinates will be transmitted daily by the Task Manager to the GIS Specialist who will incorporate the data into GIS. Data will be reviewed for completeness and accuracy. All data will be provided to Harley-Davidson project ArcGIS database manager (refer to Attachment 1) for additional details.

Surface and near surface soil samples will be conducted using a hand auger. A surface sample (0-1 ft bgs) will be collected from the upper few inches of soil, below any leaf litter. Following collection of the surface sample, the hand auger will be advanced approximately two feet below the surface sample depth, and the subsurface sample collected. Soil sampling will only be performed in those areas where subsurface anomalies are not present. The depth of the subsurface sample will be recorded in the field notebook. Following sample collection, the soil will be replaced in the auger hole and the auger will be decontaminated using a Liquinox®, nitric acid, and water rinse. The decontamination fluid will be containerized in a 5-gallon bucket and transferred to a labeled, 55-gallon polyethylene drum to be housed in Building 14, pending analysis and disposal.

If during nature and extent intrusive investigation activities, a breeched MEC item is found, sampling will be conducted by appropriate personnel, namely the SUXOS or designee with oversite by the SUXOS following direction from the UXOSO and a determination that the sample location is safe. The sampler will don protective equipment (i.e. gloves) to protect the sampler from contaminant exposure. A discrete soil sample will be collected beneath the item and analyzed for a tailored suite of explosives (USEPA Method 8330A) based on the item identified. Soil sampling will be conducted in accordance with SOP 025 (Attachment 1). In the event a MEC item is identified which is different from the items previously encountered, a soil sample may be collected and analyzed for a different/tailored suite of explosives based on item identified. The field team would contact Harley-Davidson and report the finding and request approval to expand the list of analytes.

Quality assurance/quality control (QA/QC) samples including field duplicates, matrix spike/matrix spike duplicates, rinsate blanks, and equipment blanks will be collected in accordance with Chapter 5 and Appendix B of the Phase I Work Plan (Attachment 1).

Sample designation/labeling will be completed in accordance with Table B-3, which is included in Appendix F of the Phase I Work Plan (Attachment 1).

4.8.2 MC Groundwater Sampling

As noted in Table 4-1, groundwater sampling would be proposed for those locations where a potentially complete pathway is found to exist based on the review of the soil sampling results with stakeholders. The following conditions would be indicative of a potentially complete groundwater pathway:

If there are exceedances of the soil to groundwater criteria and

1) Vertical delineation is not achieved (i.e. the buffer distance from the bottom of the contamination to groundwater or bedrock (which ever one comes first) is not achieved, or
2) Karst is present within 100 ft of the soil to groundwater exceedance(s).

Groundwater sampling will be discussed and likely proposed for those locations where exceedances of soil to groundwater criteria are occurring and where vertical delineation is not achieved which is demonstrated where:

1) the buffer distance from the bottom of the contamination to groundwater or bedrock (which ever one comes first) is not achieved or,

2) there is Karst within 100 ft of the exceedances.

After completing the intrusive investigations and soil sampling, a table and figure(s) will be developed confirming proposed groundwater sampling locations, if applicable based on soil exceedances and findings related to the intrusive investigations. The recommendation s (well locations, well depth, rationale for sampling, analytes, etc.) would be passed on to stakeholders for input. Groundwater sampling, if recommended based on the aforementioned findings, would occur as a follow-on phase.

It is noted that several existing wells are located within the RI study area (Figure 4-7). EA reviewed existing well data for wells located in the RI study area boundary to include groundwater levels measured during the 2009 Key Well Event as listed in Table 2.4-1 of the 2011 Groundwater SI report. Monitoring wells located within the RI boundary had measured depths to groundwater of 11.52 ft (MW-17), 20.85 ft (MW-19), 5.7 ft (MW-68), 6.31 ft (MW-69), 16.55 ft (MW-70D), 16.61ft (MW-70S), 7.8 ft (MW-86D), 10.13 ft (MW-86S), and 28.19 ft (MW-104) (Figure 7).. Based on previous soil sampling results it is anticipated that EA may use existing wells and potentially install additional groundwater monitoring wells downgradient of MRS 3, MRS 5, AOC 1, and AOC 2 to determine if historic munitions operations in these areas have impacted site groundwater. As discussed previously the rationale for installing any new wells or sampling any existing wells will be documented and provided to stakeholders for input prior to sampling.

Proposed monitoring wells, if necessary, will be installed using a hollow stem auger drill rig. Based on existing information, it is anticipated that well depths would be between 10.7 ft and 33.19 ft, averaging approximately 25-ft below ground surface (bgs). A 2-inch diameter, schedule-40 polyvinyl chloride (PVC) casing with 5-ft of 0.010 slot PVC screen at the base will be installed to at least 5 ft below shallowest groundwater level.. The wells will be completed as a 6-inch diameter steel stick-up with a 24-inch concrete base. Following completion of the monitoring wells, the wells will be developed for a minimum of 2 hours in accordance with SOP 019 (Attachment 3).

Following installation of the monitoring wells, it is anticipated that one round of groundwater samples will be collected from wells identified in accordance with SOP 013 (Attachment 3). Samples would likely be analyzed for select total metals and select dissolved metals to include barium, copper, lead, nickel, and zinc using USEPA Method 6020A. No propellant or high-explosive containing munitions have been identified at fYNOP; however, if items containing explosives are identified during the second phase of the RI, select explosives including 2,4-DNT, 2,6-DNT, and NG using USEPA Method 8330A will be added to the list of analytes.

Quality assurance/quality control (QA/QC) samples including field duplicates, matrix spike/matrix spike duplicates, rinsate blanks, and equipment blanks will be collected in accordance with Chapter 5 and Appendix B of the Phase I Work Plan.

4.8.3 Additional Media Sampling

Eight samples associated with Building 14 will be collected to assess potential MC residuals remaining in Building 14. Discrete sampling will be conducted in the air handling/bag house area of Building 14 (2 samples of media present in and around the baghouse drum) and outside the door of the sand handling/filter area (3 locations with two samples from each location – consisting of dust/soils around the area). Three samples will also be collected from different locations in the backstop sand in Building 14. No technicians will enter the confined spaces, such as the mechanical areas, sumps, elevator shafts, or any other areas of the backstop not designed specifically for human ingress/egress. Samples will be analyzed for the target list of metals shown in Table 4-2 and a refined explosives list as discussed below.

4.8.4 Additional MC Sampling

The only MEC found onsite were unfired or misfired inert items which were removed in 1993 from an area identified as the “misfire” pit. If MEC is encountered, the current conceptual site model will change and additional soil and/or groundwater sampling may be necessary in one or more grids. The confidence is high that additional sampling due to the presence of MEC would not need to be completed; however, if MEC is found the project team will be contacted and a proposed path forward will be proposed. The path forward will likely include additional MC samples (soil and/or groundwater) for explosives in specific grids where MEC is found to determine nature and extent of the MC based on the proposed path forward discussions.

In addition the nature of the anomalies identified during Phase I is unknown, but many will be investigated during the Phase II efforts. If additional saturated areas of MEC or MD are found outside of planned sampling areas, additional sampling may be required. The project team will be contacted and a proposed path forward will be suggested prior to conducting additional sampling. The path forward will likely include additional MC samples in specific grids where saturated areas of MD or MEC are found to determine nature and extent of the MC based on the proposed path forward discussions.

4.8.5 Sample Custody and Documentation

MC soil sample locations will be mapped with GPS and coordinates will be transmitted daily by the Task Manager to the Geographic Information System (GIS) Specialist who will incorporate the data into GIS. Data will be reviewed for completeness and accuracy. All data will be provided to Harley-Davidson project ArcGIS database manager (refer to section 5.9 for additional details).

4.8.6 Sample Custody and Documentation

Chain of Custody (COC) forms will be initiated by the field personnel at the time samples are collected for contract laboratory analysis. The COC will be transported with the samples to Test America Denver where the sample custodian will accept custody of the samples by signing the COC. A copy of the COC will be retained onsite. An example of the laboratory COC form is provided in Attachment 1, Appendix D. Field personnel will enter site-specific information at the top of the form and specific sample information into the following areas:

- Sample designation (e.g., MRS 1-SS-01)
- Date and time (military time, i.e., 0800, 1300, etc.) of sample collection
- Check the “Grab” column indicating that the sample cores represent discrete sampling intervals
- Requested analytical name and parameter (e.g., Metals 6020A) for each sample
- Enter his/her signature and enter the date and time (military time), enter printed version of his/her name, and his/her title in the appropriate boxes at the bottom of the form
- Indicate the required turn-around-time and requested Matrix Spike/Matrix Spike Duplicate (MS/MSD), if applicable, in the “comments” section on the right side of the form.

Custody seals will be used on the shipping containers to ensure the integrity of the samples should they be left unattended or when they are relinquished to a delivery service until the shipping containers are opened by the laboratory. All samples will be shipped in insulated shipping containers, and each shipping container will be sealed with at least two custody seals at opposite corners of the container and covered with clear packing or strapping tape. The seals will be affixed to each shipping container so that it is necessary to break the seals to open the shipping container.

4.8.7 Sample Packing and Shipping

Samples will be placed into the appropriate containers with applicable preservatives. A label indicating the sample designation, sample interval, sample date and time, and requested analysis will be placed on each container. Sample containers will be individually wrapped in bubble wrap and placed in zipper-type plastic bags.

Samples will then be placed into coolers for transportation to the laboratory for analysis. Samples will be placed on ice, if required, prior to and during shipment to the laboratory. Bubble wrap will be used to line the bottom and sides of the sample cooler and fill voids where needed to cushion the sample containers during transportation. The completed COC representing the packaged samples will be taped to the inside of the cooler lid. The required turnaround time will be noted on the COC. The request for MS/MSD analysis, if required, will also be noted on the COC. A copy of the COC will be maintained onsite. The cooler will be sealed with packing tape and custody seals, and delivered via courier to:

Test America Denver
4955 Yarrow Street,
Arvada, Colorado 80002
Phone: (303)736-0156
www.testamericainc.com
Attention: Sample Custodian

4.8.8 Field Documentation

To streamline field data collection for daily reporting purposes and long-term data storage, EA will employ a customized ArcGIS-based data collection system. The data collection system will utilize Apple iPad tablets for all UXO field data collected, and online web-based forms for all administrative reporting requirements in order to complete the daily reporting process. Using a customizable version of ESRI's Data Collector app, field data, including GPS locations and photographs, will be entered into the Data Collector app on the iPad and uploaded to a SQL Database located on EA's secure network via an internet connection. This process may occur in real-time if a cellular connection is available, or at the end of the day when the iPads are brought within range of a Wi-Fi connection. The SUXOS and UXOQCS/UXOSO will complete their respective forms directly into a secure website which is linked to the EA SQL database. Once the administrative forms and field data from the tablets have been uploaded to the database, the daily reports can be produced via an automated process that complies the field data and administrative data into the SUXOS Daily Report which can then be exported as a signed PDF document. Accompanying progress maps can also access the spatial locations of the field data stored in the SQL Database to provide up-to-date visualizations of project status. Field documentation for MC sampling to include field logs, calibration logs, quality control reports, Health and Safety reporting, photologs, etc. will be collected during field operations. Additional guidance concerning field logs is included in Attachment 3 – SOPs (SOP 5 Field Log Books).

Original field logs and records will be maintained by the PM as part of the project files. The initial project file will be structured to include a copy of the following documents and information:

- Schedule and progress reports
- Work plans, industry standards, and procedures including addenda and modifications
- Work orders and other contract modifications
- UXO information forms/daily reports/incident reports (if MEC is found)/safety information
- Equipment manufacturer's certificates
- Equipment check records
- Location and survey records
- Telephone conversation logs
- Meeting minutes and agenda
- Inspection logs and schedules
- Site maps

- Qualifications and training records of all site personnel
- Photo documentation
- Non-conformance and corrective action reports.

The filing structure may be expanded or reduced as necessary to include relevant information. Additional details regarding record collection and related QC are provided in Section 5.7 of the original Phase I work plan (Attachment 1).

4.9 MUNITIONS MATERIAL MANAGEMENT AND DISPOSAL

4.9.1 MD Inspection and MDAS Storage and Disposition

MD will be inspected in accordance with DoD Instruction 4140.62/DoD 6055.9-M and EM 385-1-97. MD inspection procedures are detailed in SOP 012 (Attachment 3), Munitions Debris Inspection. MDAS will be stored in 55-gallon drums or other suitable sealable and lockable containers, which will be shipped to a recycling facility pending Harley-Davidson approval for final disposition. Disposal will be coordinated with Harley-Davidson. Total weight of MDAS is documented during certification and verified upon receipt by the recycle facility. Each container is kept closed and locked, except when materials are being loaded into the container or the contents of the container are being inspected. Each container is closed in a manner that requires that the container seal be broken to gain access to the interior of the container. The plan is to use 55-gallon, sealable/ drums, which will be stored inside Building 14. With Harley-Davidson approval, the material will be shipped to a recycle facility, at the end of the project or periodically, as required, for final disposition. Refer to SOP 012 (Attachment 3) for additional details.

4.9.2 MEC Removal and Demolition Procedures

EA will not be removing or disposing of MEC or MPPEH (items that cannot be confirmed as MEC or MD based on conditions of the items). In the event MEC or MPPEH is identified, the item location will be flagged, GPS coordinates will be collected and the Harley-Davidson Project Champion or designee will be notified. The Harley-Davidson Project Champion or designee will contact the local authority (i.e. Springettsbury Township) to arrange for disposal of any suspect MEC or MPPEH identified.[6]

4.10 INVESTIGATIVE-DERIVED WASTE PLAN

Investigative-derived waste generated during the RI field efforts is expected to consist of non-munitions debris, removed during the magnetometer assisted surface clearance and/or intrusive

[6] If notified by Harley-Davidson, EA will engage in discussions with Harley-Davidson, USACE and additional stakeholders if necessary to include DEP Bureau of Mines in the Pottsville Office to identify necessary procedures and approvals to place a Type II, Bureau of Alcohol, Tobacco, and Firearms (ATF) approved, temporary magazine on-site for storage of suspect MEC items. The determination to store items in the magazine will be dictated by Harley-Davidson.

investigations, as well as expendable materials used in completing the investigation (disposable gloves, general trash).

4.10.1 NMRD Disposal

During the subsurface investigations NMRD that is located will be inspected, removed from the RI investigation grids, and stockpiled for disposition or recycling in accordance with local, and State laws and regulations by Harley-Davidson. All recycling or disposal operations will be coordinated with Harley-Davidson. EA will not be performing subsurface clearance to remove subsurface debris in the existing landfill/disposal areas noted in Figure 5.[7]

4.10.2 Decontamination Materials

All non-disposable equipment will be decontaminated. All decontamination fluids will be collected, containerized, characterized, and disposed in accordance with State laws and regulations. Disposable sampling equipment will be utilized when possible and will be disposed of as general refuse.

4.10.3 Other

Vegetation removed (i.e. mulched) during site clearing activities will be left as ground cover. Any vegetation, or debris from tree removal, will be taken off-site and recycled (if possible) at a location approved by the Harley-Davidson Project Champion. Other waste materials generated during the RI will be collected, removed from the site, and disposed in accordance with local and State laws and regulations. Anticipated wastes will consist primarily of sampling materials (i.e. gloves, scoops, etc.), waste paper, food and beverage containers, and expendables. As practicable, any recyclable material will be segregated for disposal at a State licensed recycling facility. EA will not comingle RI waste materials with existing Harley-Davidson waste streams without permission from the Harley-Davidson Project Champion.

4.11 MEC HAZARD ASSESSMENT

If MEC is identified during the RI, EA will prepare a risk assessment for MEC using the MEC Hazard Analysis (USEPA 2008) as a qualitative assessment to evaluate the MEC risk present. Alternatively, if MEC is not identified during the RI, EA will complete a MEC probability assessment as per EPA 505B08001, DoD 6055.9-M, USACE EM 385-1-97, and EM 200-1-15 (Technical Guidance For Military Munitions Response Actions. A summary of the MEC HA process is provided below.

A qualitative MEC screening-level risk assessment for potential explosive safety risks will be conducted based on data gathered up to through the RI. An explosive safety risk is the probability for a MEC item to detonate and potentially cause harm as a result of human activities. An explosive safety risk exists if a person can come near or in contact with MEC and

[7] A known disposal area exists within the RI footprint area. This area will not be cleared of any surface debris unless MEC/MD is identified. If MEC or MD is identified EA will communicate with the Harley-Davidson Project Champion to determine the path forward.

act on it to cause a detonation. The potential for an explosive safety risk depends on the presence of three elements: a source (presence of MEC), a receptor (person), and interaction (e.g., touching or picking up an item).

The exposure route for a MEC receptor typically is direct contact with a MEC item on the surface or through subsurface activities (e.g., digging during construction activities). MEC tends to remain in place unless disturbed through human activity or other natural forces (e.g., storm events, frost heaving, or erosion). If MEC movement occurs, the probability of direct human contact may increase, but may not necessarily result in direct contact or exposure.

Each of these primary risk factors will be used to evaluate the field and historic data to generate an overall hazard assessment rating of either low, moderate, or high. The MEC source is based on the MEC type, sensitivity, density, and depth distribution. The likelihood of exposure and thereby injury may be severe (lethal if detonation occurs), moderate (minor or major injury if detonation occurs), or low (no detonation, and consequently, injury occurs). MEC sensitivity, the likelihood of detonation and severity of exposure (fuzing and weathering, for instance), may be very sensitive (e.g., electronic fuzing, land mines, booby traps), less sensitive (standard fuzing), and insensitive/inert (residual risk or no injury).

Site characteristics are based on site accessibility (no restrictions, limited restrictions, and complete restrictions to access) and site stability (stable, moderately stable, and unstable). Finally, human interaction includes the type of human contact (low, moderate, and significant) and population number and frequency of access (low, moderate, high). Possible receptors will include residents, site workers, construction workers, and recreational users.

Based on these criteria, low, moderate, and high MEC risks are defined in Table 4-4. As noted in work plan (Attachment 1) the SI concluded that there is a low risk of MEC at fYNOP (low probability of encountering MEC) given previous removal actions and findings to date.

Table 4-4: Low, Moderate, and High Munitions and Explosives of Concern Risk Assessment Categories

MEC Factor	Low MEC Risk	Moderate MEC Risk	High MEC Risk
MEC Source	Low MEC Type (no detonation and no injury) Insensitive/Inert MEC	Moderate MEC Type (minor/major injury) Moderate Sensitive MEC	Severe MEC Type (lethal) Very Sensitive MEC
Site Characteristics	Complete restrictions to access Stable (no MEC exposure by natural events)	Limited restrictions to access Moderately stable (MEC may be exposed by natural events)	No restrictions to access Unstable (MEC exposure most likely by natural events)
Human Interaction	Low potential for and frequency of contact (e.g., no general public access, infrequent site access primarily by site personnel, no subsurface activity)	Moderate potential for and frequency of contact (e.g., a limited number of the general public has open and somewhat frequent access, few site uses, surface/subsurface intrusive activity possible)	High potential for and frequency of contact (e.g., general public has open and frequent access, high potential for surface/subsurface intrusive activity)

4.12 MUNITIONS CONSTITUENTS BASELINE RISK ASSESSMENT

A baseline human health risk assessment may be required to assess risk at the site. The latest USEPA risk assessment guidance (RAGS) and PADEP Act 2 will be used for conducting this risk assessment.

The screening levels established in Chapter 5 will be used to determine chemicals of potential concern to be included in the baseline risk assessment. Screening levels for the protection of human health include USEPA Regional Screening Levels (RSLs) and PADEP Act 2 PADEP Medium-Specific Concentrations for residential soils. The RSLs for non-carcinogenic compounds, except lead, will be divided by 10 to account for potential occurrence of adverse non-carcinogenic health effects due to exposure to multiple non-carcinogens.

4.13 FOLLOW-ON ACTIVITIES

Following completion of field activities an RI report will be prepared to document the results of the RI field activities and any risk to human receptors from MEC or MC in MRSs 2 through 5 and AOCs 1 and 2. EA will refine the definition of MRS 1 (within the west parking lot, adjacent to the West Campus) with a combination of historical photographs, historical aerial photographs, and the 1995 Archive Search Report prepared by the USACE (USACE 1995) to support a path forward for MRS 1.

Based on the findings of the RI, Harley-Davidson may use the data to support further action, evaluate alternatives, and develop cost estimates for further action, if warranted. Follow on activities beyond the RI Report are not part of the current authorized tasks.

5. QUALITY ASSURANCE PROJECT PLAN

Chapter 5 of the work plan as written is still valid for the planned soil sampling (Attachment 1). Chemical specific measurement quality objectives for groundwater has been added as well as quality control procedures related to geophysics and intrusive investigations.

5.1 ANALTYICAL PROCEDURES

Chemical specific measurement quality objectives for groundwater and soil are presented below in Tables 5-1 and 5-2. The only analyte for soils where the laboratory method detection limit exceeds the screening criteria is nitroglycerine. Nitroglycerine was used in trace amounts with dinitrotoluene as part of the primer/propellant in the munitions items fired onsite. No evidence of nitroglycerine, 2,4-Dinitrotoluene or 2,6-Dinitrotoluene was found in the MRSs and AOCs being investigated as part of the RI (either during the TCRA or during the SI). Furthermore, nitroglycerine is expected to be co-located with 2,4-Dinitrotoluene and 2,6-Dinitrotoluene, and or 2,4-Dinitrotoluene has acceptable method detection limits; therefore, the analytical methods selected are appropriate to meet DQOs, and the reporting limits are adequate to produce reliable data which can be used during the RI for decision making purposes.

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Table 5-1. Evaluation of Potential Chemical-Specific Measurement Quality Objectives for Soil

Analyte (Abbreviation)	Chemical Abstract Service Number	EPA RSL Industrial Soil (mg/kg)	PADEP Direct Contact MSCs for surface soil 0-2 ft Industrial (mg/kg)	PADEP Direct Contact MSCs for 2-15 feet	PADEP Soil-to-Groundwater Numeric Values for Non-Residential, Used Aquifers (TDS <= 2,500)	Lab Method Limit of Detection (MDL) (mg/kg)	Lab Reporting Limit (RL) (mg/kg)
2,4-Dinitrotoluene (2,4-DNT)	121-14-2	7.4	260	190,000	***0.2***	0.0498	0.25
2,6-Dinitrotoluene (2,6-DNT)	606-20-2	1.5	2,800	190,000	3	0.0542	0.25
Nitroglycerin (NG)	55-63-0	82	280	10,000	***0.056***	0.78	5.1
Antimony (Sb)	7440-36-0	470	1,100	190,000	27	0.014	0.2
Barium (Ba)	7440-38-2	220,000	190,000	190,000	8,200	0.071	0.25
Copper (Cu)	7440-50-8	47,000	100,000	190,000	43,000	0.071	2.5
Lead (Pb)	7439-92-1	800	1,000	190,000	450	0.018	0.4
Nickel (Ni)	7440-02-0	22,000	56,000	190,000	650	0.025	0.35
Zinc (Zn)	7440-66-6	350,000	190,000	190,000	12,000	0.3	2.5

Notes:

Table 5-2. Evaluation of Potential Chemical-Specific Measurement Quality Objectives for Groundwater

Analyte	Abbreviation	Chemical Abstract Service Number	USEPA MCL (µg/L)	PADEP (µg/L)	Lab Method Detection Limit (MDL) (µg/L)	Lab Reporting Limit (RL) (µg/L)
2,4-Dinitrotoluene	2,4-DNT	121-14-2	7.3*	8.4	0.0838	0.40
2,6-Dinitrotoluene	2,6-DNT	606-20-2	3.7*	100	0.0645	0.20
Nitroglycerin	NG	55-63-0	0.37*	5	0.921	3.0
Antimony	Sb	7440-36-0	6.0	6	0.400	6.00
Barium	Ba	7440-38-2	2,000	2,000	0.290	3.00
Copper	Cu	7440-50-8	1,300	1,000	0.560	2.00
Lead	Pb	7439-92-1	15	5	0.180	3.00
Nickel	Ni	7440-02-0	NSL	100	0.300	3.00
Zinc	Zn	7440-66-6	5,000	2,000	2.00	20.0

Notes:
* Screening levels are the USEPA Tap Water Regional Screening Levels from June 2011. A non-carcinogen; the original screening level was divided by 10 to achieve a hazard index of 0.1.

PADEP Medium-Specific Concentrations – Non Residential, Used Aquifer Groundwater, Jan 2011 (TDS <=2,500)

NSL - No screening Level
Laboratory Reporting Limits provided by Test America

5.2 TEST, MAINTENANCE, AND CALIBRATION RECORDS

The following text replaces Section 5.7.2.5 Test, Maintenance, and Calibration Records of the work plan (Attachment 1).

Instrumentation used in the field will be tested with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications this work plan, and applicable SOPs. Equipment, instruments, tools, gauges, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's specified recommendation. The manufacturer's written maintenance schedule shall be followed to minimize the downtime of the measurement systems. The operator's responsibility will be to adhere to this maintenance schedule and to arrange necessary and prompt service as required. At a minimum, equipment used daily will be cleaned at the end of each workday and kept in good operating condition. Service to the equipment, instruments, tools, etc. shall be performed by qualified personnel. Field instruments will be calibrated per manufacturer recommendations and the calibration events will be documented in the field notebook or calibration worksheets. At a minimum the test, calibration, or maintenance notebook or worksheets will contain the date and time of the task, equipment name and identification numbers, name of individual performing the task, and results of the task. Testing/calibration, repair, or replacement records will be filed and maintained by the site manager. Additional discussion regarding the phases of inspection, definable features of work (DFW), and QC are presented in Section 5.2.1.

5.2.1 Three Phases of Control

The UXOQCS will be responsible for verifying compliance with this portion of the work plan (WP) through implementation of a three phase control process, which ensures that project activities comply with the approved plans and procedures. The three phase control system is comprised of the preparatory, initial, and follow-up phases. Each phase is considered relevant for obtaining necessary product quality. However, the preparatory and initial inspections are particularly invaluable in preventing problems. Work will not be performed on a DFW until the preparatory and initial phase inspections have been completed and any non-conformance issues are resolved. Implementation and tracking of the DFWs will be accomplished through the use of the tracking form provided in Attachment 4. The specific QC monitoring requirements for each DFW are presented in Table 5-3 below.

5.2.1.1 Preparatory Phase Inspection

The Preparatory Phase comprises the planning and design process leading up to the actual RI field activities. The UXOQCS will perform a Preparatory Phase Inspection before beginning each DFW. The purpose of this inspection is to review applicable specifications and plans to verify that the necessary resources, conditions, and controls are in place and compliant before work activities start. The Preparatory Phase Inspection will also verify that the UXOSO adequately identifies all hazards associated with actual field conditions and that the UXOSO promulgates the appropriate safe work practices. Upon completion of the inspection, the UXOQCS will complete the Preparatory Phase Inspection Checklist provided in Attachment 4.

To perform the inspection, the UXOQCS or designee will review work plan. The UXOQCS will verify that required plans and procedures have been approved and are available to the field staff; field equipment is appropriate, available, functional, and properly calibrated for its intended/stated use; staff responsibilities have been assigned and communicated; staff have the necessary knowledge, expertise, and information to perform their jobs; arrangements for support services have been made; training in accordance with the requirements of this work plan has occurred; and the prerequisite mobilization tasks have been completed. As part of the Preparatory Phase Inspection, the UXOQCS will verify that lessons learned during previous similar work have been incorporated, as appropriate, into the project procedures to prevent recurrence of past challenges. Project staff must correct or resolve discrepancies between existing conditions and the approved plans/procedures identified by the UXOQCS during the Preparatory Phase Inspection. The UXOQCS or designee will verify that unsatisfactory and/or non-conforming conditions have been corrected before beginning work.

5.2.1.2 Initial Phase Inspection

The Initial Phase occurs at the startup of field activities associated with a specific DFW. At the onset of a particular DFW, the UXOQCS will perform an Initial Phase Inspection and complete the Initial Phase Inspection Checklist provided in Attachment 4. The main objectives of the inspection are to check preliminary work for compliance with procedures and specifications, establish an acceptable level of workmanship, check for omissions, and resolve differences of interpretation. The Initial Phase Inspection results will also be documented by the UXOQCS in the QC Log Book and summarized in the QC Report. Should results of the inspection be unsatisfactory, the Initial Phase Inspection will be rescheduled and performed again.

During the Initial Phase Inspection, the UXOQCS will ensure that discrepancies between site practices and approved plans or specifications are identified and resolved. The resolution of discrepancies is a critical step in the Initial Phase Inspection. As applicable, the appropriate Senior Technical Consultant (e.g., Site Supervisor, Project Chemist, SUXOS, UXOSO, etc.) will guide the PM and project team members in resolving discrepancies. If discrepancies arise in establishing the baseline quality for a DFW, the responsibility for resolution falls to the PM. If the discrepancy cannot be resolved in a manner that satisfies the project requirements, it will be elevated to the program level (i.e., to the Program QC Manager) and a Non-Conformance Report will be issued (Attachment 4). With concurrence of the project team, the appropriate Senior Technical Consultant may direct a cessation of work activity if an unresolved discrepancy jeopardizes the results of the DFW or puts the project at risk of non-conformance.

5.2.1.3 Follow-Up Phase Inspection

Completion of the Initial Phase Inspection of QC activity leads directly into the Follow-Up Phase, which covers the routine day-to-day activities at the site. The UXOQCS will perform a Follow-Up Phase Inspection at regular intervals while a particular DFW is performed. This inspection ensures continuous compliance and verifies an acceptable level of workmanship. To conduct and document these inspections, the UXOQCS will complete the Follow-Up Phase Inspection Checklist provided in Attachment 4. The UXOQCS will monitor onsite practices and operations taking place and verify continued compliance with the specifications and requirements of the work plan and approved amendments. The UXOQCS will also verify that daily health and safety inspections are performed and documented as prescribed in the work plan. Discrepancies between site practices and approved plans/procedures will be resolved and corrective actions for unsatisfactory and non-conforming conditions or practices will be resolved by the UXOQCS or designee before continuing work.

At the conclusion of each work day, the field teams will return to the project field office and provide the SUXOS and/or UXOQCS with any completed investigation forms, field notes, and inspection reports from that day's activities. Data will be collected by the UXOQCS or data manager at the conclusion of each field day. Any issues arising from the day's activities will be discussed between the Site Supervisor, SUXOS, UXOQCS, and appropriate field personnel. The UXOQCS will record these discussions, and resolutions or corrective actions arising from these discussions will be addressed during the following morning's safety meeting and recorded on the Daily QC Report.

5.2.2 Digital Geophysical Mapping QC Procedures

QC mechanisms will be implemented to ensure the data acquisition, processing and interpretation, and target reacquisition practices are monitored at a sufficient level to meet the overall program objectives. The following QC performance metrics are based on the most recent guidance published by USACE and are performed in accordance with SOP 67.

Daily Instrument Verification Tests

Before beginning the production geophysical surveys for the DGM survey, a test area will be used to verify the EM61-MK2 DGM system is operating properly and to set the performance criteria to be used during daily tests. Three industry standard objects (i.e., 1-in. by 4-in. pipe nipples) will be buried along a line at various depths (3-in., 6-in., and 9-in.) and the EM61-MK2 will collect data over the item at the beginning and end of each day. Actual instrument responses collected over the pipe nipples will be compared to standard instrument response curves developed for this item during testing performed by the Naval Research Laboratory. The standard response curves for the pipe nipple define the range of instrument responses expected for the item over a range of burial depths and orientations. The instrument verification tests will be performed in accordance with SOP 67.

The Project Geophysicist will evaluate the daily test data and determine whether the selected geophysical system meets the performance requirements described below. If the system does not meet the performance requirements, a root-cause analysis will be performed to determine the cause of the failure, and actions taken to correct the failure.

Specific instrument and functional checks will be performed each day at the test area. The test regimen and anticipated performance metrics includes the following:

Equipment warm-up (minimum 5 minutes prior to data acquisition). The geophysical sensor will be turned on and allowed to run for a minimum of 5 minutes prior to collecting data to reduce instrument drift.

Acquisition personnel metal check (ensure no metal on acquisition personnel). Field team members will be accountable for and ensure that there is no unnecessary metal (e.g., rings, chains, earrings, knives, wallets, belt buckles, etc.) residing on personnel immediately prior to data acquisition activities to reduce "walking" noise.

Vibration/cable shake test (< 2mV variation in channel 2 readings). Coil operator will move around relative to coil and also shake equipment cables while electronics operator observes readings for excess noise due to cables or presence of metal on coil operator.

Static background and static spike check (mean static spike minus mean static background ±10 percent of original). The static test involves locating the instrument over a "geophysically quiet" area and recording data for a minimum of one minute, then placing a standard item at a fixed location on the instrument coil and recording one minute of data. The static response should be within 10 percent of the expected response (determined during initial tests).

Along Line Sample Interval (98 percent ≤25 cm). The sample interval (sample distance) profile plot will be displayed using Geosoft Oasis for each data file to assess in-line data density. The sample distance statistics should be 98 percent of adjacent samples are within 25 cm of each other.

Dynamic repeatability (test item response >75 percent of expected response and measured coordinates of test item ≤85 cm). This DGM quality check is performed daily by comparing the dynamic response (sensor in motion) over a standard test item (i.e., pipe nipple) against the expected response for the test item. The measured value should be no less than 75 percent of the expected value. The measured coordinates of the test item should be within 85 cm.

Data Processing/Interpretation. The Project Geophysicist will review 100 percent of the interpretation. During the review, the Project Geophysicist will ensure that all geophysical anomalies meeting the selection criteria are included on the dig sheet.

DGM Blind Seeding

As part of the quality control procedures, a blind seeding program will be implemented. The main purpose of the seed program is to provide ongoing verification that known objects produce signals that are expected. The industry standard objects (ISO) used in the Instrument Verification Strip (IVS) will be used as blind QC seeds to verify that the geophysical systems are functioning properly and that the performance requirements for detection and positioning are being met continuously throughout the duration of the work.[8] The offset allowed for the blind seed detection is calculated as less than or equal to 50 cm plus 1/2 line spacing (38 cm) equal to 88 cm. The blind seeding program is discussed in more detail in SOP 01 and SOP 67. Blind seeds will be emplaced at a rate such that the DGM team encounters at least one blind seed per day.

[8] The ISOs to be used in the IVS are typically 1-in. by 4-in., 2-in. by 8-in., and 4-in. by 12-in. steel pipe nipples, depending on project requirements. ISOs are organized in a straight line and separated by approximately 3 to 4 meters (m), or as necessary to prevent anomaly signatures from interfering with one another.

After each dig package is completed, the Project Geophysicist will review the dig package and compare the data against the blind seeds to verify that the detection and positioning performance requirements are being met. Should a performance requirement not be met or a trend indicate a future failure, appropriate personnel will be notified, a root-cause analysis (RCA) will be performed, and a corrective action determined as discussed below.

5.2.3 Other Equipment QC Procedures

QC for GPS instruments will involve comparing a control point (i.e. existing benchmark noted in Figure 1) that was established using conventional survey or GPS to confirm GPS readings are within ±1 foot. The results will be documented, and assessed and summarized in the Daily QC Report.

QC for the analog geophysical instruments (i.e., Schonstedt) will be accomplished through daily checks that the instruments are functioning before use for field activities. Each instrument will be tested on the instrument verification strip (IVS). If the instrument is not able to detect the item, it will be taken out of use until it is repaired.

QC for mowing machinery will be accomplished through daily checks that the equipment is functioning as per the manufacturer's and operator's instructions prior to field activities.

Checks for the process and procedures used during execution of this work plan will be conducted by the UXOQCS. Process integrity is defined as conformance to specifications (i.e., the requirements of the work plan, regulations, and industry standards). These checks will consist of visual observations of the methods used and will be part of the inspections conducted during the performance of the work and documented in the QC Log Book and the QC Report.

5.2.4 Anomaly Investigation QC Procedures

The following is the procedure to be followed for QC inspections of the intrusive anomaly investigations:

- After the dig team intrusively investigates an anomaly location, the hole is to be left open to the depth investigated and a plastic flag placed in the hole or bent after the investigation is completed.

- For both anomalies detected using DGM (in accessible areas) and for mag flag and dig (in inaccessible areas), the UXOQCS will inspect at least 10 percent of the intrusively investigated anomaly locations using an analog geophysical instruments (i.e., Schonstedt) to determine whether all detectable metallic items within a 2-ft radius of the hole have been removed. The locations checked will be distributed in a spatially representative sample across the area. In the event a disposal pit is identified, no QC check is necessary due to the presence of remaining metal in the disposal feature (i.e. this is not a complete removal action).

- All holes related to intrusive investigations will be filled back to original grade or covered before departing from the project site.

- UXOQCS will (along with results of the inspection and corrective actions) record, document and provide to the Project Geophysicist all DGM anomaly locations inspected.

5.2.5 FAILURE CRITERIA

The QC methods described above are designed to ensure conformance with the project specifications and achieve the overall contract objectives. In cases where QC inspections indicate nonconformance, specific actions resulting from a specific QC concern or failure have been developed. QC failure is defined as non-conformance with: (1) provisions of the work plan, and (2) industry standards. For each QC method described in this QAPP, the following failure criteria are summarized below along with required follow-up corrective actions using the corrective action form (Attachment 4).

Except where clearly defined, the responsibility for assessing whether a QC failure is considered major (e.g., has the potential to jeopardize the health and safety of the project team, jeopardize the environment, or compromise project requirements) or minor (i.e., results from using improper methods in which a field team or field team member is conducting the work or sweep), lies with the UXOQCS.

5.2.5.1 **Equipment Failure and Corrective Measures**

If equipment is not operating properly, it will be repaired or taken out of service and replaced with suitably operating equipment. On a case-by-case basis, the UXOQCS will evaluate whether the equipment failure has compromised data quality and will determine the appropriate corrective action.

Should any detection instrument fail to function or cannot detect items during the daily check, the operator and field team leader will determine and resolve the equipment failure. If the failure cannot be determined and repaired, the instrument will be shipped offsite for repair. A replacement will be used once it has successfully processed through the daily check and confirmed and documented by the UXOQCS. The UXOQCS will review this type of failure on a case-by-case basis to determine whether the failed instrument may have compromised data quality.

5.2.5.2 **Process and Procedural Failure and Corrective Measures**

Process integrity is defined as conformance to specifications (i.e., requirements of the WP, regulations, and industry standards). Checks for process integrity will consist of visual observations of the methods used and will be a significant part of the Follow Up Phase Inspections and documented on the form included in Attachment 4 for each DFW.

Defined as conformance to the requirements of the WP, checks for procedural integrity will consist of observations of specific procedures used, and the accuracy of those methods. The results of these inspections will be documented on Form 4-6, and will be appended to Follow Up Phase Inspection the form included in Attachment 4 for each DFW.

Non-conformance with process or procedural requirements will be addressed by the UXOQCS with the appropriate team leader (e.g., UXO Team Leader, survey crew leader, etc.). If the nonconformance is found to affect safety or overall product quality, work will cease until an appropriate resolution is identified and implemented, and the SUXOS/Site Manager will be notified. Once the UXOQCS, appropriate team leader, and SUXOS/Site Manager are satisfied with the suggested corrective action, the action will be implemented and documented on the form included in Attachment 4 and the QC Log Book.

If the failure directly affects product quality, or is otherwise determined by the UXOQCS to require a follow-up action, a Nonconformance Report will be prepared and submitted to the subcontractor. The Nonconformance Report will include a detailed written description of the nonconformance item, and required follow-up actions, developed and signed by the UXOQCS (see Attachment 4). A copy of the completed Nonconformance Report will be provided to the SUXOS and Project Manager as notification of the failure. In response, the EA project team will have a period of 2 working days to provide a plan for corrective action for the failure, and not more than 5 working days from the date of issue of the Nonconformance Report to complete the corrective action. Once the corrective action has been completed, it will be documented on the form and, if approved, will be signed by the UXOQCS and Project Manager. These signatures will indicate that the failed work has been corrected, accepted, and the Nonconformance Report will be closed. A copy of the Nonconformance Report and any relevant attachments will be placed in the project QC file, along with Follow-Up Phase Inspection documents for that DFW.

If the failure of process or procedure occurs more than once for where a particular team is working, a Correction Action Request will be prepared (see Attachment 4). The Correction Action Request will specify whether a Corrective Action Plan is needed. The UXOQCS will meet with the appropriate team leader and members to determine the corrective course of action. During follow-up QC inspections, the UXOQCS will ensure and document in the UXOQCS Log Book and the Daily Report that agreed upon corrective actions have been implemented.

5.2.5.3 **Intrusive Anomaly Investigation Failure and Corrective Measures**

Failure to investigate a digital geophysical mapping anomalies selected for investigation per and/or anomalies within inaccessible areas (using mag and dig procedures) the requirements of this WP will constitute a QC discrepancy, if the anomalies have not been fully investigated and the location is turned over by the intrusive team for QC inspection. To assess these failure criteria, QC staff will conduct a random inspection at least 10 percent of the anomaly locations to determine whether metallic anomalies remain uninvestigated. An anomaly location will fail if metallic debris is located in the excavation which meets or exceeds the size of a 20 mm TP projectile it will be considered a failure.

Failure to fully investigate a digital geophysical mapping anomaly selected for investigation per the requirements of this WP will result in the following actions:

- The UXOQCS will meet with the SUXOS and UXO Team Leader to discuss the discrepancy.

- A Nonconformance Report will be issued by the UXOQCS, in conformance with the requirements of this QAPP, and as necessary, a root cause analysis will be conducted. The root cause analysis consists of determining whether inadequate operational procedures, poor management procedures, lack of communication, inadequate tools, or other causative factor contributed to the failure. The Root Cause Analysis form (see Attachment 4) will be completed by the UXOQCS, and appended to the Nonconformance Report and placed into the project file.

Failure to adequately investigate digital geophysical mapping anomalies and “Mag and Dig” techniques in accordance with this WP will require the location to be reinvestigated as determined by the UXOQCS. The following will occur:

- The location will be reinvestigated by the field team that originally completed the intrusive investigation at that location. The re-investigation will occur as dictated by the UXOQCS and recorded the daily logs.

- Following the reinvestigation, the QC Inspection team will confirm that anomalies have been identified and investigated satisfactorily.

- If additional uninvestigated anomalies are discovered by the QC inspection, the process above will be repeated. Failure of Dig teams to adequately identify and investigate metallic anomalies within multiple or consecutive areas investigated by the same field team will require that both the Correction Action Request and Corrective Action Plan be prepared.

- Continued failure of EM and Dig teams to fully identify and investigate metallic anomalies may result in the stopping further project work until the deficiency is corrected. The SUXOS and the UXOQCS will meet with the Project Manager to determine if and when a stop work order should be issued.

Table 5-3: Summary of QC Procedures, Responsibilities, Criteria, and Actions

Activity	Definable Feature of Work	Responsible Personnel	Procedure	Frequency	Pass/Fail Criteria	Action if Failure Occurs
Planning/ Pre-mobilization	Establishment of GIS	Task Manager, GIS Manager	• Gather all GIS data from provided historical records, georeferenced project location, Phase I RI activities, and develop GIS maps for Phase II activities (e.g., grid network, site boundaries, anomalies, etc.).	Once	• Scales are in feet, measurable using engineering scale. • Key map included. • Project name and location correct. • Grid network proper size.	• Review all data/input with GIS staff. Do not proceed until corrections are reviewed and accepted by Lead STR. Notify PM and the Program Manager.
Planning/ Pre-mobilization	Document management and control	Task Manager, Technical Editor	• Follow established EA document control guidelines.	Once	• Document not in compliance with EA document control guidelines.	• Internal corrective action meeting.
Planning/ Pre-mobilization	Subcontracting	PM or Task Manager, Procurement Manager, Contracts Manager, Health & Safety Manager	• Issue subcontractor requests for proposal or review blanket purchase orders.	Once	• Verify qualifications, safety record, training, and appropriate licenses are up to date and acceptable. Subcontracts are executed.	• Review Terms and Conditions for corrective actions.

Table 5-3: Summary of QC Procedures, Responsibilities, Criteria, and Actions

Activity	Definable Feature of Work	Responsible Personnel	Procedure	Frequency	Pass/Fail Criteria	Action if Failure Occurs
Planning/ Pre-mobilization	Personnel qualifications	Task Manager, UXOQCS/ UXOSO, SUXOS	• Verify all health and training certification/qualifications for all proposed personnel are appropriate and current for assigned activities. • For UXO personnel, verify qualification in accordance with DDESB TP-18.	Once	• All personnel meet or exceed the training requirements and/or certifications for the assigned positions.	• Provide required training or replace personnel. Notify PM and the Program Manager.
Planning/ Pre-mobilization	Procurement of supplies/ materials	UXOQCS/ UXOSO, SUXOS, Task Manager, Procurement Manager, Corporate Equipment Manager	• Order all supplies in accordance with corporate procurement policy. • Establish purchase requisitions. • Reserve corporate equipment.	Once	• All supplies and materials received. • Inspect supplies and material for damage. • Function-check all equipment in accordance with operator or manufacturers' handbooks.	• Review purchase orders. • Review project schedule for schedule impacts. • Replace all defective supplies/materials and equipment. • Notify PM and the Program Manager.
Field Operations	Site-specific training	Task Manager, UXOQCS/ UXOSO, SUXOS	• Verify that all on-site personnel have been given the necessary site-specific training (e.g., GPS, data management, vendor escort, work plan, SOPs etc.).	Once (for each new personnel, throughout field operations)	• Demonstrated knowledge of site-specific training topics through Q&A, equipment operational review, etc.	• Escort individual from project and exclude from site or complete on-site training for individual.

Table 5-3: Summary of QC Procedures, Responsibilities, Criteria, and Actions

Activity	Definable Feature of Work	Responsible Personnel	Procedure	Frequency	Pass/Fail Criteria	Action if Failure Occurs
Field Operations	Mag and flag subsurface analog-detected anomalies	UXOQCS, SUXOS	• Mag and flag large anomalies in accordance with work plan and SOP.	Daily/each anomaly	• Analog handheld magnetometers not operating in accordance with Operator Manual. • Equipment fails IVS. • Subsurface anomaly not detected and flagged.	• Replace or repair handheld magnetometers. • Initiate corrective action request.
Field Operations	Qualitative mapping of subsurface flagged anomalies	UXOQCS, SUXOS	• Anomaly survey data downloaded, imported to GIS, mapped, and checked.	Daily/each GPS	• Data downloaded and cumulative anomaly map created; no mapping errors found.	• Do not produce final map until errors corrected.
			• Survey GPS operating to project specifications.	Daily	• Horizontal GPS ±1.0 foot of known benchmark coordinate.	• Do not proceed with survey until GPS operates within accuracy limit.
Field Operations	DGM	Project Geophysicist, UXOQCS	• Perform DGM to project specifications • Verify instrument tests (daily static and dynamic at IVS)	Daily	• Established measurement criteria achieved	• Perform root cause analysis, identify issues(s), propose modifications (as needed). • Rework, as needed.

Table 5-3: Summary of QC Procedures, Responsibilities, Criteria, and Actions

Activity	Definable Feature of Work	Responsible Personnel	Procedure	Frequency	Pass/Fail Criteria	Action if Failure Occurs
Field Operations	Anomaly Reacquisition	UXOQCS	• Utilize GPS and magnetometer to reacquire anomalies, as identified on dig sheets.	Daily	• Horizontal GPS ±1.0 foot of known benchmark coordinate. • Unable to identify/locate anomaly	• Do not proceed with reacquire until GPS operates within accuracy limit. • Perform root cause analysis, identify issue(s). • Notify PM, Program Manager and Corporate Quality Control Manager.
Field Operations	Intrusive investigation	UXOQCS/ SUXOS	• Intrusively investigate selected subsurface anomalies within each grid.	10% of areas intrusively investigated	• An anomaly is identified within a cleared excavation/hole which meets or exceeds the size of a 20mm TP projectile it will be considered a failure. • Following investigation, presence of MEC/UXO/MD at selected anomaly constitutes failure.	• Initiate corrective action request. • Notify PM, Program Manager and Corporate Quality Control Manager.

Table 5-3: Summary of QC Procedures, Responsibilities, Criteria, and Actions

Activity	Definable Feature of Work	Responsible Personnel	Procedure	Frequency	Pass/Fail Criteria	Action if Failure Occurs
Field Operations	MPPEH procedures	UXOQCS/ UXOSO, SUXOS	• Verify certification is per work plan MPPEH Management SOP 12 and EM 385-1-97.	Daily/as required	• Discovery of any MPPEH within material inspected MDAS (SOP 12).	• Initiate corrective action request. • Notify PM, Program Manager and Corporate Quality Control Manager.
Field Operations	MC sampling	Task Manager, UXOQCS/ SUXOS	• Collect soil sample beneath each compromised MEC with exposed explosives for MC analysis. • Sample designated MRS/AOC for MC analysis. • Install wells and conduct GW sampling (as necessary). • Maintain chain of custody.	During MC sampling	• Chain of custody broken. • Sample procedures not followed.	• Initiate corrective action request. • Notify PM, Program Manager and Corporate Quality Control Manager Resample.
Field Operations	Demobilization	Task Manager, UXOQCS/ SUXOS, Data Manager	• Verify MRS is returned to near original condition. • Confirm plan for custody of MD and NMRD disposal.	Once	• Walk through by the property owner. • Site condition found acceptable by the property owner.	• Develop final punch list of corrective actions to return the site to acceptable condition. • Notify PM, Program Manager and Corporate Quality Control Manager.

Table 5-3: Summary of QC Procedures, Responsibilities, Criteria, and Actions

Activity	Definable Feature of Work	Responsible Personnel	Procedure	Frequency	Pass/Fail Criteria	Action if Failure Occurs
Final Project Report and Closeout	Evaluation of analytical data	PM/Task Manager, Project Chemist	• Review and validate data per the approved QAPP. • 100% of data will be reviewed and verified.	Once	• No data rejected.	• Re-review or revise, as required. • Notify PM and the Program Manager. • Perform Corrective Action, as needed. • Recollect data, as needed.
Final Project Report and Closeout	Report preparation	PM/Task Manager, Lead Senior Technical Reviewer	• Verify that report has been prepared per guidance and provides the required information to meet project objectives.	Once per version submitted	• Report has been reviewed, comments addressed and resolved, and approved.	• Take appropriate action to obtain report approval.
Final Project Report and Closeout	Report preparation	Data Manger UXOQCS/ UXOSO, SUXOS,	• Audit of the following items: tabulation of all MEC, MD and other material recovered during the removal action is accurate and complete. • Daily records. • Grid tracking system. • QC reports and results. • USACE 948 QA acceptance for all grids.	Once	• Any missing report • Discrepancies in grid tracking	• Conduct corrective action meeting to determine discrepancies and required action.
Final Project Report and Closeout	Data archiving and closeout	PM/Task Manager, Project Chemist	• Have lab prepare Electronic Data Deliverable. Submit to Client.	Once	• Data is accepted by client.	• Revise data package and re-submit.

Table 5-3: Summary of QC Procedures, Responsibilities, Criteria, and Actions

Activity	Definable Feature of Work	Responsible Personnel	Procedure	Frequency	Pass/Fail Criteria	Action if Failure Occurs
Final Project Report and Closeout	Data archiving and closeout	PM/Task Manager, Procurement Manager, Contracts Manager	• Verify purchase orders, vendors and subcontractors have been closed out. • Run internal accounting commitment reports to verify outstanding balances.	Once	• Release of claims not received.	• Resolve issues with Contracts Manager and Procurement Manager.

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6. REFERENCES

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Figures

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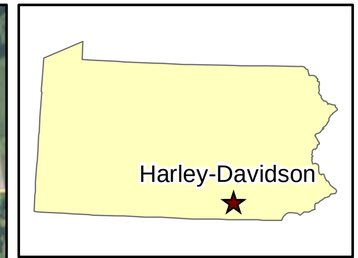


Legend

- Access Gate used for Site Entry
- Benchmarks
- Fenceline
- Current Harley-Davidson Boundary
- Former York Naval Ordnance Plant Boundary
- West Campus Boundary
- AOC Boundary
- MRS Boundary

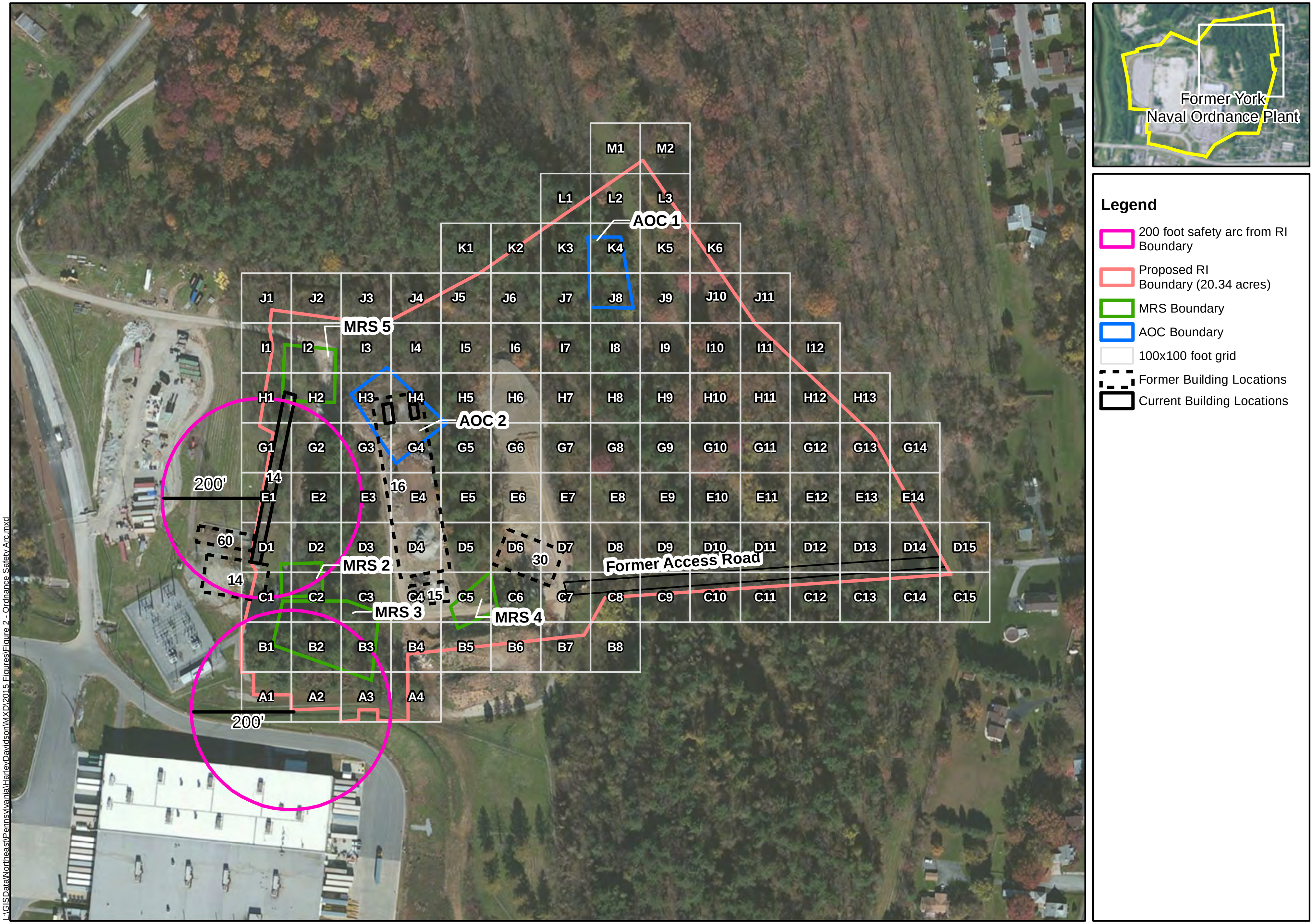
L:\GISData\Northeast\Pennsylvania\HarleyDavidson\MXD\2015 Figures\Figure 1 - AOC and MRS Location Map.mxd

Figure 1 - AOC and MRS Location Map
MMRP RI Former York Naval Ordnance Plant

Source:
ESRI 2012

Projection: NAD 83 Maryland StatePlane Feet
Date: April 2015

0 400 800
Feet

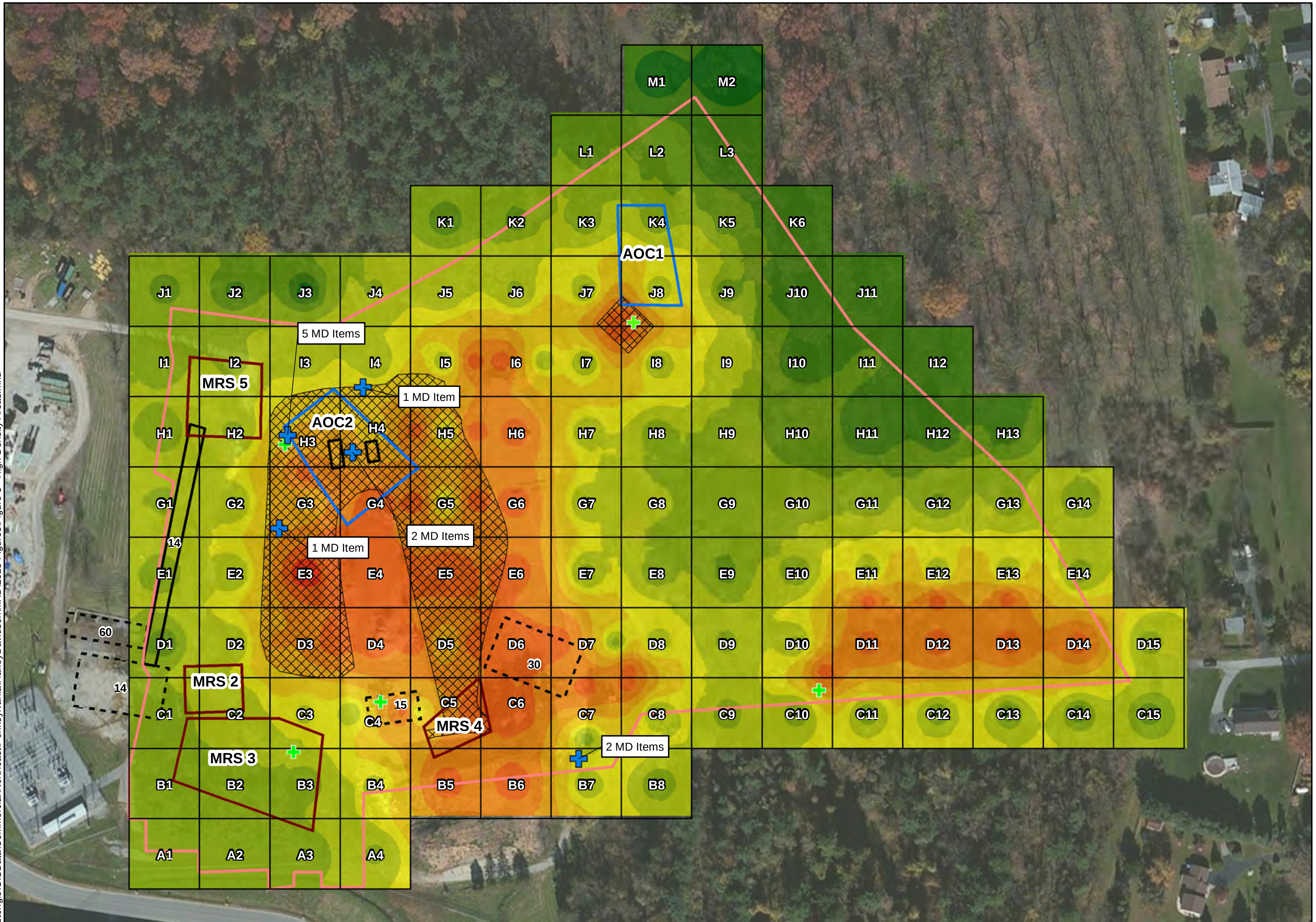


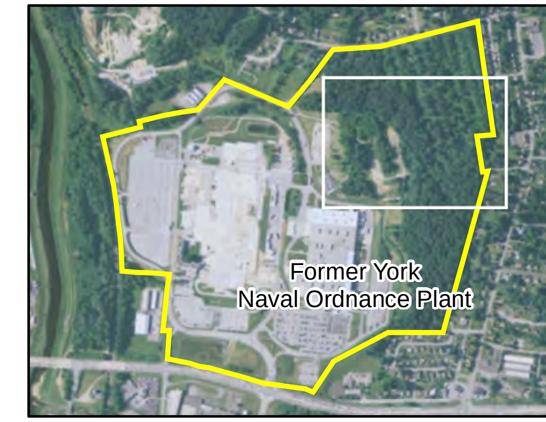
L:\GISData\Northeast\Pennsylvania\HarleyDavidson\MXD\2015 Figures\Figure 2 - Ordnance Safety Arc.mxd

Figure 2 - Ordnance Safety Arc Distance to Occupied Structures
MMRP RI Former York Naval Ordnance Plant

Source:
ESRI 2012

Projection: NAD 83 Maryland StatePlane Feet
Date: December 2015





Legend

- Munitions Debris found previously
- Munitions Debris found during Phase 1 of RI
- Proposed RI Boundary (20.34 acres)
- MRS Boundary
- AOC Boundary
- Former Building Locations
- Current Building Locations
- 100x100 foot grid
- High Anomaly Density

Subsurface Anomaly Density (Anomalies/Grid)

- < 10
- 10 - 25
- 25 - 50
- 50 - 100
- 100 - 200
- 200 - 300
- 300 - 500
- 500 - 700
- 700 - 900
- 900 - 1,100
- > 1,100

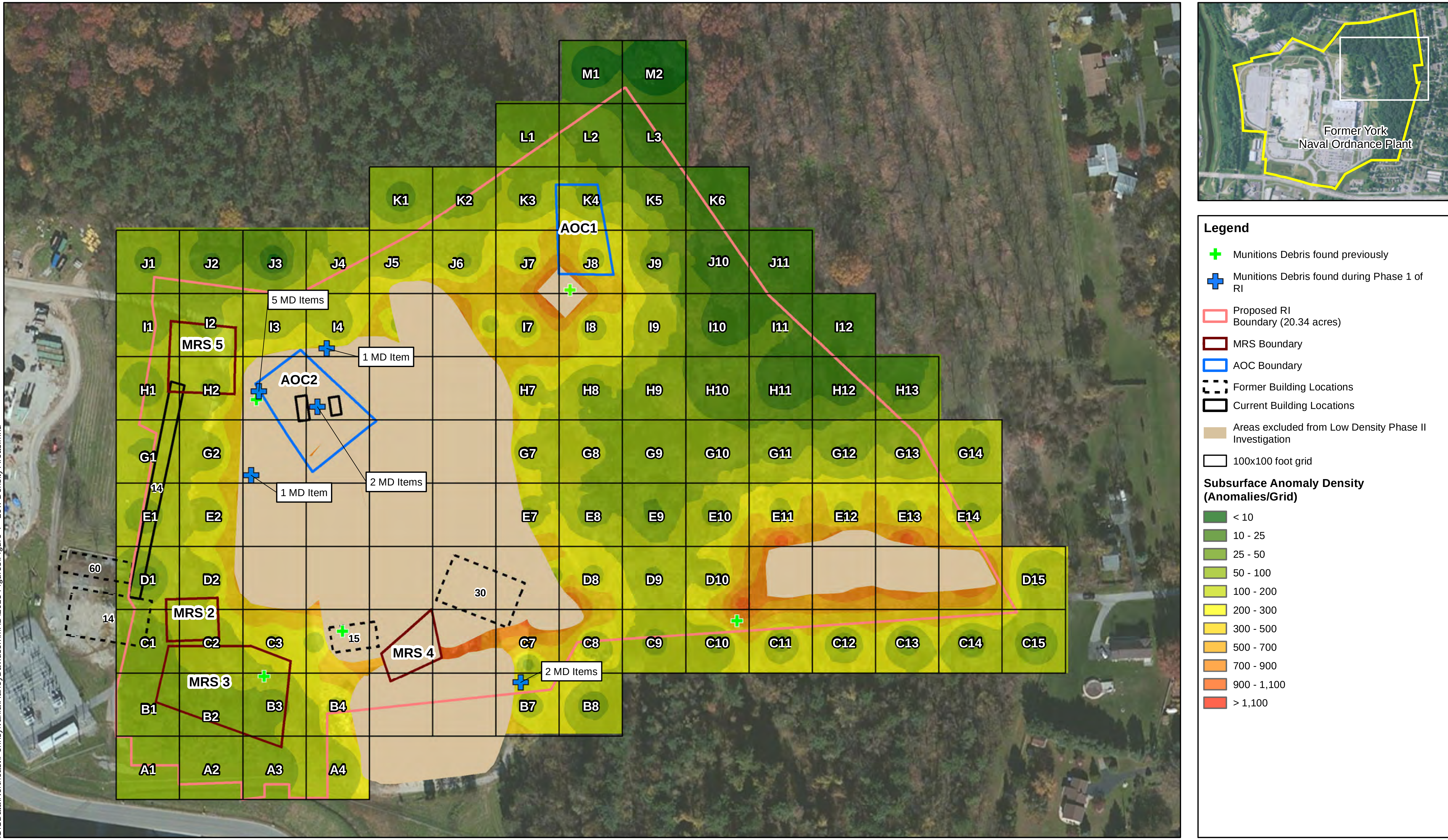
\\lovetongis\GISData\Commercial\Northeast\Pennsylvania\HarleyDavidson\MXD\2015 Figures\Figure 3 - High Density Areas.mxd

Figure 3 - High Density Areas
MMRP RI Former York Naval Ordnance Plant

Source:
ESRI 2012

Projection: NAD 83 Maryland StatePlane Feet
Date: December 2015

0 100 200
Feet



L:\GISData\NortheastPennsylvania\HarleyDavidson\MXD\2015 Figures\Figure 4 - Low Density Areas.mxd

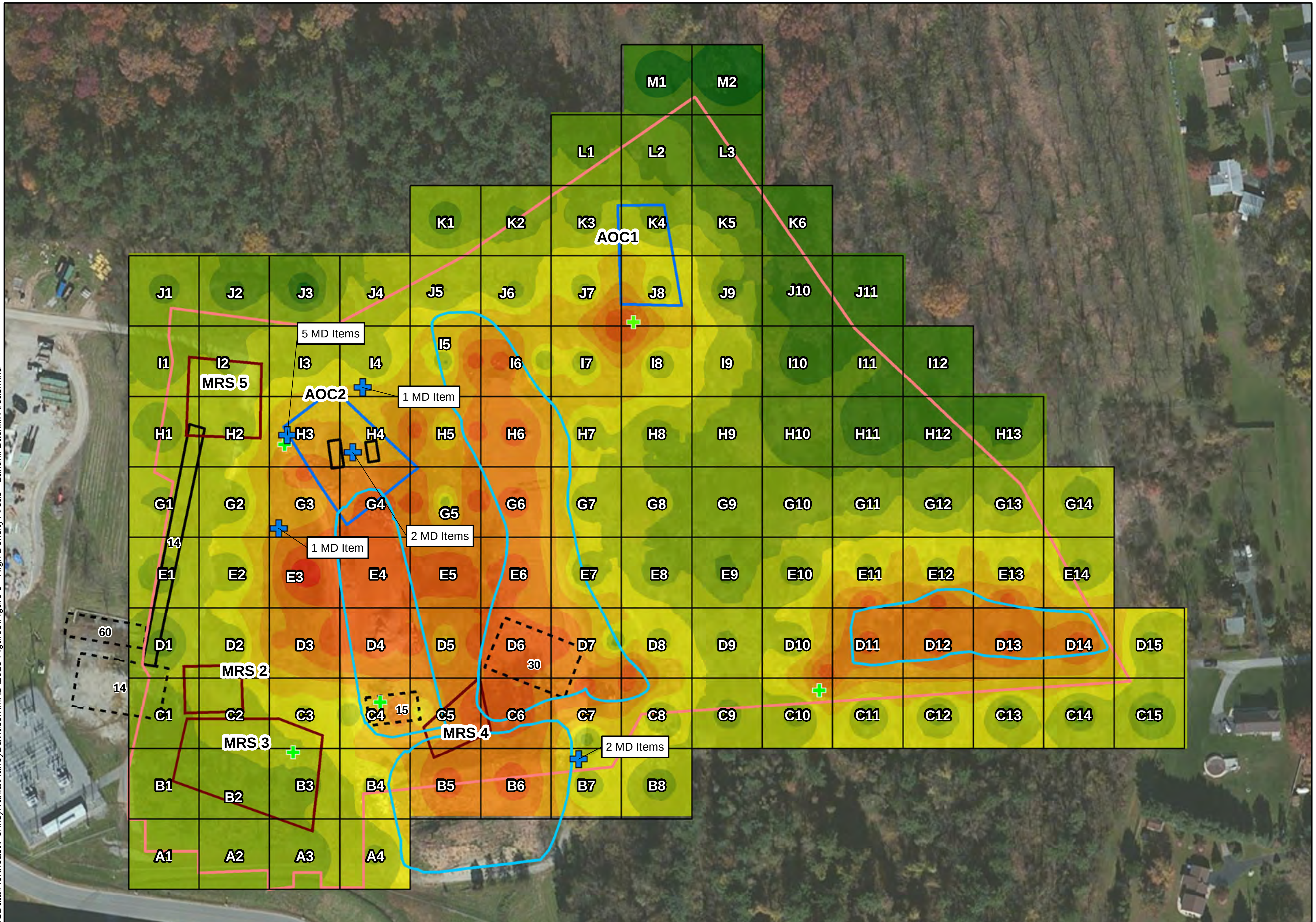
Figure 4 - Low Density Areas
MMRP RI Former York Naval Ordnance Plant

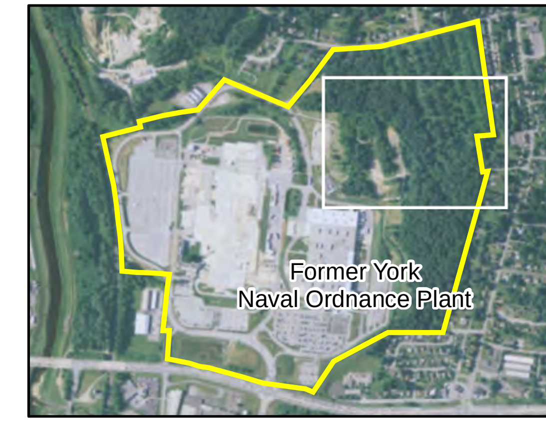
Source:
ESRI 2012

Projection: NAD 83 Maryland StatePlane Feet
Date: December 2015

0 100 200
Feet

L:\GISData\NortheastPennsylvania\HarleyDavidson\MXD\2015 Figures\Figure 5 - High Density Areas - Landfill Backfill Areas.mxd





Legend

- Munitions Debris found previously
- Munitions Debris found during Phase 1 of RI
- Proposed RI Boundary (20.34 acres)
- MRS Boundary
- AOC Boundary
- Former Building Locations
- Current Building Locations
- 100x100 foot grid
- High Anomaly Density, Fill

Subsurface Anomaly Density (Anomalies/Grid)

- < 10
- 10 - 25
- 25 - 50
- 50 - 100
- 100 - 200
- 200 - 300
- 300 - 500
- 500 - 700
- 700 - 900
- 900 - 1,100
- > 1,100

Figure 5 - High Density Areas - Landfill/Backfill Areas
MMRP RI Former York Naval Ordnance Plant

Source:
ESRI 2012

Projection: NAD 83 Maryland StatePlane Feet
Date: December 2015

0 100 200
Feet

L:\GISData\NortheastPennsylvania\HarleyDavidson\MXD\2015 Figures\Figure 6 - Phase II Proposed MC Sampling.mxd

Legend

- Existing Background Sample Locations
- Existing SI 2007 Soil Sample Locations
- Munitions Debris found previously
- Munitions Debris found during Phase 1 of RI
- Proposed RI Boundary (20.34 acres)
- MRS Boundary
- AOC Boundary
- Grids Containing Samples with Exceedances of RI Screening Criteria (based on SI Data)
- Former Building Locations
- Current Building Locations
- 100x100 foot grid

Note:
Initial soil pathway analysis found a complete pathway (SI sample results which exceed RI screening criteria [Act 2 soil to groundwater screening criteria]). Grids with complete soil pathways were identified for MC sampling during the RI; however, specific sampling locations were not identified within those grids. A list of sampling locations, which incorporates the SI results and the findings from the intrusive investigations (i.e. MD, MEC, etc.) will be shared with stakeholders prior to conducting RI nature and extent sampling.

EA®

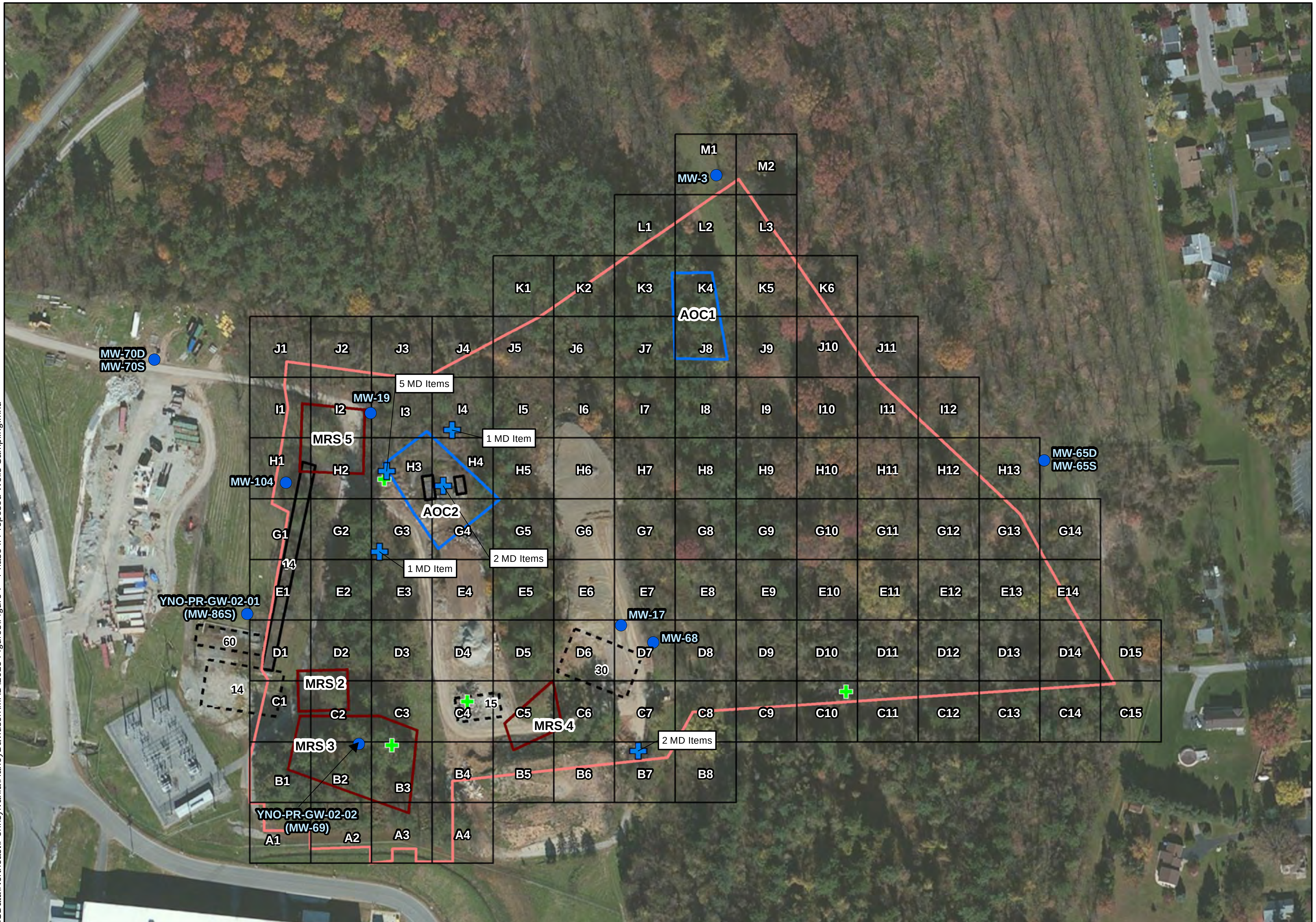
Figure 6 - Grid Locations Requiring Additional MC Soil Sampling
MMRP RI Former York Naval Ordnance Plant

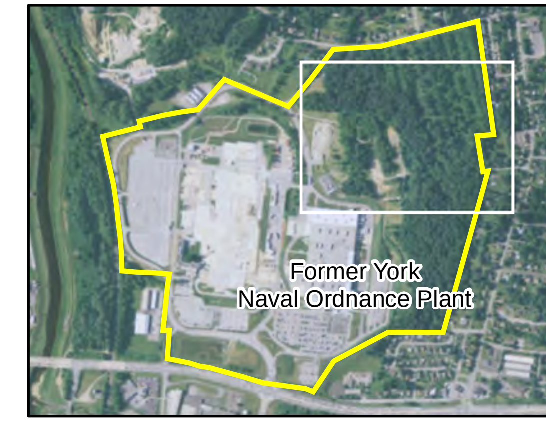
Source:
ESRI 2012

Projection: NAD 83 Maryland StatePlane Feet
Date: December 2015

0 100 200
Feet

L:\GISData\Northeast\Pennsylvania\HarleyDavidson\MXD\2015 Figures\Figure 7 - Phase II Proposed Wells Sampling.mxd





Legend

- Existing Groundwater Wells
- Munitions Debris found previously
- Munitions Debris found during Phase 1 of RI
- Proposed RI Boundary (20.34 acres)
- MRS Boundary
- AOC Boundary
- Former Building Locations
- Current Building Locations
- 100x100 foot grid

Note:
No exceedances of Act 2 screening criteria for groundwater were identified in existing wells; however, initial groundwater pathway analysis found a potentially complete pathway for groundwater based on surface soil exceedances of Act 2 soil to groundwater screening criteria in certain grids (Figure 6). Groundwater sampling needs will be assessed based on the RI nature and extent soil sampling results (i.e. if there are exceedances of Act 2 soil to groundwater screening criteria and the associated buffer distance is not met additional groundwater sampling may be required). Proposed sampling locations consisting of new or existing wells will be shared with stakeholders prior to installing wells and sampling groundwater.

Figure 7 - Existing Groundwater Sampling Locations
MMRP RI Former York Naval Ordnance Plant

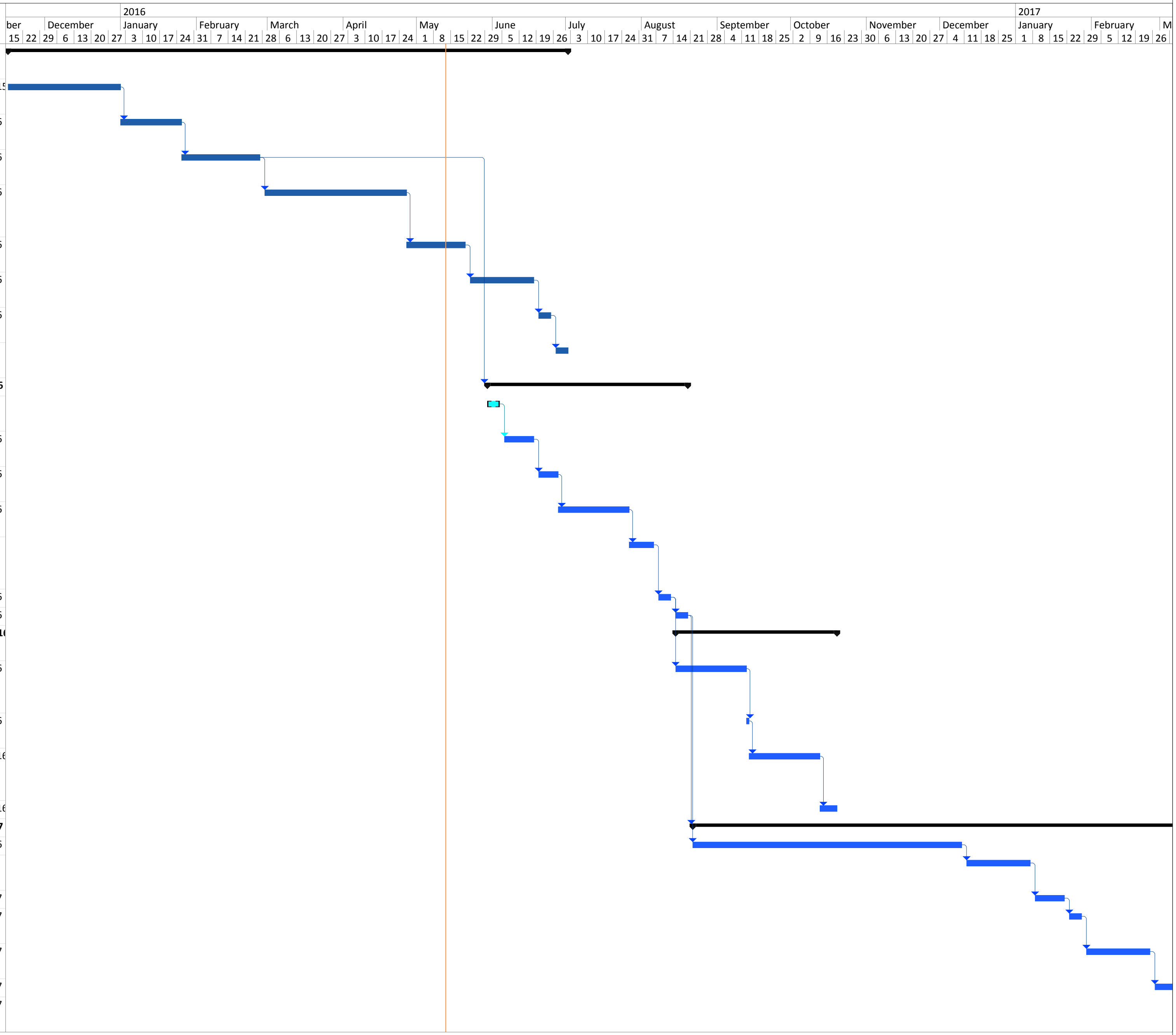
Source:
ESRI 2012

Projection: NAD 83 Maryland StatePlane Feet
Date: December 2015

0 100 200
Feet

FIGURE 8
FYNOP REMEDIAL INVESTIGATION SCHEDULE

Nu	Task Name	Duration	Start	Finish
1	**Prepare Second Phase Planning Documents**	**165 days**	**11/16/2015**	**7/1/2016**
2	Prepare Draft RI Work Plan Addendum	34 days	11/16/2015	12/31/2015
3	Stakeholder Review of Draft RI Work Plan Addendum	17 days	1/1/2016	1/25/2016
4	Prepare Draft Final RI Work Plan Addendum	24 days	1/26/2016	2/26/2016
5	Stakeholder Review and Approval of Draft Final RI Work Plan Addendum	42 days	2/29/2016	4/26/2016
6	Additional Work Plan Changes and Backcheck	18 days	4/27/2016	5/20/2016
7	Regulatory review of Draft Final RI Work Plan Addendum	20 days	5/23/2016	6/17/2016
8	Prepare Final RI Work Plan Addendum	5 days	6/20/2016	6/24/2016
9	Regulatory and Stakholder Approval of Final RI Work Plan Addendum	5 days	6/27/2016	7/1/2016
10	**Conduct Second Phase of RI**	**60 days**	**5/30/2016**	**8/19/2016**
11	Second Phase Mobilization includes kickoff meeting onsite	5 days	5/30/2016	6/3/2016
12	RI Field Work -Mowing and Geophysics	10 days	6/6/2016	6/17/2016
13	RI Field Work - Review and Discuss Target Selection with Stakeholders	6 days	6/20/2016	6/27/2016
14	RI Field Work -Intrusive Investigations	21 days	6/28/2016	7/26/2016
15	RI Field Work -Review and Discuss MC Soil Sampling Locations with Stakeholders	8 days	7/27/2016	8/5/2016
16	MC Soil Sampling	5 days	8/8/2016	8/12/2016
17	Second Phase Demobilization	5 days	8/15/2016	8/19/2016
18	**Conduct Third Phase of the RI (if necessary)**	**48 days**	**8/15/2016**	**10/19/2016**
19	Review Data from Second Phase / Preparation of Additional Sampling Strategy	21 days	8/15/2016	9/12/2016
20	Additional MC Sampling Location Discussions	1 day	9/13/2016	9/13/2016
21	Additional Soil and Groundwater Sampling (includes time for well install, development, and sampling)	21 days	9/14/2016	10/12/2016
22	Third Demobilization	5 days	10/13/2016	10/19/2016
23	**Prepare RI Report**	**150 days**	**8/22/2016**	**3/17/2017**
24	Prepare Draft RI Report	80 days	8/22/2016	12/9/2016
25	Stakeholder Review of Draft RI Report	20 days	12/12/2016	1/6/2017
26	Prepare Draft Final RI Report	10 days	1/9/2017	1/20/2017
27	Stakeholder Review and Approval of Draft Final RI Report	5 days	1/23/2017	1/27/2017
28	Regulatory Review of Draft Final RI Report	20 days	1/30/2017	2/24/2017
29	Prepare Final RI Report	10 days	2/27/2017	3/10/2017
30	Regulatory and Stakholder Approval of Final Report	5 days	3/13/2017	3/17/2017



Task
Summary

Attachment 1
April 2015 RI FYNOP Work Plan

(electronic on CD only)

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FINAL
WORK PLAN FOR THE
REMEDIAL INVESTIGATION OF THE MUNITIONS RESPONSE AREAS AT THE FORMER YORK NAVAL ORDNANCE PLANT

Prepared for:

Harley-Davidson Motor Company Operations, Inc.
1425 Eden Road
York, Pennsylvania 17402

Prepared by:

EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle
Hunt Valley, Maryland 21031

April 2015

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File copy signed

4/03/2015

Michael O'Neill — Date
Project Manager, PMP

File copy signed

4/03/2015

Vince Williams — Date
Program Manager, PMP

APRIL 2015

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LIST OF ACRONYMS AND ABBREVIATIONS

AMF	American Machine & Foundry Company
AMO	AMO Environmental Decisions
AOC	Area of Concern
AP	Armor-Piercing
ARAR	Applicable or Relevant and Appropriate Requirements
ASR	Archive Search Report
ATF	Alcohol, Tobacco, and Firearms
BKC	Blaw-Knox Corporation
CENAB	Corps of Engineers at Baltimore
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
COC	Chain of Custody
COPC	Chemical of Potential Concern
COPEC	Chemical of Potential Ecological Concern
CSM	Conceptual Site Model
CY	Cubic Yard(s)
DDESB	Department of Defense Explosives Safety Board
DFW	Definable Feature of Work
DGM	Digital Geophysical Mapping
DNT	2,4- and 2,6- Dinitrotoluene
DoD	Department of Defense
DQI	Data quality Indicator
DQO	Data Quality Objective
EA	EA Engineering, Science, and Technology, Inc., PBC
EcoSSL	Ecological Soil Screening Level
EM	Engineer Manual
EOD	Explosive Ordnance Disposal
°F	Fahrenheit
FDE	Findings and Determination of Eligibility
FM	Factory Mutual
FS	Feasibility Study
ft	Feet
FUDS	Formerly Used Defense Site
fYNOP	Former York Naval Ordnance Plant
GIS	Geographic Information System
GPS	Global Positioning System
GSC	Groundwater Sciences Corporation

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

H-D	Harley-Davidson or Harley-Davidson Motor Company Operations, Inc.
HFP	Hazard Fragment Distance
HQ	Hazard Quotient
HTRW	Hazardous, Toxic, and Radioactive Waste
ID	Identification
INPR	Inventory Project Report
IVS	Instrument Verification Strip
LCS	Laboratory Control Sample
m	meters
MC	Munitions Constituents
MD	Munitions Debris
MDL	Method Detection Limit
MDAS	Material Documented As Safe
MEC	Munitions and Explosives of Concern
MGFD	Munitions with the Greatest Fragmentation Distance
mg/kg	milligrams per kilogram
mm	Millimeter(s)
MPPEH	Material Potentially Presenting an Explosive Hazard
MRA	Munitions Response Area
MRS	Munitions Response Site
MSD	Minimum Separation Distance
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NAD	North American Datum
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NIR	Notice of Intent to Remediate
NG	Nitroglycerin
OEW	Ordnance and Explosive Waste
PADEP	Pennsylvania Department of Environmental Protection
PAH	Polycyclic Aromatic Hydrocarbons
PARCCS	Precision, Accuracy, Representiveness, Completeness, Comparability, and Sensitivity
P.E.	Professional Engineer
P.G.	Professional Geologist
PM	Project Manager
PRP	Potentially Responsible Party
QA	Quality Assurance

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

QAPP	Quality Assurance Project Plan
QC	Quality Control
QCP	Quality Control Plan
RAC	Risk Assessment Code
RAGS	Risk Assessment Guidance
RBC	Risk-Based Concentrations
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RLs	Reporting Limits
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
RSL	Regional Screening Level
SAIC	Science Applications International Corporation
SARA	Superfund Amendments and Reauthorization Act
SI	Site Inspection
SOP	Standard Operating Procedure
SSHASP	Site-Specific Health and Safety Plan
SSL	Soil Screening Levels
SUXOS	Senior Unexploded Ordnance Supervisor
SWHS	Statewide Health Standards
SWMU	Solid Waste Management Unit
TCRA	Time Critical Removal Action
TNT	Trinitrotoluene
TP	Target Practice
U.S.	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UTL	Upper Tolerance Limit
UTM	Universal Transverse Mercator
UL	Underwriters Laboratories
UXO	Unexploded Ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer
UXO Tech I	Unexploded Ordnance Technician I
UXO Tech II	Unexploded Ordnance Technician II
VOC	Volatile Organic Compounds
WIP	Wholly-Inert Projectiles
WP	Work Plan

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

WWII	World War II
YCIDA	York County Industrial Development Authority

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1. INTRODUCTION

1.1 PROJECT AUTHORIZATION AND REGULATORY FRAMEWORK

This Remedial Investigation (RI) Work Plan was prepared by EA Engineering, Science, and Technology, Inc., PBC (EA) under contract to Harley-Davidson Motor Company Operations, Inc. (Harley-Davidson) to support the investigation of Munitions Response Areas (MRAs) at the former York Naval Ordnance Plant (fYNOP) located at 1425 Eden Road, Springettsbury Township, York, Pennsylvania (Figure 1).[1] This plan was reviewed by fYNOP project team members including AMO Environmental Decisions (AMO), Harley-Davidson and the United States Army Corps of Engineers (USACE). The goal of the RI is to investigate the MRAs and evaluate risks to human health and the environment. The RI addresses issues related to munitions and explosives of concern (MEC) and munitions constituents (MC) associated with each munitions response site (MRS) and Area of Concern (AOC) identified during previous investigations conducted by the USACE.

Since at least 1986, Harley-Davidson has been conducting investigations and clean-up activities under the supervision of the Pennsylvania Department of Environmental Resources/Protection (PADEP). Following a 1995 settlement agreement between Harley-Davidson, the United States Department of Defense (DoD), and the United States Department of Navy, environmental assessments and remedial activities at the fYNOP are to be performed by Harley-Davidson with USACE review and guidance consistent with the National Oil and Hazardous Substances Contingency Plan (NCP) and other applicable federal, state, and local regulations. The DoD and Navy interests are represented by the USACE. Harley-Davidson is presently overseeing the performance of a remedial investigation/feasibility study (RI/FS) of the property pursuant to the NCP and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) to address the presence of volatile organic compounds (VOC) in groundwater and VOCs, polycyclic aromatic hydrocarbons (PAHs) and metals in soils.

Harley-Davidson is actively participating with the DoD under a cost sharing agreement to address the site remedial actions. Harley-Davidson and the United States Environmental Protection Agency (USEPA) signed an agreement to participate in the Federal Facility Lead Program in 2002. The Facility Lead Program was superseded by the USEPA One Cleanup Program enacted in 2003. Harley-Davidson submitted a Notice of Intent to Remediate (NIR) to the PADEP in 2005 which initiated cleanup actions under Act 2. CERCLA and Act 2 have no special provisions for dealing with explosive safety and, therefore, the provisions in the DoD Ammunition and Explosives Safety Standards (DoD 6055.9-M), USACE Engineer Manual (EM) 385-1-97 and the Final United States Army MMRP Munitions Response Remedial Investigation / Feasibility Study Guidance will be adhered to during the RI. Munitions response actions will be

1 The property is a Formerly Used Defense Site (FUDS) Property No. C03PA0984 identified and investigated by the USACE Baltimore District. In accordance with a settlement agreement between DoD and Harley-Davidson the clean-up lead is Harley-Davidson. This work plan uses the terms former York Naval Ordnance Plant (fYNOP) and Site when referring to the property. The term munitions response area or "MRA" refers to the areas encompassing the MRSs and AOC identified during previous investigations.

conducted in compliance with USACE, Harley-Davidson, and local/state requirements regarding personnel, equipment, and procedures.[2]

1.2 PURPOSE AND OBJECTIVE

The purpose of this work plan is to summarize the methodology planned to provide quality RI and munitions response services to Harley-Davidson at the fYNOP site. The overall objective of this RI is to collect data that will be used to define the nature and extent and fate and transport of MEC and MC in and around the MRSs and AOCs associated with historical munitions use.

It is noted that based on the site visit and initial discussions with Harley-Davidson personnel the RI approach will be phased. The initial phase will serve to confirm the boundaries of the existing MRSs and AOCs identified by USACE during previous investigations and to identify any additional areas requiring investigation. After the initial investigations are conducted, a work plan addendum will be issued to identify specific areas requiring more focused investigations and MC sampling to complete RI investigations.

1.3 WORK PLAN ORGANIZATION

This Work Plan contains the following chapters used to outline the work to be performed during the RI:

Chapter 1, Introduction: This chapter provides an introduction to the project, purpose and scope, and work plan organization.

Chapter 2, fYNOP Background: This chapter provides the project location, site description, site history, current and projected land use, brief summary of previous investigations, and an initial summary of the risk from MEC and MC.

Chapter 3, Technical Management Plan: This chapter details the organizational structure, lines of authority, and communication of the project team.

Chapter 4, Field Investigation Plan: This chapter describes the field methods and procedures planned for the RI, and the approach to risk characterization and analysis.

Chapter 5, Quality Assurance Project Plan (QAPP): This chapter describes laboratory methods for MC sampling, laboratory standard operating procedures (SOPs), and field and laboratory quality assurance (QA)/quality control (QC) requirements and procedures to be employed.

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[2] The settlement agreement between Harley-Davidson and the DoD reduces some of the USACE requirements for separate documents (i.e. no explosive safety submission, accident prevention plan, or explosives siting plan are required);however, safety aspects of conducting investigations for munitions are included in this RI work plan, and safe work practices will follow DoD and USACE guidance documents. Furthermore, to be consistent with current terminology the term MEC is used throughout this Work Plan in lieu of the term OEW which appears in the Settlement Agreement.

Chapter 6, References: This chapter includes a list of references used in the preparation of the work plan.

Additional information and plans are attached to this work plan as appendices to include:

Appendix A, Site-Specific Health and Safety Plan (SSHASP): The SSHASP describes the health and safety procedures, personal protection standards, and environmental health hazards applicable to this project.

Appendix B, Test America Denver Quality Assurance Project Plan and Certifications: The appendix includes the laboratory standard operating procedures (SOPs) and laboratory certifications.

Appendix C, Standard Operating Procedures (SOP): Presents the SOPs that will be used during the RI field activities.

Appendix D, Field Forms: Presents field forms that will be used during the RI field activities.

Appendix E, Summary of Previous Investigations and Findings: Presents a summary of munitions related investigations conducted to date and other findings related to MEC and MC.

Appendix F, Harley-Davidson Sample Nomenclature and Data Deliverable Requirements: Presents sample labeling requirements along with Electronic Data Deliverable and Database requirements for Harley Davidson.

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2. FYNOP BACKGROUND

2.1 LOCATION AND SETTING

The fYNOP is located in Springettsbury Township in York, York County, Pennsylvania. The site is bordered to the south by United States (U.S.) Route 30; to the west by Eden Road, a railroad line and Codorus Creek; and to the east and north by residential properties (Figure 1). The North American Datum 1983 (NAD) Universal Transverse Mercator (UTM) northing and easting coordinates for the approximate center of fYNOP are 353811m and 442801m, respectively.

2.2 OPERATIONAL HISTORY

The site was constructed in 1941 by the York Safe and Lock Company, a contractor for the United States Navy for production of armaments for use by the DoD during World War II (WWII). The manufacture and assembly of 40 millimeter (mm) twin and quadruple guns and gun mounts, 37 mm guns and carriages, 3-inch and 90mm anti-aircraft gun mounts, and Navy shields and gun slides was performed onsite.[3] The York Safe and Lock Company constructed two proof testing ranges for the testing of the manufactured guns (including the 40 mm, 3-inch, and 37 mm guns). Facilities constructed in the proof testing area (referred to as the Magazine Area in 1959) included proof testing ranges (Buildings 14 and 16), along with ammunition storage buildings/magazines (Buildings 17 through 23) (Figure 2). Historical documents state that 1.1 inch detonating fuses, aircraft and surface craft depth bomb mechanical fuses, 40 mm shell casings and projectiles (bullets), and 37mm shot and rocket motors were produced by York Safe and Lock Company.[4] These documents do not confirm whether these items were manufactured at the fYNOP or not (USACE 1995, Alion 2008).[5] No information was found to confirm the fuses, rocket motors or shell casings were loaded onsite or that the fuses or rocket motors were tested at the proof range. To date no evidence of fuses or rocket motors have been found onsite.[6]

By Executive Order, dated 21 January 1944, the Secretary of the Navy, permitted the Government to possess and operate the facility. After Government authorization was executed, the facility was named the U.S. Naval Ordnance Plant, York, Pennsylvania. Later in 1944, the Blaw-Knox Corporation (BKC) was requested to assume management and operation of the York Plant. BKC operated the facility as a U.S. Navy contractor until 1946 (USACE 1995).

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[3] Historical documents indicate that York Safe and Lock Company had three separate plants located in York, PA. These plants were identified as the Main Office and Plant (located on Loucks Mill Road), the South Plant (located at Pine and Boundary streets) and the East Plant (located at 6th and Ogontz streets) (Alion 2008).

[4] Historical documents list the M46, M66 and M72 fuses (Alion 2008).

[5] Historical documents indicated that as of August 1945, ordnance manufacturing contracts were being fulfilled by the other York Safe and Lock Co. facilities (not the fYNOP). In particular the York Safe and Lock Co. East Plant had a number of contracts and it housed engineering research and experimental branches while the York Safe and Lock Co. South Plant was performing sheet metal work and constructing Navy spare part boxes and ordnance items (Alion 2008).

[6] No information was found to confirm that rocket, shell, or fuse loading activities occurred at the fYNOP. Available documents state that the proof testing range was only used for the testing of machine guns up to 40mm (Alion 2008).

During the Korean War in the early 1950s, BKC was the manufacturer of 3-inch, .50-caliber guns, and 20-mm aircraft machine guns. Towards the end of 1955, the plant began to manufacture power drive units for the 5-inch and .54-caliber guns along with the 20-mm aircraft machine guns. A mission statement presented in historical documents indicated the fYNOP was also authorized to "dispose, from whatever sources received, in accordance with current directives" (USACE 1995). Disposal activities of unserviceable and/or dangerous ammunition and explosives at the site have not been confirmed through historical information or findings during previous investigations. Historical maps do not show an open burn/open detonation area, which would likely have been used for this type of operation as being present onsite (USACE 1995, Alion 2008). The only potential disposal area contains MEC identified to date was a misfire pit located adjacent to Building 14, a former proof range. The misfire pit was removed as discussed in below.

General production operations at fYNOP continued until 1964 when the plant was sold. In January 1964, the U.S. Government sold the fYNOP to American Machine & Foundry Company (AMF). AMF acquired fYNOP in 1964 and continued manufacturing operations to include rocket launchers, gun components, and other materials formerly manufactured at the facility for several years before switching over to non-ordnance manufacturing. In 1969, AMF merged with the Harley-Davidson Motor Company Operations, Inc. In 1973, Harley-Davidson moved its motorcycle assembly operations to the fYNOP. Besides motorcycles, Harley-Davidson has also produced bomb casings and other items at fYNOP (Alion 2008).

On 14 June 2012, Harley-Davidson entered into an Agreement of Sale with the York County Industrial Development Authority (YCIDA) for YCIDA to purchase approximately 58 acres of the fYNOP identified as the "West Campus". Currently, the entirety of MRS 1 is situated on property owned by the YCIDA. The West Campus parcel address is referenced as 1445 Eden Road, York PA, and environmental liability for the West Parcel is retained by Harley-Davidson as a result of the Sale Agreements. The remaining MRSs and AOCs, including the overall RI study area is located on the remaining 171 acres of property retained by Harley-Davidson. Harley –Davidson continued to develop the property over the years. Operations were moved into a new plant used for the production of motorcycles and older buildings were demolished. As a result of past and recent development, the area surrounding the MRAs to the south is developed (Figures 1 and 3) and some development (including placement of utilities and fill materials) has occurred within the MRS (Figure 4).

2.3 PREVIOUS INVESTIGATIONS

Between 1984 and 2013, USACE and Harley-Davidson have conducted multiple investigations and cleanup/removal actions to address MEC, munitions debris (MD), and MC related to former proof testing operations to include a removal action by Explosive Ordnance Disposal (EOD) personnel in 1993, a time critical removal action (TCRA) in 2004, and a site inspection (SI) in 2007 and 2008 investigations as well as the soil removal actions at the Building 16 backstops. As a result of these investigations, five MRSs and two AOCs were designated as being present at the site and requiring further action to address risk to human health and the environment (Figure 3). A summary of the previous investigations performed on the MRSs and AOCs at fYNOP is presented in Appendix E. A description of each MRS and AOC and a summary of the findings as they relate to remaining risk is presented below.

2.4 MRS AND AOC SITE DESCRIPTIONS

2.4.1 MRS 1 - Burial Area (Parking Lot)

MRS 1 is located on the western side of the fYNOP site in an area termed the West Parking Lot. This land is no longer owned by Harley-Davidson. MRS 1 derives its shape and location from the USACE Archive Search Report (ASR) that created a "square" shape range area encompassing a location where a former YNOP employee had drawn an "X" on a map. The "X" was to indicate the location of a former "dump" area used by YNOP. The ASR also noted that historically an inert projectile had been found during sampling activities in the west parking lot; however, it is unclear where the item was actually found. In addition, it is not clear how this information was used to validate the location of MRS 1 as no wells, boring locations, or test pit locations were cited to confirm the location of the projectile. During the 2007 SI, it was noted that MRS 1 was part of the west parking lot landfill area which was undergoing investigations. Based on a review of the 2009 Draft Supplemental Remedial Investigations Report, it was noted that the West Parking lot had been divided into a series of disposal areas which were investigated to varying degrees to include geophysics and soil/groundwater sampling to include metals but not explosives. One area, identified as Area F, appears to be in proximity to where the "X" in the ASR map was originally drawn. Based on a review of the 2009 investigation results from this area, no evidence of MEC was found. Following the investigation, Area F was part of the reconstruction project for Eden Road. As a result Area F was capped with several feet of soil and a portion of this area is covered by roadway. Land use controls are in place for this area and future use as a roadway and parking area is not expected to change. [7] No investigation of this area is planned as part of the first phase of the RI; however, the investigation and sampling data for this area will be evaluated in the work plan addendum to determine if the MRS boundary needs to be adjusted and to determine if geophysics or additional MC sampling is necessary to evaluate or close out this area. Given the low potential for MEC, the area will likely be carried fourth in post RI documents (i.e. FS) and addressed with land use controls.

2.4.2 MRS 2- Burial Area (Building 14 Misfire Pit)

MRS 2 is located east of Building 14 (MRS 5), in the eastern portion of fYNOP (Figure 3). The MRS was listed as having an area of 1 acre; however, the acreage listed does not correspond to the area of the pit and the area investigated (estimated to be approximately 400 square feet [sqft]). The area contained a small concrete covered pit, which was approximately 4 by 4 feet (ft) and 6 ft deep and termed a "misfire pit". The pit which contained MEC (20-mm TP cartridges, 3-inch antiaircraft gun TP cartridges, 37-mm TP cartridges, a 37-mm M74 shot cartridge, and 105 assorted small arms cartridges) was the subject of multiple removal actions (1993 UXO removal action and 2004 TCRA). The 2004 TCRA resulted in the removal of the

[7] A Protective Covenant was issued as part of the Agreement of Sale for the western portion of the Harley Davidson property (West Campus). The covenant restricts the use of groundwater and is restricts the disturbance of engineering controls present on the site in accordance with any soil management plan and applicable laws. At a minimum, recommendations will be proposed to make revisions to the existing controls to address the low potential for encountering munitions in MRS 1 below the surface.

entire concrete pit to depth. The area where the pit was removed was subsequently investigated and sampled during the 2007 SI to determine if any evidence of MEC or MC hazards remain. There were no MEC/MD findings and samples were below screening criteria. The SI recommended no further action for the MRS; however, investigations were limited to the source area (former pit location) and the immediate surrounding area.

2.4.3 MRS 3- Burial Area (20mm Dump)

MRS 3 is located southeast of Building 14 (MRS 5), between Building 14 and the former location of the Building 16 firing point (Figure 3). This area was the reported location of “dump” where 20mm MD and potentially MEC was disposed of from the proof ranges. The MRS was listed as having an area of 1 acre; however, the acreage listed does not correspond to the area investigated. Historically, MD (to include one 37-mm round) was found and removed during the TCRA; however, no MEC has been historically found in the area. The area was investigated during the SI and no MEC or MD was found. However, further action was recommended for MEC due to the historical presence of MD. Risks to ecological receptors (select metals in surface soils) were also identified during the SI.

2.4.4 MRS 4- Burial Area (Building 16 Misfire Pit)

MRS 4 is located east of Building 16, in the eastern portion of fYNOP (Figure 3). The MRS was listed as having an area of 1 acre (matching MRS 2 Misfire Pit Acreage). Historically, there have been no finds of MEC or MD in the location of MRS 4 and no MEC/MD findings were observed during the SI. The SI recommended no further action for the MRS; however, investigations were limited to the suspect source area (former pit location) and the immediate surrounding area.

2.4.5 MRS 5- Proof Range

MRS 5 is located in the central portion of the fYNOP (Figure 3). The MRS was listed as having an area of 1-acre and the designated MRS boundary encompasses a portion of Building 14 (to include the ventilation system and target backstop area). Historically there were findings of MEC or MD and no MEC was identified during the SI. MD (empty small arms casings) were found near the former firing point during the SI reconnaissance activities (outside the MRS boundary). No MD was identified in the backstop area during the SI. However, due to the non-intrusive nature of the SI, the SI field team could not access/inspect the subsurface of the backstop sands and the sand handling system; therefore, it is unclear if MEC or additional MD are remaining within the building. The SI recommended further action for MEC due to the presence of MD and MC due to risks to ecological receptors (select metals in surface soils).

2.4.6 AOC 1 – Solid Waste Management Unit (SWMU) 20/21 (37 mm Suspect MD and Sand Disposal Area)

AOC 1 is located in a wooded area in the northeastern portion of fYNOP (Figure 3). The area is mostly covered by mature trees; however, a portion of the area contains grass cover and evidence of an access road. There are no current structures in this location and the only evidence of past dumping activities consists of vegetation (trees) which were observed to have been pushed off of a cleared dirt road. No MEC or MD was found at AOC 1 during SI reconnaissance or sampling activities. Subsurface anomalies likely attributable to MD or cultural debris were noted as being present in the area. The SI recommended further action for MEC due to the potential for MEC/MD and MC due to risks to human and ecological receptors (select metals in surface soils).

2.4.7 AOC 2 – Building 16 Backstops

AOC 2 surrounds the area that contains the two backstops for Building 16 (Figure 3). This area is located directly east of MRS 5 (Building 14) and north of MRS 2 (20 mm Disposal Area). Current structures at this location include the east and west backstops of Building 16. The area is partially covered with concrete and contains very little vegetation. The areas behind the backstops contain tall trees and thick vegetation and a pile of material removed from the area in front of the backstops. Historically, MD to include sand filled or black powder-filled projectiles certified as inert along with slag material was found and removed from the Building 16 backstop areas (2004 TCRA). During the SI, MD and MC (dust piles associated with the former proof range ventilation system) was observed to be scattered throughout the area in front of and inside the backstops. No subsurface anomalies likely attributable to MEC/MD were located in the area during the SI reconnaissance. The SI recommended further action for MEC due to the presence of MD and MC due to risks to human and ecological receptors (select metals in surface soils).

2.4.8 Additional Findings and Focus of Investigations

Since 2007, Harley-Davidson has had additional munitions related findings outside the designated MRSs and AOCs (Figure 3). These findings appear to be related to disposal operations associated with the proof range operations. However, given the fact that these items were outside the 2007 designated MRS and AOC boundaries, the area of investigation is expanded to include a buffer around the AOCs and MRSs to ensure any single items potentially present outside the MRSs and AOCs will be identified.

2.5 SITE SETTING

2.5.1 Climate

Pennsylvania is generally considered to have a humid continental type of climate, but the varied physiographic features have a marked effect on the weather and climate of various sections within the state. The average yearly temperature at the fYNOP is 58.3 degrees Fahrenheit (º F), with the maximum being 95º F and the minimum being 5º F. The average precipitation is 40 inches (USACE 1995, Alion 2008).

2.5.2 Topography

Elevations across the fYNOP site range from 354 to 575 feet above sea level with an average of approximately 400 feet above sea level (USACE 1995). Historical site topography from 1944 is presented in Figure 2 and current topography is shown on Figure 5. In general, the topography is conducive to the planned RI activities; however, it is noted that the topography near AOC 1 is very steep in places, which could impact degree of coverage during RI activities.

2.5.3 Soils

Unconsolidated overburden material of residual soils and saprolite has developed from the underlying bedrock throughout the fYNOP. The overburden material ranges in thickness from 15 feet to greater than 60 feet. Portions of the fYNOP also have alluvial deposits, which include more coarsely grained sediments interspersed among the predominantly fine-grained residual soils (USACE 1995).

2.5.4 Vegetation

The vegetation in the fYNOP consists of white pine, red pine, Norway spruce, white spruce, jack pine, European larch, ash, walnut, lespedeza bicolor, bush honeysuckle, and shrub roses (USACE 1995, Alion 2008). A portion of the fYNOP surrounding MRS 1 (no longer owned by Harley Davidson) is developed with limited or no vegetation (parking lot).

2.5.5 Geology

Two geologic formations underlie the fYNOP, a solution-prone, gray limestone (carbonate-rich) located in the flat lowland, and a quartzitic sandstone underlying the more steeply sloping hills or upland are in the eastern part of the fYNOP. The bedrock is from the Kinzers Formation. The Kinzers Formation in York County is a medium to dark gray microcrystalline to very fine crystalline limestone with some quartz veins (USACE 1995).

Weathering has taken place within the limestone bedrock in the form of dissolution of carbonate minerals. Several sinkholes have occurred on the fYNOP, which are typical within areas of karst topography (USACE 1995, Alion 2008).

2.5.6 Hydrogeology

Groundwater generally migrates from the upland area (east) towards Codorus Creek (west). The eastern upland area is underlain by quartzitic sandstone while a carbonate (karst) aquifer underlies the western half of the Site. Aquifer transmissivity is very different between these geologic materials with the quartzitic sandstone being lower due to groundwater migrating through minor bedding planes, joints and fractures that have a high resistance to flow compared to the solution-enhanced carbonate aquifer. The materials of the carbonate aquifer are prone to dissolution by migrating groundwater which increases the formations transmissivity and permits groundwater to more readily flow through the aquifer (Groundwater Sciences Corporation (GSC) 2011).

Water table gradients are relatively steep (6 to 10%) in the upland, quartzitic sandstone, regions and are reduced to a relatively flat gradient (less than 1%) once groundwater flows into the carbonate rock aquifer. The upland area flow patterns are mainly driven by the interconnected network of fractures, joints, and bedding planes. Once the groundwater enters the carbonate rocks, groundwater flow is directed along fractures, dissolution cavities, interconnected conduits, and weathered zones in the rock. Locally, the groundwater flow through the karst bedrock is widely variable following the pathways of the karstic conduits (GSC 2011).

The extent of the karst aquifer is limited to the north and east by phyllite, quartzite, and quartzitic sandstone. These noncarbonated formations underlie the carbonate formation, dipping at angle of approximately 15 to 20 degrees toward the carbonate, and form the lower limit of the karst aquifer in the northern and eastern portions of the Site. To the south, the carbonate aquifer is laterally extensive, and the depth of the karst aquifer is unknown. Under the southern portion of the Site (including the West Parking Lot), the depth to the bottom of the carbonate aquifer is unknown (GSC 2011).

2.5.7 Additional Site Information

The fYNOP contains habitat that supports the State endangered Short-eared Owl, the State threatened Upland sandpiper, and the Federal and State protected Bald Eagle (USACE 1995). Activities will be conducted to minimize impact to threatened and endangered species. Specifically no activities are planned in areas where threatened or endangered species are located.

Additionally, there are no identified wetlands within the designated AOCs and MRSs at the fYNOP, and the Site is located in south central Pennsylvania and, as a result, there are no coastal zones present on the site or in the study area (USACE 1995).

No Cultural and Archaeological Resources are present within the site boundaries of fYNOP (USACE 1995) and no active waste disposal sites currently exist.

Drinking water populations within 4 miles of the fYNOP include residents of York County, Pennsylvania, which has an estimated population of over 416,322 (United State Census Bureau 2000).

Several groundwater monitoring wells are currently present on the fYNOP property; however, there are no potable water wells located on-site. Potable water for fYNOP is obtained from the York Water Company or from bottled water suppliers.

2.6 CURRENT AND PROJECTED LAND USE

MRS 1, located on YCIDA-owned property, is currently a paved (asphalt covered) parking area. There is no present use of MRS 1/West Parking Lot and no future land use is designated at this time, but it will likely be developed for industrial use.

MRS 2, MRS 3, MRS 4, MRS 5, and AOC 2 are on Harley-Davidson owned land that is access controlled via secure, perimeter fences. Currently, no active manufacturing operations are occurring in this area of fYNOP. Due to the presence of potential MEC and/or MC, no future land use is currently anticipated; however, as a portion of the area lacks significant topographical changes, the potential exists for future industrial development.

AOC 1, on the eastern boundary of the fYNOP, is densely wooded and located along a steep embankment. Currently, no active manufacturing operations are occurring in the area of AOC 1, and based on topography, no future land use is anticipated as the site may continue to function as a natural buffer.

2.7 INITIAL SUMMARY OF RISK FROM MUNITIONS AND EXPLOSIVES OF CONCERN AND MUNITIONS CONSTITUENTS

The initial summary of risk from MEC and MC for the fYNOP MRSs and AOCs is concluded from the 2007 SI report. The fYNOP is a low risk for MEC (low probability of encountering MEC) given previous removal actions and findings to date. Based on sampling results, the fYNOP does pose a risk to human health and the environment due to elevated concentrations of metals (specifically, antimony, copper, lead, nickel, and zinc) that exceed the Act 2 Pennsylvania Statewide Health Standards (SWHS) in MRS 3, MRS 5, AOC 1, and AOC 2.

2.8 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) for each fYNOP MRS and AOC has been developed for the different types of contaminants present onsite, including MEC and MC. The CSMs define the source (e.g., the secondary source/media), interaction (e.g., the secondary release mechanism, the tertiary source, and the exposure route), and human and ecological receptors. Potential contaminant sources and receptors were identified and the pathways linking them together were analyzed. The CSMs presented in this RI work plan will continue to be updated throughout the RI process as additional data are collected and analyzed. CSMs for the MRS are described in the following sections.

2.8.1 MEC CSM

2.8.1.1 MEC Exposure Pathway

This section discusses the MEC exposure pathway and hazard assessment for the fYNOP MRSs and AOCs. MEC exposure pathways have been identified as complete, potentially complete, or incomplete. The following definitions were used to make a determination for the status of each pathway:

Complete Pathway – There is confirmed receptor and media interaction and there is MEC confirmed to be present.

Potentially Complete Pathway – There is confirmed receptor and media interaction; however, the exposure may be limited, either due to the type of receptor or the nature of the source, and has not been confirmed. The potentially complete pathway for MEC arises in the following instances:

- Source and mechanism of chemical release (e.g. a munitions-related organic chemical is detected or site metal concentration exceeds background concentrations);
- Transfer mechanisms (e.g. overland flow of contaminants into an adjacent stream, advection of contaminants with groundwater flow);
- Point of contact (exposure point, e.g., drinking water, soil); and
- Exposure route to receptor (e.g., ingestion, inhalation, etc.).
- The presence of material potentially presenting an explosive hazard (MPPEH) indicates there is a potential for MEC to be present, but it has not been confirmed.
- The presence of anomalies indicates there is a potential for MEC to be present, but it has not been confirmed.

Incomplete Pathway – There is no receptor and media interaction or MEC was not identified.

2.8.1.2 Transport Process

At the time of potential MEC release into the environment, the medium receiving items was surface or subsurface soil.

Natural transport processes, including soil erosion, may cause MEC to move within the environment following the primary release. Human activities, including construction activities such as excavation or clearing and grading, may also cause MEC to move within the environment. Following the initial release of MEC, detonation, damage on impact, or degradation may release MC to the environment. Leaching and other transport mechanisms may transfer released MC between two or more media.

The CSM requires that an estimate of expected depth of MEC be included in the site-specific analysis for determining response depth, as the depth(s) at which MEC is located is a primary determinant of both potential human exposure and the cost of investigation and cleanup. A wide variety of factors may affect the depth at which military munitions are found. These factors include penetration depth—a function of munitions size, shape, propellant charge used, soil characteristics, angle of entry, and other variables—and movement of MEC through human interaction. Based on the munitions debris identified at the fYNOP MRSs and AOCs, the expected depth for potential MEC is limited to surface soils (top 6 inches of soil) and in some areas subsurface soils based on the potential for MEC and MD disposal pits at the Site.

2.8.1.3 Exposure Media and Accessibility

Interaction describes ways that receptors come into contact with a source. Interaction is the means by which receptors come in contact with MEC. This interaction requires two closely connected elements: access and activity. Access is the ability of a receptor to enter the source area. Activity is any action by a receptor that may result in direct contact with individual MEC items.

The presence of access controls will help determine whether an exposure pathway to a receptor is complete, as fences or natural barriers can limit human access to a source area. The depth of MEC items in subsurface soil may also limit access by a receptor. Additionally, the effects that future land use may have on-site access must be considered. For example, access may be unlimited for construction workers, but may be restricted for nearby residents or other potential receptors. Ease of entry for adjacent populations (e.g., lack of fencing) can facilitate intentional or accidental trespassing.

The hazard presented by MEC is caused by direct contact as a result of some human activity. Site access without such activity does not present a hazard. Identification of MEC exposure pathways focuses on current and future activities that bring humans into contact with the MEC.

MEC exposure media are limited to surface and subsurface soil at fYNOP; however, access to these media is limited and education programs are in place at fYNOP to prevent interaction/contact with MEC.

2.8.1.4 MEC Exposure Receptors

The receptors considered for MEC at fYNOP include authorized Harley-Davidson personnel, contractors, visitors, and biota. The fYNOP contains habitat that supports the State endangered Short-eared Owl, the State threatened Upland sandpiper, and the Federal and State protected Bald Eagle.

2.8.1.5 MEC Exposure Conclusions

MEC were not observed during the 2007 SI; however, munitions debris associated with 20mm projectiles were observed. Two items were identified Harley-Davidson and removed by State Police after 2007 and USACE found an area containing surface MD adjacent to AOC 1. The presence of MD indicates there is a potential for MEC to be present in the subsurface.

2.8.2 Munitions Constituents CSM

The MC information presented in the CSM was used to identify all complete, potentially complete, or incomplete exposure pathways for the MRSs/AOCs, for both current and reasonable anticipated future land uses. An exposure pathway is the course a chemical or physical agent takes from a source to a receptor. The MC pathways may also include a release mechanism (i.e., volatilization) and a transport medium (i.e., air) if the point of exposure is not at the same location as the source.

The source areas associated with potential MC exposure within fYNOP includes the MRSs and AOCs and any additional areas where munitions were used or disposed. Figures 3 and 4 show the location of previously identified MRSs and AOCs located in the eastern portion of fYNOP and details of the munitions use in these areas are discussed in Section 2.4. MC of concern associated with fYNOP munitions use and remaining munitions debris identified onsite primarily includes metals (antimony, copper, lead, and zinc) from 0.50 caliber and 20 and 37 mm projectiles. To a lesser extent, select explosives associated with propellant and firing of the projectiles to include (2,4-dinitrotoluene, 2,6-dinitrotoluene (DNT), and nitroglycerin (NG) may be present as well.[8]

MC (metals and explosives) associated with the MEC or MD dissipate through the soil through infiltration and percolation. In addition to being transported, contaminants in the environment may also transfer from one medium to another, such as from soil to groundwater.

The propensity of a chemical to react to equilibrium conditions in the environment and transfer between media is an important factor in determining the mobility of a compound.

The fate and transport of MC are dependent on a variety of factors. Contaminant fate refers to the expected final state that an element, compound, or group of compounds will achieve following release to the environment. Contaminant transport refers to migration mechanisms and rates of contaminant movement from the source area. Migration pathways include air, water, soil, and the interfaces between the phases of the contaminant (i.e., solid, liquid, or gas). The fate and transport of contaminants occur in all three environmental media: terrestrial, aquatic, and atmospheric. Terrestrial environments are comprised of soil and groundwater, aquatic environments include surface water and sediment, and air is the only component of the atmospheric environment.

In the terrestrial environment, if the contaminant is released to soil, it may volatilize, adhere to the soil by sorption, leach into the groundwater, or degrade due to chemical (abiotic) or biological (biotic) processes. If the contaminant is volatilized, the compound may be released to the atmosphere, or if volatilization occurs in the subsurface, the contaminated vapor may migrate and sorb to previously uncontaminated soil or dissolve in groundwater. Constituents that adhere to soil may eventually be transported with surface runoff to an aquatic environment and become sediment. Furthermore, dissolved constituents may eventually be transported to an aquatic environment as surface water.

In the aquatic environments, if the contaminant is released to surface water and/or sediment, it may volatilize, adhere to the sediment by sorption, leach into the groundwater, or degrade due to chemical (abiotic) or biological (biotic) processes. If the contaminant is volatilized, the compound may be released to the atmosphere.

In the atmospheric environment, contaminants may exist as vapors or as particulate matter. The transport of contaminants relies mostly on wind currents, and continues until the contaminants are

[8] As noted in Sections 2.8.2.1 thru 2.8.2.4 DNT and NG have not been found in soil or GW samples collected at the site; however, they are still included in the suite of analytes for the RI.

returned to the earth by wet or dry deposition. Degradation of organic compounds in the atmosphere can occur due to direct photolysis, reaction with other chemicals, or reaction with photo chemically-generated hydroxyl radicals.

The fate and transport of contaminants at fYNOP are strongly influenced by physical and chemical properties, as well as environmental factors such as soil characteristics.

The subsections below discuss the MEC and MC exposure pathways for each of the media at the fYNOP MRAs. MC exposure pathways have been identified as complete, potentially complete, or incomplete. The following definitions were used to make a determination for the status of each pathway:

Complete Pathway – There is confirmed receptor and media interaction and there are confirmed exceedances of screening criteria and for metals exceedances of the mean background level indicating that MC is present.

Potentially Complete Pathway – There is confirmed receptor and media interaction; however, the exposure, either due to the type of receptor or the nature of the source, may be limited or has not been confirmed. The potentially complete pathway for MC arises in the following instances:

- There are confirmed exceedances of screening criteria and the mean background level indicating that MC is present, but the receptor may not significantly interact with the media (e.g. If there is an exceedance of a human health screening level in soil, there is a complete surface soil pathway for contractors, but a potentially complete surface soil pathway for visitors).
- No data was collected for the specific media; however there are confirmed exceedances of screening criteria in neighboring media and the mean background level (e.g. No surface water or sediment samples were collected; however, there was an exceedance of screening levels in soil).

Incomplete Pathway – There is no receptor and media interaction or there are no exceedances of screening criteria and a potential MC source (i.e. MEC or MPPEH) was not identified.

2.8.2.1 Surface Soil Exposure Pathway Analysis

Appropriate human and ecological receptors which have potential to be exposed to surface soil were selected for fYNOP based on site-specific conditions. Human receptor subcategories considered for this evaluation included authorized Harley-Davidson personnel and contractors. Recreational users, visitors, and trespassers are not anticipated to interact with surface soil. Biota and sensitive environments are also considered in the evaluation.

MRS 1: Surface soil in MRS 1 was initially viewed as an incomplete pathway for human and ecological receptors for MC prior to the SI field efforts because the area is a paved parking lot (Alion 2008). No surface or subsurface soil samples were collected in the MRS due to the presence of the paved surface. The area remains paved and the surface soil pathway for MRS 1 is incomplete for human health and ecological risk receptors.

MRS 2: Surface soil in MRS 2 was viewed as an incomplete pathway for human and ecological receptors for MC prior to the SI field efforts as the source of MC was removed during the 1993 removal action and the 2004 TCRA and the site was regraded and backfilled (Alion 2008). Although the CSM pathway was viewed as incomplete, samples were still collected during the SI. Concentrations of explosives were not detected in the samples collected during the SI for MRS 2. The surface soil pathway in MRS 2 remains incomplete for human health and ecological risk receptors based on previous investigations including the 2007 SI.

MRS 3: Surface soil in MRS 3 was initially viewed as a potentially complete pathway for human and/or ecological receptors for MC prior to the SI field efforts (Alion 2008). Two surface soil samples were collected from MRS 3 during the SI and analyzed for explosives of concern (2,4-DNT, 2,6-DNT, and NG. The explosives (DNT and NG) were not detected, but antimony, lead, and zinc were detected at various concentrations that exceeded background soil concentrations in MRS 3; therefore, the pathway for human and ecological receptors is complete. Antimony, lead, and zinc exceeded their respective ecological screening values and were identified as chemicals of potential ecological concern (COPECs). Concentrations reported for the two surface soil samples were below human health screening criteria; therefore, no chemicals of potential concern (COPCs) were identified. The pathway for ecological receptors from exposure to surface soil is identified as complete. No human health COPCs were identified in soil; however, metals were detected in surface soil above background concentrations; therefore, the pathway was determined to be potentially complete for human receptors. The most likely human receptors are construction workers and/or contractors who may be working in the area.

MRS 4: Historically no pit was ever identified in MRS 4 as being located in this area and reconnaissance conducted as part of the 2007 SI found no evidence of a pit or MEC/MD, therefore no surface soil samples were collected to evaluate risk for MRS 4. As no source was found, the surface soil pathway in MRS 4 is incomplete for human health and ecological risk receptors.

MRS 5: Surface soil in MRS 5 was initially viewed as a potentially complete pathway for human and ecological receptors for MC prior to the SI field efforts (Alion 2008). During the SI, two surface soil samples were collected from MRS 5 and compared to industrial human health screening values and ecological screening criteria. No explosives were detected in samples collected from MRS 5. Antimony, copper, lead, nickel, and zinc concentrations detected in surface soil exceeded background concentrations; therefore, the pathways for human and ecological receptors were identified as complete. No MC of concern exceeded the human health screening values; therefore, acceptable risks were identified for human receptors and no COPCs were identified for MRS 5. Antimony, copper, lead, and zinc (max hazard quotient (HQ) of 18.5) were detected above background and ecological screening values, and identified as COPECs for this MRS. The pathway for ecological receptors exposure to surface soil was identified as complete. No human health COPCs were identified in soil; however, metals were detected in surface soil above background concentrations; therefore, the human health pathway is considered to be potentially complete for human receptors. The most likely human receptors are construction workers and/or contractors who may be working in the area.

AOC 1: Surface soil in AOC 1 was initially viewed as a potentially complete pathway for human and ecological receptors for MC prior to the SI field efforts (Alion 2008). During the SI, three surface soil samples and were compared to human health industrial screening values and ecological screening criteria. No explosives were detected. Antimony, copper, lead, nickel, and zinc concentrations at AOC 1 exceeded background. Antimony, copper, lead, and zinc were detected at levels above ecological screening values; therefore, they were identified as COPECs for AOC 1. Lead was detected above human health screening levels; therefore, it was identified as a COPC for AOC 1. The pathway is considered complete for both human and ecological receptors for surface soil based on detection of metals in AOC 1 that exceeded both ecological and human health screening levels. The most likely human receptors are construction workers and/or contractors who may be working in the area.

AOC 2: Surface soil in AOC 2 was initially viewed as a potentially complete pathway for human and ecological receptors for MC prior to the SI field efforts (Alion 2008). During the SI, three surface soil samples were collected from AOC 2 and compared to human health screening values (industrial criteria) and ecological screening criteria. A sample collected from between the backstops was located in an area of discolored soil/sand that contained suspect MD. Antimony, copper, lead, nickel, and zinc concentrations at AOC 2 reported in surface soil samples exceeded background concentrations. No MC of concern exceeded human health screening values consequently no COPCs were identified. Antimony, copper, lead, and zinc were detected at levels above ecological screening values; therefore, they were identified as COPECs for AOC 2. Harley-Davidson removed soils and dust related to the air handling system in the Building 16 backstops aft the SI and the backstop areas were also closed off to prevent access. The pathway is considered potentially complete for both human and ecological receptors for surface soil in AOC 2. The most likely human receptors are construction workers and/or contractors who may be working in the area.

2.8.2.2 Subsurface Soil Exposure Pathway Analysis

Appropriate human and ecological receptors to subsurface soil were selected for fYNOP based on site-specific conditions. Human receptor subcategories considered for this evaluation included authorized installation personnel and contractors. Recreational users and visitors, and trespassers are not anticipated to interact with subsurface soil. Biota and sensitive environments are considered in this evaluation.

MRS 1: No subsurface soil samples were collected at this MRS due to the presence of asphalt. The pathway for construction workers and/or contractors are still noted as potentially complete for future activities (i.e. excavations) which could provide exposure to MC.

MRS 2: Two subsurface samples collected in MRS 2 during the SI were analyzed for MC including DNT, NG, antimony, copper, lead, nickel, and zinc. Copper and nickel concentrations at MRS 2 exceeded background, but did not exceed Region III Risk-Based Concentrations (RBCs). Concentrations of explosives were not detected in the samples collected for MRS 2. Comparison to ecological screening criteria for MRS 2 was not performed due to the absence of exposure for ecological receptors to subsurface soil. Pathways from subsurface soil to construction workers and/or contractors are identified as complete for MRS 2, but acceptable risks were found and no COPCs were identified. No risk from explosives was identified in the SI (Alion 2008).

MRS 3: Subsurface soil in MRS 3 was viewed as a potentially complete pathway for construction workers and/or contractors in the 2007 SI prior to the SI field efforts. During the SI, one subsurface soil sample was collected and analyzed for MC including DNT, NG, antimony, copper, lead, nickel, and zinc in MRS 3 during the SI. The subsurface soil sample was not compared to the ecological screening values because there are no exposure routes for biota. Antimony, copper, lead, nickel, and zinc concentrations at MRS 3 exceeded background; therefore, the human health subsurface soil pathways in the CSM are identified as complete. Acceptable risks were found and no COPCs were identified for this MRS. The subsurface soil samples from MRS 3 were not compared to the ecological screening values because there are no exposure routes for biota. Antimony, copper, lead, nickel, and zinc concentrations at MRS 3 exceeded background; therefore, the human health subsurface soil pathways in the CSM are identified as complete with acceptable risks (Alion 2008).

MRS 4: Reconnaissance conducted as part of the 2007 SI found no evidence of a pit or MEC/MD; therefore, no subsurface soil samples were collected to evaluate risk for MRS 4. Reconnaissance conducted as part of the 2007 SI found no evidence of a pit or MEC/MD; therefore, no subsurface soil samples were collected to evaluate risk for MRS 4. The pathways for subsurface soil are incomplete because no evidence of a pit or MEC/MD was found and no source areas were identified (Alion 2008).

MRS 5: Subsurface soil in MRS 5 was viewed as a potentially complete pathway for construction workers and/or contractors in the 2007 SI prior to the SI field efforts. During the SI, one subsurface soil sample was collected from MRS 5. Copper at MRS 5 exceeded background, consequently the pathway for construction workers and/or contractors were identified as complete in the CSM. Acceptable risks were identified for human receptors from exposure to subsurface soil. Exposure of ecological receptors to subsurface soil is not complete because there is no interaction between the media and receptor. Copper at MRS 5 exceeded background, consequently the pathway for construction workers and/or contractors were identified as complete. Acceptable risks were identified for human receptors from exposure to subsurface soil. Exposure of ecological receptors to subsurface soil is not complete because there is no interaction between the media and receptor (Alion 2008).

AOC 1: Subsurface soil in AOC 1 was viewed as a potentially complete pathway for construction workers and/or contractors in the 2007 SI prior to the SI field efforts. No subsurface soil samples were collected from AOC 1 and based on the findings from the surface soil samples in AOC 1, the pathways for construction workers and/or contractors were considered potentially complete for subsurface soil in AOC 1.

AOC 2: Subsurface soil in AOC 2 was viewed as a potentially complete pathway for construction workers and/or contractors in the 2007 SI prior to the SI field efforts. During the SI, one subsurface soil sample was collected from AOC 2. Antimony, copper, lead, and zinc site concentrations were greater than background; consequently, the pathway for human receptors exposure to subsurface soil is complete. None of these concentrations exceeded human health screening values; therefore, no COPCs were identified. Exposure of ecological receptors to subsurface soil is not complete because there is no interaction between the media and receptor. The pathway for human receptors exposure to subsurface soil is complete based on antimony, coppery, lead and zinc concentrations that exceed background. None of these concentrations exceeded human health screening values. Exposure of ecological receptors to subsurface soil is not complete because there is no interaction between the media and receptor (Alion 2008).

2.8.2.3 Surface Water/Sediment Migration Pathway Analysis

No channelized surface water exists within the fYNOP MRS and AOCs and therefore no surface water/sediment receptors are present.

2.8.2.4 Groundwater Migration Pathway Analysis and Conclusions

During the SI planning phase, groundwater in MRS 1 was initially considered a potentially complete pathway for construction workers and/or contractors based on the presence of groundwater monitoring wells located in the vicinity of MRS 1. During the 2007 SI, existing wells were sampled adjacent to MRS 1 and munitions-related constituents were not detected in groundwater samples. No COPCs or COPECs were identified for groundwater in this MRS. Based on the sample results, the pathway in the CSM is identified as incomplete.

During the SI planning phase, groundwater in MRS 2, was not considered a potentially complete pathway as the concrete pit and associated MEC/MD was removed during the TCRA. Additionally, no firing occurred in this area and any associated MC was likely removed with the concrete pit. Although there was no evidence of a source, the groundwater was sampled in conjunction with MRS 3 and MRS 5. Due to the location of the existing groundwater monitoring wells in relation to this MRS, the data was used to evaluate the groundwater pathway for MRS 2. Groundwater sampling was limited to NG and DNT and compared to human health screening values (EPA Region III RBCs). The samples were not compared to the ecological screening values because there is no exposure route for biota. The munitions-related constituents for this MRS were not detected and there are no COPCs identified for groundwater in this MRS. Based on the sample results, the pathway in the CSM is identified as incomplete.

During the SI planning phase, groundwater in MRS 3 was noted as a potentially complete pathway for construction workers and/or contractors as there are several groundwater monitoring wells downgradient of MRS 3. The groundwater pathway was not potentially complete for employees and biota because there are no potable water wells located downgradient and there is no exposure for biota. During the 2007 SI, groundwater sampling was limited to NG and DNT and compared to human health screening values (EPA Region III RBCs). The samples were not compared to the ecological screening values because there are no exposure routes for biota. The munitions-related constituents for this MRS were not detected and there are no COPCs identified for groundwater in this MRS. Based on the sample results, the pathway in the CSM is identified as incomplete.

MRS 4 groundwater was not a potentially complete pathway because previous investigations and the SI found no evidence of a pit or MEC/MC associated with MRS 4. The pathways are incomplete because no groundwater source areas were identified or expected.

During the SI planning phase, groundwater in MRS 5 was identified as a potentially complete pathway for construction workers and/or contractors as there are several groundwater monitoring wells downgradient of MRS 5. The groundwater pathway was not potentially complete for employees and biota because there are no potable water wells located downgradient and there is no exposure for biota. During the 2007 SI, groundwater sampling was limited to NG and DNT and compared to human health screening values (EPA Region III RBCs). Samples were not compared to the ecological screening values because there are no exposure routes for biota. The munitions-related constituents for this MRS were not detected and there are no COPCs identified for groundwater in this MRS. Based on the sample results, the pathway in the CSM is identified as incomplete.

During the SI planning phase, groundwater in AOC 1 was identified as a potentially complete pathway for construction workers and/or contractors as there are several groundwater monitoring wells downgradient of AOC 1. The groundwater pathway was not potentially complete for employees and biota because there are no potable water wells located downgradient and there is no exposure for biota. During the 2007 SI, groundwater sampling was limited to NG and DNT and compared to human health screening values (EPA Region III RBCs). The samples were not compared to the ecological screening values because there are no exposure routes for biota. The munitions-related constituents for this AOC were not detected and there were no COPCs identified for groundwater in this AOC. Based on the sample results, pathways in the CSM are identified as incomplete.

During the SI planning phase, groundwater in AOC 2 was identified as a potentially complete pathway for construction workers and/or contractors as there are several groundwater monitoring wells downgradient of AOC 2. The groundwater pathway was not potentially complete for employees and biota because there are no potable water wells located down-gradient and there is no exposure for biota. During the 2007 SI, groundwater sampling was limited to NG and DNT and compared to human health screening values (EPA Region III RBCs). The samples were not compared to the ecological screening values because there are no exposure routes for biota. The munitions-related constituents for this AOC were not detected and there were no COPCs identified for groundwater in this AOC. Based on the sample results, the groundwater pathway in the CSM was identified as incomplete for AOC 2.

2.8.2.1 Air Migration Pathway Analysis and Conclusions

Air is not a potentially complete pathway for soil in MRS 1 since it is located in a paved parking lot. However, air is noted as a potentially complete pathway from subsurface soil to construction workers and/or contractors as the area underlying the pavement was used as a landfill where MD has been found.

MRS 2 air migration was not a potentially complete pathway as any evidence of a source was removed with the concrete pit during the TCRA.

The air migration pathway for MRS 3 has an extremely low potential, if any, for human and/or environmental receptors to come into contact with the analytes detected in air because of the vegetative cover.

For MRS 4, air was not a potentially complete pathway for surface or subsurface soil as there are no primary or secondary sources expected in the area.

The air migration pathway for MRS 5 has an extremely low potential, if any, for human and/or environmental receptors to come into contact with the analytes detected in surface or subsurface soil because of the vegetative cover.

The air migration pathway for AOC 1 has an extremely low potential, if any, for human and/or environmental receptors to come into contact with the analytes detected in surface soil because of the vegetative cover; therefore, the pathway is incomplete.

The air migration pathway for AOC 2 has potential for human and/or environmental receptors to come into contact with the analytes detected in surface soil because of the limited ground cover in the area of the former backstops.

3. TECHNICAL MANAGEMENT PLAN

3.1 PROJECT OBJECTIVE

The project objective is to conduct an RI to define the MEC and MC risks associated with historical military munitions use at the fYNOP MRSs and AOCs. The location of the fYNOP MRAs are depicted in Figure 1.

Specific objectives of this RI include:

- Confirm MRS/AOC extent within the identified fYNOP boundary,
- Characterize nature and extent of MEC and MC contamination,
- Refine the site-specific CSM,
- Provide identification of Applicable or Relevant and Appropriate Requirements (ARARs),
- Complete Human Health and Ecological risk assessments based on known contamination, and
- Conduct a hazard assessment based on known MEC.

3.2 PROJECT ORGANIZATION

The organizations that will participate in implementation of this project are described in this subsection. These organizations have specific functions according to their project responsibilities. An organization chart outlining the relationship between EA project personnel is shown on Figure 6.

3.2.1 Environmental Department at Harley-Davidson

The Environmental Department at Harley-Davidson is responsible for managing all environmental affairs at the facility and for coordinating all environmental-related investigation and remediation work with USEPA Region 3 and PADEP. Sharon Fisher is the head of the Environmental Department at Harley-Davidson and the Harley-Davidson Project Champion. Ms. Fisher will manage this project and act as the main conduit for communications with the federal and state regulatory agencies.

3.2.2 AMO Environmental Decisions (AMO)

AMO Environmental Decisions will assist Harley-Davidson with managing the RI project. Mr. Ralph Golia is responsible for this project. Mr. Golia will review planning documents, provide technical oversight during the RI, and will review the RI Report.

3.2.3 United States Army Corps of Engineers

The USACE Baltimore District is responsible for providing concurrence for the RI. Mr. Hamid Rafee is the USACE Project Manager responsible for this project. Mr. Rafee will review planning documents, provide technical oversight during the RI, and will review the RI Report.

3.2.4 EA Engineering, Science, and Technology, Inc., PBC

EA has been contracted by Harley-Davidson as the entity responsible for implementation of the RI. EA will subcontract specific vendor services as required by the project. EA reports to Harley-Davidson and AMO.

3.2.5 Regulatory Agencies

USEPA Region 3 and PADEP will provide review and technical oversight for the project. The USEPA Region 3 Remedial Project Manager for this project is Mr. Griff Miller. The PADEP Remediation Project Manager for this project is Ms. Pam Trowbridge.

3.3 PROJECT PERSONNEL

The RI activities will be managed through an organized effort of scientific and engineering personnel and technical resources. Key members of the RI project team are presented in Table 3-1.

Table 3-1. Key Project Members and Contact Information

Organization	Personnel	Contact Information
Harley-Davidson Environmental Department (Project Champion)	Sharon Fisher	Phone: 717-852-6544 Email: Sharon.r.fisher@harley-davidson.com
Project Manager	Hamid Rafee	Phone: 410-962-7546 Email: Hamid.Rafiee@usace.army.mil
AMO Environmental Decisions, Inc.	Ralph Golia	Phone: 215-230-8282 Email: rgolia@amoed.com
Federal Regulatory Oversight, USEPA	Griff Miller	Phone: 215-814-3407 Email: miller.griff@epa.gov
State Regulatory Oversight, PADEP	Pam Trowbridge	Phone:717.705-4864 Email: ptrowbridg@state.pa.us
EA Regional Munitions Response Program Manager	Vince Williams	Phone: 410-329-5151 Email: vwilliams@eaest.com
EA Project Manager	Michael O'Neill	Phone: 410-329-5142 Email:moneill@eaest.com
EA Task Manager – Field	Steven Yankay	Phone: 717-487-6632 Email:syankay@eaest.com
EA Task Manager – Documents	Ivy Harvey	Phone: 410-329-1426 Email: iable@eaest.com
EA Program Health and Safety Coordinator	Pete Garger	Phone: 410 -90-6338 Email: pgarger@eaest.com
EA Director of MEC Operations	Rick Hanoski	Phone: 443-632-4887 Email: rhanoski@eaest.com
EA Corporate Quality Assurance/Quality Control (QA/QC) Officer	Frank Barranco	Phone: 443-286-8791 Email: fbarranco@eaest.com

Table 3-1. Key Project Members and Contact Information

Organization	Personnel	Contact Information
EA Unexploded Ordnance Quality Control Specialist/ Unexploded Ordnance Safety Officer (UXOQCS/UXOSO)	John Monk*	Phone: 410-329-5162 Email: jmonk@eaest.com
EA SUXOS	Howard "Yorky" Knowles*	Phone: 727-688-4856 Email:yknowles@eaest.com
Test America Denver	Ms. Elain Walker	(303)736-0156

*Depending on the timing of the fieldwork, a suitable qualified alternate may be used for UXO technician categories (see additional discussions below).

3.3.1 EA Program Manager

The EA Program Manager, Mr. Vince Williams, will be responsible for monitoring the overall progress of the project, reviewing progress reports, and verifying that necessary resources are available to the project manager. The Program Manager will maintain close communications with the Project Manager during performance of this RI.

3.3.2 EA Project Manager

The EA Project Manager, Mr. Michael O'Neill, PMP, is the primary contact for the Harley-Davidson and AMO. Within his area of responsibility, Mr. O'Neill develops scope, schedule, and budget. He will provide day-to-day management of project team and schedules and lead kickoff meetings and review conferences. Mr. O'Neill will be responsible for the safe, efficient, and quality execution of the project and for ensuring any subcontractors deliver their work safely, to specifications, and in accordance with EA's quality and safety polices/standards.

In addition, the Project Manager is responsible for integrating QC functions into project activities and supporting the Corporate QA/QC Manager with QC staff resources. This includes coordinating project and QC team communications and providing periodic status reports to Harley-Davidson and AMO.

Mr. O'Neill's authority will include making process, procedure, and managerial decisions regarding specific project issues; negotiating with subcontractors; approving subcontractor deliverable performance and invoices; and developing and implementing the work plan. He also will have the authority to temporarily stop work for unsafe conditions. Mr. O'Neill will report to the EA Program Manager for the contract and will ensure the RI is delivered in accordance with industry standards.

3.3.3 EA Director of MEC Operations

The EA Director of MEC Operations, Mr. Rick Hanoski, provides senior technical input on issues related to MEC. The Director of MEC Operations also reviews the project to identify any MEC safety or QC concerns.

3.3.4 Unexploded Ordnance Quality Control Specialist and Unexploded Ordnance Safety Officer (UXOQCS/UXOSO)

The UXOQCS/UXOSO is currently expected to be Mr. John Monk, but depending on the timing of the field work, an alternate, equally qualified UXOQCS/UXOSO may be selected from EA's staffing roster. The UXOQCS/UXOSO will be responsible for the following health and safety tasks: implementing the approved MEC health and safety program in compliance with applicable federal, state, and local health and safety statutes, regulations, and codes; scheduling the daily safety briefings; analyzing operational risks, explosive hazards, and safety requirements; establishing and ensuring compliance with all site-specific explosives operations safety requirements; and enforcing personnel limits and safety exclusion zones for explosives-related operations. The UXOQCS/UXOSO will also be responsible for conducting, documenting, and reporting the results of safety inspections to ensure compliance with all applicable explosives safety policies, standards, regulations, and codes; and ensuring all protective works and equipment used within the exclusion zone are operated in compliance with applicable DoD policy, and federal, state, and local health and safety statutes, regulations, and codes.

The UXOQCS will also be responsible for developing and implementing the MEC-specific sections of the QAPP; conducting and documenting QC audits for compliance with established procedures; and identifying, documenting, reporting, and ensuring completion of all corrective actions to ensure that operations comply with requirements. The UXOQCS openly communicates with the project management team, contributes to the overall success of the project, and ensures that suitable QC requirements are implemented. The UXOQCS will identify areas where the project could benefit from improvement and assist with the implementation of improvements. The UXOQCS will also assist in the preparation of risk and hazards analyses and will supervise the conduct of onsite MEC-related operations. The UXOQCS will administer and maintain the QC program to ensure that QC objectives are met. The UXOQCS will approve all corrective action requests and corrective action plans to ensure all MEC-related work complies with contractual requirements. The UXOQCS/UXOSO will have the authority in determining acceptance or rejection of all munitions response field work in process and completed work activities, and also will have the authority to stop work on munitions response field activities for safety or quality-related reasons. The UXOQCS will maintain instrument and equipment testing, calibration, repair, and replacement records; a photographic log; and a daily QC log.

It is anticipated that no more than 12 people will be onsite during completion of the field activities. However, if there is a period where greater than 15 EA personnel (including EA's subcontractors) will be onsite, then a separate qualified individual will also be assigned as the UXOSO and Harley-Davidson will be notified in advance.

3.3.5 EA SUXOS

The SUXOS is currently expected to be Mr. Howard "Yorky" Knowles, but depending on the timing of the field work, an alternate, equally qualified SUXOS may be selected from EA's staffing roster. The EA SUXOS will be the primary point of contact for communications during operational efforts for issues relating to field actions and daily schedules. The SUXOS will be responsible for management and leadership of the project UXO activities and will be onsite to provide direct oversight of field activities. He will manage field resources, information, commitments, and leads and will facilitate effective project execution and delivery of project milestones and schedules according to the RI work plan and guidance relative to public safety. The SUXOS will coordinate and schedule field activities; inspect field activities throughout the day; maintain a field log of daily activities; maintain records of field relevant observations (i.e., results of anomaly counts, MEC/MD findings, etc.) and disposal documentation (if applicable). The SUXOS will submit a daily progress report to Mr. O'Neill.

3.3.6 EA Task Manager(s)

Mr. Steve Yankay will serve as the EA Field Task Manager and will be involved in project scoping activities, will facilitate RI field work and ensure EA personnel are familiar with and follow Harley-Davidson procedures and policies. During field efforts, Mr. Yankay will act as liaison between Harley-Davidson and the field team. Mr. Yankay will assist with the management and execution of field activities and will report to the SUXOS and the Project Manager. Ms. Ivy Harvey will act as the document task manager and assist the project manager with the creation of project-related plan and reports.

Additionally, the Task Manager will work with the Project Manager and assist the UXOQCS/UXOSO to set up and maintain logs and records of field QC inspections, audits, reports, and meetings for the project files. The Task Manager will also ensure that project field-generated documents such as Nonconformance Reports, Root Cause Analyses, and Correction Action Requests are reviewed and approved before implementation. The UXOQCS and the Task Manager will work together to establish and maintain the project field QC file.

3.3.7 EA Program Health and Safety Manager

The EA Program Health and Safety Manager, Mr. Pete Garger, Certified Industrial Hygienist (CIH), will be responsible for overall safe execution of all work on this project and for compliance with all USACE safety requirements, and will have the authority to issue stop work orders for health and safety-related reasons. He will ensure that procedures described in the work plan are safe and all safety requirements are implemented in the field. Mr. Garger will conduct project safety audits, as needed.

3.3.8 EA Program Quality Control Officer

The EA Program Quality Control (QC) Manager, Mr. Frank Barranco, P.E., will provide overall program quality management and implementation on the project. He will have responsibility for identifying quality problems and will initiate, recommend, and/or provide corrective measures to those problems. The Program QC Manager verifies implementation of corrective measures and conducts senior level review of contract deliverables; monitors activities at the work sites; and coordinates with the Project Manager, SUXOS, and UXOQCS/SO to establish the needs and priorities of QC activities. He maintains all quality records, work plans, or other documents. The Program QC Manager also provides training, certification, and evaluation of continued satisfactory performance of QC personnel.

The Program QC Manager's authority includes an ability to halt or stop work as necessary to address quality issues and approving all work plans and all changes or deviations from established procedures or techniques.

3.4 PROJECT COMMUNICATION AND REPORTING

The success of this project depends on proactive and open communication among project stakeholders. Such communication ensures a mutual understanding of project goals and an endorsement among the stakeholders toward achieving those goals. Stakeholders associated with the project include:

- Harley-Davidson
- AMO
- USACE Baltimore District
- USEPA Region 3
- PADEP
- EA Team

3.4.1 Project Meetings

Project meetings will be coordinated to discuss planning and scheduling, obtain stakeholder concurrence on key project decisions, review/discuss project deliverables, and present field data and information. Currently, no set schedule exists to define meeting frequency; however, Harley-Davidson, AMO, or EA can suggest meetings based on progress or issues encountered. Meeting attendees will vary based on the agenda items for discussion.

3.4.2 Internal Communications

Internal communications are defined as communications within the project team that are essential to completion of the project objectives. This generally includes Harley-Davidson, AMO, USACE, EA, and subcontractors (as needed). Communication may be in the form of written correspondence including letters and technical directives, electronic format including email, or it may be verbal either in person or via telephone. All communications that are relevant to the project will be documented for the final record. This includes meeting minutes, telephone logs, field notebooks, and email files.

3.4.3 External Communications

External communications are defined as communications with local, state, and federal agencies and the general public. Unless EA is directed otherwise, all external communications will be initiated by Harley-Davidson.

3.4.4 Coordination with Operating Facilities

Field work will be coordinated with Harley-Davidson to minimize the impact or disruption to production operations. Contact and communication with the facility leads will be initiated through the Head of the Environmental Department, Ms. Sharon Fisher, who is the Project Champion.

3.4.5 Communication during Field Efforts

During the RI field work, the EA Team Task Manager and SUXOS will meet daily with all onsite personnel and field personnel to review the project status and discuss technical and safety issues. These meetings will be directed by the SUXOS with input from the Task Manager and the UXOQCS/UXOSO. The UXOQCS/USOSO will complete a Daily Tailgate Meeting Log (provided in Appendix D) upon completion of the meeting. The Daily Tailgate Meeting Log provides a summary of topics, including QC issues, discussed during the meeting and provides a list of personnel in attendance. If necessary, additional meetings may be scheduled by the UXOQCS/UXOSO or project personnel to discuss technical, quality, or safety issues at any time during the investigation. The SUXOS and UXOQCS/UXOSO may also meet individually with field personnel or the subcontractors, as necessary, to resolve problems. During the field effort, the SUXOS will be in regular contact with the project management team. When significant problems or decisions requiring additional authority occur, the SUXOS will immediately contact the Project Manager for assistance.

3.5 PERSONNEL QUALIFICATIONS AND TRAINING

All project staff members will be qualified to perform their assigned jobs in accordance with the terms outlined in the contract and by the project plans. Specific qualifications and training required for UXO-qualified personnel are discussed below.

3.5.1 Qualification and Training for UXO Personnel

UXO personnel will be qualified and certified in accordance with Department of Defense Explosives Safety Board (DDESB) Technical Paper 18. Refer to Section 5.7.2.6 for additional discussion regarding record keeping.

3.5.2 UXO Training Documentation

Prior to the investigation, the UXOQCS will verify each site person and obtain copies of letters and certifications, as necessary, to complete the personnel qualifications file. This information will be maintained in the project files. Records of site-specific and routine training will be maintained in the project files. Refer to Section 5.7.2.6 for additional discussion regarding record keeping.

3.5.3 Health and Safety Training

Health and safety training requirements for onsite project personnel have been established in accordance with Occupational Safety and Health Act requirements for hazardous site workers [29 Code of Federal Regulations (CFR) 1910.120] and are specified in the SSHASP provided as Appendix A of this work plan.

3.6 PRIVACY AND SECURITY

Project documents including data, reports, or other information gathered as part of this project will not be released without the expressed written consent of the Head of the Environmental Department at Harley-Davidson, Ms. Sharon Fisher. EA and its subcontractors will comply with Harley-Davidson security protocols and confidentiality requirements.

3.7 PROJECT DELIVERABLES

The project deliverables for this project include the RI Work Plan, Addendum(s) to the RI Work Plan, a SSHASP addendum (if required), and the RI Report.

3.7.1 Remedial Investigation Work Plan

The RI work plan is based on the technical approach developed through discussions and meetings with Harley-Davidson, AMO, and USACE. The RI work plan details the first phase of RI activities that will be performed at the fYNOP and provides a general outline of RI activities that may be employed during the second phase of the RI to refine potential MRS/AOC boundaries.

3.7.2 Remedial Investigation Work Plan Addendum

The RI work plan Addendum will be prepared as part of the second phase of the RI. The data collected during the first phase of the RI will be used to further delineate MRSs/AOCs and identify data gaps needed to determine the nature and extent of potential MEC and MC contamination. The RI work plan Addendum will provide the details necessary to execute the second phase of the RI to clarify the areas of interest, specify the type of investigation to be completed in each area, specify locations for analog or digital geophysics, and specify MC sampling locations.

3.7.3 Remedial Investigation Report

The EA Team will prepare and submit an RI Report to include the results from the field investigation at the fYNOP. The report outline will generally follow the outline being used for ongoing RI activities at the Site.

Geophysical and MC sampling data generated during the RI will be reviewed for accuracy and completeness, and compiled into the RI Report. Laboratory data will be electronically downloaded into a database for review and verification (100% data review and verification). Laboratory data (at least 10%) will also be independently validated by a third-party. The electronic data will be submitted with the Final RI Report. Data validation qualifiers will be entered into the database and a data quality report prepared. The validated laboratory data along with the field data will be used to prepare the RI Report. The RI Report will summarize the field investigation efforts, analyze the data collected, characterize the nature and extent and fate and transport of MEC and MC, present a risk hazard assessment for MEC, present a baseline risk assessment for MC, and assess risk management alternatives. The report will include recommendations if additional munitions response activities are needed or if any areas can be considered for No Further Action.

3.8 DOCUMENT MANAGEMENT

The version of each document (i.e., Draft, Draft Final, and Final) will be denoted on the cover and on each page of the document. Each document will go through the EA Senior Technical Review process to ensure EA document quality standards have been met. Documents will be distributed to Harley-Davidson, AMO, and USACE (Draft, Draft Final, and Final) along with USEPA and PADEP (Draft Final and Final), according to Harley-Davidson requests.

3.9 REVIEW AND ACCEPTANCE

Following submittal and review of all documents, stakeholders (team members and regulators) will provide EA with comments. Subsequently, EA will prepare written responses to each comment and will provide to stakeholders for acceptance or rejection of the comment prior to submittal of the deliverable. Upon notice of concurrence, the comments will be incorporated into the document and the revised version will be resubmitted. The review period for team members (USACE, AMO, Harley Davidson was initially set at 10-15 calendar days and the regulatory review period is scheduled for 30 calendar days. This schedule can be adjusted as necessary to meet stakeholder requirements.

3.10 PROJECT SCHEDULE

An Activity-Based Schedule has been developed for the project (see Figure 7) will be updated at least monthly or as needed throughout the project. The schedule outlines activities defined and is logically sequenced to support and manage completion of the RI objectives thru RI reporting. The schedule has been prepared and will be maintained using Microsoft Project software. The schedule defines the interrelationships of the tasks in a logical manner. Relationships, changes in durations, and changes to early start and finish dates will be updated for each activity after initial review by stakeholders. Schedule updates will be provided to support management requirements of the project.

3.11 PERIODIC REPORTING AND MEETINGS

Periodic reports such as daily progress reports (Appendix D) during field activities will be prepared to document project activities. Summary progress reports will be prepared to document activities completed during a billing cycle for AMO, Harley-Davidson, and USACE approval.

3.12 PERIODIC MEETINGS

Periodic meetings during field work will be held to coordinate activities, discuss field progress, and review upcoming field work. These meeting will be held at the request and direction of Harley-Davidson, if needed.

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4. FIELD INVESTIGATION PLAN

4.1 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are both qualitative and quantitative statements that define the type, quality, and quantity of data necessary to support the decision-making process during project activities. The DQO process used for this project follows the USEPA QA/G-4 guidance (USEPA 2006) and uses the following seven-step DQO development process to ensure the environmental data used in the decision making are appropriate for their intended application:

1. State the problem. Describe concisely the problem to be studied.

2. Identify the goals of the study. State the decisions to be made to solve the problem.

3. Identify information inputs. Identify information and supporting measurements needed to make the decisions and describe the source(s) of the information.

4. Define the boundaries of the study. Specify conditions (i.e., time periods and spatial locations).

5. Develop the analytic approach.

6. Specify performance or acceptance criteria.

7. Develop the plan for obtaining data. Evaluate the results of the previous steps and develop the most resource-efficient design for data collection.

The following section describes the DQOs for the fYNOP. Individual suspected MEC items and disposal areas will be the targets of the RI; however, they will be evaluated in the context of the extent of MEC across any particular area (i.e., the second phase of the investigation will focus on identifying patterns or the density of items to determine nature and extent as opposed to trying to locate individual items for disposal).

The DQO process outlined in the USEPA 2006 guidance document entitled “Guidance on Systematic Planning Using the Data Quality Objectives Process” was used to support development of site-specific DQOs for this project. Each of the seven planned steps are included in Table 4-1.

Table 4-1. Data Quality Objectives for the fYNOP

Step		DQO
1.	State the Problem	MEC and MD associated with 3-inch rounds, 20mm Target Practice projectiles, 40mm anti-air craft practice projectiles, and 37mm inert projectiles, have been identified/removed from fYNOP. During the SI, MC (including antimony, barium, copper, lead nickel and, zinc) were detected onsite at concentrations exceeding human health and/or ecological screening criteria. Items identified as MEC and MD have been found outside the designated MRSs and AOCs. The nature and extent of remaining MEC and MC have not been characterized at the fYNOP. The overall objective of this RI is to collect data that will be used to define the nature and extent and fate and transport of MEC and MC in and around the MRSs and AOCs associated with historical munitions use.
2.	Identify the Goals of the Study	*First Phase:* • Assess the presence or absence of MEC and identify additional areas of concern beyond the boundaries of the existing fYNOP MRSs and AOCs. • Remove metallic debris from the surface to facilitate additional investigation using analogue or digital geophysics. • Assess the presence or absence of MC (i.e. focused in Phase I of this RI on areas containing backstop sand or firing range debris in soil, Building 14 backstops, and breached MEC items). *Second Phase:* • Assess the nature and extent of MEC within areas of concern identified during the first phase. • Assess nature and extent and fate and transport of MC contamination (to include explosives, and select metals [antimony, barium, copper, lead nickel and, zinc] as appropriate) in soil within the refined AOC/MRS boundaries as derived during the first phase. • Assess risk from MEC using the MEC Hazard Assessment (if MEC is identified) or assess risk from potential MEC (if no MEC is identified) using the MEC Probability Assessment. • Assess risk from MC to human health and the environment.
3.	Identify Information Inputs	Historical MEC and MC data, including historical records reviews, historical munitions-related reports, previous environmental studies, and receptor information will be compiled from the following reports: • TCRA Report (Plexus 2004) • Site Inspection Report for the York Naval Ordnance Plant (Alion 2008) • Supplemental Remedial Investigations Soil Report - Former York Naval Ordnance Plant (SAIC 2009) • Soil Risk Assessment-Former York Naval Ordnance Plant (GSC 2012) • Miscellaneous backup documents and reports. *First Phase:* **MEC Information Inputs:** New MEC data will be obtained by conducting a magnetometer assisted surface clearance over approximately 18.07 acres of the fYNOP. Prior to conducting the surface clearance, the fYNOP will be divided into 100 ft by 100 ft grids and vegetation removal will be performed, as needed, within each grid. Field observations will be recorded. **MC Information Inputs:** If breached MEC is identified, a grab soil sample will be collected beneath the item. Samples will be analyzed for a suite of explosive (to include, trinitrotoluene (TNT) degradation products, if appropriate based on the item identified, via USEPA Method 8330A). Refer to Sections 4.2 thru 4.10 for additional details on the data collection process.

Table 4-1. Data Quality Objectives for the fYNOP

Step		DQO
		Second Phase: **MEC Information Inputs:** New subsurface MEC data will be obtained using analogue or digital geophysics. Subsurface data will be collected based on the observations during the first phase of the RI. Locations and rationale for the geophysics will be outlined in an Addendum to this work plan. **MC Data:** Soil data from the SI will be used to focus MC sampling. Sampling data will be used to evaluate the nature and extent of MC in each MRS/AOC. The new MC data will supplement the data that was gathered during previous investigations. The number of and locations of soil samples to be collected during the second phase of the RI will be outlined in an Addendum to this work plan. In addition, if breached MEC is identified, a grab soil sample will be collected beneath the item. Soil samples will be analyzed for antimony, barium, copper, lead, nickel and, zinc using USEPA Method 6020A and 2,4-dinitrotoluene, 2,6-dinitrotoluene, and nitroglycerin using USEPA Method 8330A. Soil beneath breached MEC will also be analyzed for a tailored suite of explosives (i.e. TNT and degradation products if anticipated) based on item identified via USEPA Method 8330 A.[9] **Additional Information Inputs:** The background soil data presented in *the Supplemental Remedial Investigations Soil Report - Former York Naval Ordnance Plant* (SAIC 2009) and *the Site Inspection Report for the York Naval Ordnance Plant* (Alion 2008) will be used to perform a statistical background comparison (using a standard statistical comparison test such as the Upper Tolerance Limit (UTL) or the Quantile and Wilcoxon Rank Sum tests). USEPA non-residential and ecological soil Regional Screening Levels and PADEP medium specific concentrations (MSCs) will dictate the action levels for MC and will be used to determine whether or not a risk assessment is warranted. The human health and ecological action levels are provided in the QAPP (Section 5.0). The detection limits associated with these methods are expected to be well below the action levels that will be used for these analytes as presented in Section 5.0.
4.	Define the Boundaries of the Study	**Specifying the target population.** For MEC, the target population consists of all possible induced electrical hemispheres that could be measured across the entire study area of the fYNOP with a handheld magnetometer, or all metallic anomalies across the entire study area. A MEC sampling unit would consist of one metallic anomaly above an audible threshold representing a possible magnetic response. For MC, the target population consists of all possible soil samples that comprise the soil column across a specific area of concern. A MC sampling unit would correspond to a discrete soil of sufficient volume to be analyzed for metals and/or explosives as presented in Step 3. **Specifying spatial and temporal boundaries and other practical constraints.** The spatial boundaries consist of the study area boundaries, which are presented in Figure 8. Horizontal site boundaries have been defined in a practical way for the project and are expected to contain the full extent of MEC items associated with historic use. Vertical boundaries include the depth of MEC items and MC in soil and may have changed in certain areas over time due to disposal practices, site grading, or erosional/depositional processes.

[9] MC identified is based on the CSM developed in the SI that identifies inert projectiles and small arms being used onsite in the proof ranges.

Table 4-1. Data Quality Objectives for the fYNOP

Step		DQO
		Specifying the scale of inference for decision making: *First Phase:* Approximately 18.07 acres of the fYNOP will be investigated during the first phase of the RI to identify potential areas of concern within the study area (Figure 8). This will exclude any paved areas within the study area and areas that have been covered with construction and demolition fill material. *Second Phase:* The study area will be divided into MRSs/AOCs based on observations during the first phase of the RI to facilitate more extensive investigations within areas that likely pose higher risk. The additional data required for each area of concern will take into account the size of the area of concern and will be specified in an Addendum to this work plan.
5.	Develop the Analytic Approach	**For MEC the following decision rules were developed for fYNOP:** 1. If a munitions-related item is found at the fYNOP, then the UXO team will determine the nature of the item (MEC vs. MD). 2. If MEC, significant amounts of MD, or potential disposal areas (i.e., concentrated areas of anomalies or MD) are identified at the fYNOP, then analogue or digital geophysical data collection will be recommended as part of the second phase of the RI, an Addendum to this work plan will be submitted, and follow on investigations for MEC will be recommended for existing MRSs, AOCs, and any new areas identified. The boundaries of the MRSs, AOCs, and/or newly identified areas will be evaluated and redrawn as appropriate in the Work Plan Addendum which will be provided for review and concurrence by stakeholders. 3. If no new MEC items, significant areas of MD, or potential disposal areas (i.e., concentrated areas of anomalies or MD) are found at the fYNOP, then a follow on investigation will be recommended for the existing MRSs and AOCs based on historical data to assess alternatives to address remaining hazards. The boundaries of the MRSs, and AOCs will be evaluated and redrawn as appropriate in the Work Plan Addendum which will be provided for review and concurrence by stakeholders. 4. If MEC is found at the fYNOP, then a MEC Hazard Assessment will be completed for the fYNOP using the both historical and new data gathered at the fYNOP. 5. If no MEC is found at the fYNOP, then a MEC Probability Assessment will be completed for the fYNOP using both historical and new data gathered at the fYNOP. **For MC the following decision rules developed for the fYNOP:** 6. If a breached munition is identified, then a discrete soil sample will be collected beneath the item for a tailored suite of MC based on the item identified. 7. If new areas of concern are identified during the first phase of the RI, then an Addendum to this work plan will be prepared using the data gathered during the RI and, if appropriate, soil samples will be collected and analyzed for MC within the areas of concern. 8. If no areas of concern are identified during the first phase of the RI, then an Addendum to this work plan will be prepared using historical data and, if appropriate, soil samples will be collected and analyzed for MC. 9. If MC concentrations in soil exceed project screening criteria, then additional environmental media sampling may be recommended to further delineate nature and extent prior to completing he RI report. 10. If MC concentrations in soil at the fYNOP exceed background and/or action levels and are found to represent unacceptable risk after a formal human health or ecological risk assessment, then a FS for MC will be recommended.

Table 4-1. Data Quality Objectives for the fYNOP

Step		DQO
		11. If MC concentrations in soil at the fYNOP exceed background and/or action levels, but are found to represent acceptable risk after a formal human health or ecological risk assessment, then they pose acceptable risk to human health and no further action is necessary for MC.
6.	Specify Performance or Acceptance Criteria	**MEC Performance or Acceptable Criteria:** *First Phase:* Complete coverage (100%) magnetometer assisted surface clearance will be conducted at the 18.07 acres of the fYNOP. *Second Phase:* Analogue or digital geophysical MEC data will be collected from MRSs and AOCs. The results of the magnetometer assisted surface clearance and analogue or digital geophysical data collection will be acceptable if the quality control processes described in Section 5, confirm the work was performed in accordance with this plan. **MC Performance or Acceptable Criteria:** Performance and acceptance criteria assessing the nature and extent of MC will be met using a judgmental plan. A direct comparison of soil data will be made to action levels and statistically determined background concentrations. One or more exceedance of an action level (PADEP MSCs and EPA RBCs) will trigger a human health and/or ecological risk assessment.
7.	Develop the Plan for Obtaining Data	The RI will be performed using a two-phased approach as summarized below: *First Phase:* The first phase of data collection is to include a complete (100%) magnetometer assisted surface clearance of 18.07 acres of the fYNOP to identify potential areas of concern. During the first phase of the RI, the collection of new MC soil data will be limited to locations where breached MEC are identified. *Second Phase:* The MEC and MC sampling design will be based on the data gathered during previous investigations and the first phase of the RI and will be presented in an Addendum to this work plan. Analogue or digital geophysical data will be collected from MRSs and AOCs identified and the subsurface MEC data will be combined with the data collected from previous investigations to determine the nature and extent of MEC contamination and complete a MEC hazard assessment. Alternatively, if MEC is not identified during the RI, EA will complete a MEC probability assessment as per DoD 6055.9-M and USACE EM 385-1-97. Soil samples will be collected from the MRSs and AOCs identified during the first phase of the RI and the additional soil data will be combined with data collected from previous investigations to determine the nature and extent of MC contamination and complete human health and ecological risk assessments. Refer to Section 4.2 thru 4.10 for additional detail regarding the MEC and MC data collection.

4.2 OVERALL APPROACH

The MEC and MC RI at the fYNOP will be conducted using a two phased approach. This work plan details the first phase of RI activities that will be performed at the fYNOP and provides a general outline of potential RI activities that may be employed during the second phase of the RI.

The data collected during the first phase of the RI will be used to identify any new areas, to refine MRS/AOC boundaries, and to identify any data gaps which need to be filled to determine the nature and extent of potential MEC and MC contamination. An Addendum to this work plan will be prepared as part of the second phase of the RI. The Addendum will provide the details necessary to execute the second phase of the RI (i.e., clarify the areas of interest and specify the type and degree of additional investigation to be completed in each area).

The main work activities to be completed at the fYNOP during the *first phase* are as follows:

- Surveying and Staking of Grids
- Vegetation Clearance
- Magnetometer Assisted Surface Clearance
- MC sampling of a breached MEC item (if identified).

The main work activates that may be completed at the fYNOP during the *second phase* are as follows:

- Analogue or Digital Geophysical Mapping
- Intrusive Investigation of Anomalies
- MC Sampling.

During the first phase, a magnetometer assisted surface clearance will be performed to identify MEC, MD or metallic debris from the surface within accessible areas (to exclude where fill material and debris has been placed) on the fNYOP (see Figure 8).

During the second phase analogue or digital geophysical data may be collected in the areas of concern identified during the first phase of the RI. Analogue geophysical data collection during the second phase may include performing "Mag and Dig" operations in select areas of concern to characterize the nature and extent of MEC in the subsurface. The grids established during the first phase of the RI would be used during the second phase to establish and reference work areas. During "mag and dig" operations handheld analogue magnetometers would be used to identify anomalies in the subsurface via an audible response. The identified anomalies (or a percentage of the identified anomalies) would be intrusively investigated and the results would be documented. Mag and dig operations would likely be proposed in grids with uneven terrain and dense vegetation where high densities of anomalies were observed. Percentages will be discussed with stakeholders and documented in the work plan addendum based on the findings during Phase I.

Digital geophysical data collection during the second phase may include performing Digital Geophysical Mapping (DGM) using an EM61-Mk2 in select areas of concern to further define target anomalies for intrusive investigation. The EM61-MK2 is a high-resolution, time domain electro-magnetic induction sensor capable of detecting both ferrous and non-ferrous metallic objects. The grids established during the first phase of the RI would be used during the second phase to establish and reference work areas. As part of the DGM data collection process the field team may perform DGM over 100% of each accessible area of concern. This data would be used to provide a complete list of anomalies, generate data image maps for anomaly review, and, if appropriate, develop anomaly dig lists within the area of concern. Then the field team would reacquire and intrusively investigate select anomalies, as identified on the dig lists. DGM would likely be proposed in easily accessible grids where individual anomalies can be selected. Dig lists will be discussed with stakeholders in order to reach concurrence on items to investigate.

Both general and specific work activities are further described below.

4.3 GENERAL FIELD ACTIVITIES

All field work associated with the RI is anticipated to occur five days a week, Monday through Friday, up to 10 hours per day (typically 07:00 to 17:00, however the SUXOS may adjust hours) as weather and daylight permit. Modifications to this schedule will be coordinated with Harley-Davidson, as needed. At the conclusion of daily field activities, EA will remove all project materials and solid wastes from the project site. Excavations, if necessary, will be backfilled with the displaced soil and re-graded to the prior contours.

4.3.1 Facility Access and Utility Clearance

All onsite workers will complete Harley-Davidson’s contractor onboarding process prior to initiating field work. Copies of completed documents will be provided to Harley-Davidson.

Prior to initiating any intrusive activities during the second phase of RI field work, EA will complete the requirements of Harley-Davidson’s “Subsurface Protocol and Utility Clearance” work instruction (YS2.03.300.01). Pursuant to the work instruction, EA will clearly mark out and identify areas of proposed intrusive activities and review them with the Harley-Davidson project champion or designated Plant Engineer prior to initiating subsurface activities. To the extent possible, existing utilities will be identified during the Site survey based on the current engineering drawing (Figure 4). Additionally, EA will clear utilities in accordance with EA SOP003 (Appendix C). As all of the RI activities will occur on security/access-controlled Harley-Davidson property, a separate call will not be required to Miss-Utility – Pennsylvania.

4.3.2 Mobilization and Set-Up

A facility entrance briefing and site safety meeting will be conducted. This meeting will include a review of this work plan and review and acknowledgment of the SSHASP by all site personnel. Project set-up activities will include:

- Identify/procure, package, ship, and inventory project equipment
- Coordinate with local agencies, including facility security, hospital, and fire department, as appropriate
- Coordinate communications with logistical support

- Finalize field schedules
- Test and inspect equipment
- Assemble and transport the work force
- Conduct site-specific training on the work plan, SSHASP, data collection procedures, and MEC procedures and hazards
- Verify that all forms and project documentation are in order and project team members understand their responsibilities with regard to completion of project reporting requirements.

For Phase 1, a small, lockable, job site trailer will be required and a Port-a-Pot will be placed inside the automated security gate at the entrance to the work area. This placement will allow for ease of service and separation from the contractor staging area. Should a small a temporary job-trailer be required for Phase II, the staging area will be approved by Harley-Davidson during review of the Phase II work plan addendum.

No dust and emission control is required for this project due to the heavy vegetation. However, should fugitive dust be generated during vegetation clearance activities (see Section 4.5), work shall stop, the Project Manager contacted, and dust suppression techniques be implemented (i.e. water misting and/or alteration of the vegetation clearance technique).

No spill control and prevention plan is required; however, portable, Underwriters Laboratories (UL) or Factory Mutual (FM) approved, 5-gallon, diesel fuel cans for the vegetation clearance skid steer (see Section 4.5) will be stored inside of a secondary containment polyethylene tote of sufficient capacity to contain the entire contents of the fuel can. When not in use, the can and secondary containment will be stored in the bed of jobsite pick-up truck. Fuel will be dispensed to the equipment using a dedicated, non-sparking funnel, with oil absorbent pads placed under the fueling location. A spill kit will also be available.

4.3.3 Work Exclusion Zones

Since access to area is controlled and the site is fenced, EA will work with Harley-Davidson to prevent access to the work area during the RI. In general, during surface clearance and intrusive activities, exclusion zones are set at the hazard fragment distance (HFD) for the selected munitions with the greatest fragmentation distance (MGFD) for the MRSs/AOCs. The item selected is the 20mm practice round which requires no HFD be established. Therefore specific work exclusion zones will not be established during the field activities. In the event, MEC is identified and it is not a 20 mm practice round, work will be stopped and the item will be flagged and the Harley-Davidson Project Champion and EA project manager will be notified. The field team will consult Technical Paper 16 and DDESB Fragmentation database to establish exclusion zones using the HFD identified for the particular item found. The MGFD and any minimum separation distances (MSDs) will be detailed in a work plan Addendum, if needed to address the findings.

4.4 SURVEYING AND STAKING OF GRIDS

Survey control will be established using a known benchmark Pennsylvania State Plane, North American Datum of 1983 (NAD 83), South coordinate system, to the nearest 1 foot (ft). Using a global positioning system (GPS) unit (e.g. Trimble GeoXHtm GPS with Floodlight Technology), the survey team, consisting of one UXO Technician II or above and a survey technician, will mark the fYNOP study area boundaries and the four corners of the accessible 100 ft by 100 ft grid network (refer to Figure 9). Some grid corners may not be accessible for staking, depending on the surface feature at the grid corner. In these cases, virtual grid corners will be used (or paint if a stake cannot be used). Inaccessible areas in a grid will be surveyed and approved by the PM, SUXOS, and Site Manager.

4.5 VEGETATION CLEARANCE

The degree of vegetation clearance in the work areas will vary within the grids. Vegetation clearance will be conducted in accordance with EA SOP011 (Appendix C). Prior to initiating work, the area within the grid will be reviewed by the SUXOS who will determine the type of vegetation clearance needed. The removal of vegetation will be limited to the degree necessary to safely access the site to perform the magnetometer assisted surface clearance and to provide sufficient access for follow-on activities that may be required during the second phase of the RI (i.e., geophysics and intrusive investigations). During vegetation removal operations, a UXO Technician will search the cutting area using a magnetometer and visual techniques prior to vegetation removal to ensure that the area is free of surface MEC items. Vegetation removal personnel may cut the brush using a combination of hand and power tools. If heavy equipment is required (i.e. track-mounted skid steer), a spotter will be used. All brush and trees (four inches in diameter or less) will be cut to grade and no roots or stumps that might contain MEC will be removed. If MEC is discovered, the UXO Technician will stop work immediately, direct the vegetation removal crews to leave the immediate area and contact the SUXOS. The UXO Team will assess the item as described in SOP012 (Appendix C).

4.6 SURFACE CLEARANCE AND MAPPING OF ANOMALIES

A seven-man UXO team plus a dual purpose UXOQCS/UXOSO led by a SUXOS leading a field team of one UXO Tech III, three UXO Tech II's, and three UXO Tech I's will conduct a ferrous-detecting instrument-assisted (Schonstedt magnetometer or equivalent) survey/sweep within each of the lanes in the identified grids. Lanes will be approximately 5 feet wide. Whenever the team encounters MPPEH, the SUXOS and UXOQCS/UXOSO will inspect the item to determine condition of the item and to determine if the item is safe to move. If the item is determined to be MD, the SUXOS will direct the UXO Tech II or I to recover the MD and it will be removed from the area and stockpiled with other MD. If it determined that the item is MEC or cannot be certified as material documented as safe (MDAS), the SUXOS will mark and record the location of the item and the UXOQCS/UXOSO will then notify the Harley-Davidson Project Champion with all the details and recommend a course of action for approval by Harley-Davidson. Surface clearance operations will be conducted in accordance with EA SOP013 (Appendix C).

GPS coordinates will be collected and recorded for items determined to MEC or items that cannot be certified as MDAS using a unique identifier for each anomaly.

The location of MEC or items that cannot be certified as MDAS will be mapped with GPS and coordinates will be transmitted by the Task Manager to the Geographic Information System (GIS) Specialist who will incorporate the data into GIS. Data will be reviewed for completeness and accuracy. All GIS data will be provided to Harley-Davidson and the Leidos ArcGIS database manager for incorporation into the Harley-Davidson database.

4.7 BUILDING 14 INSPECTION

To asses any potential MEC or MD, a visual inspection of the firing range backstop and sand holding area will be performed. Using portable light stands, the SUXOS, and available tecnicians (UXO Tech III, Tech II or Tech I), will access the underground firing range and visually identify existing MEC, MD, or potential sources of MC. The UXO technicians will document the finding schematically and via photography and approximate remaining quantities if conditions permit. Under no circumstance, will the technicians enter a confined space such as mechanical areas, sumps, elevator shafts, or any other areas of the backstop not designed specifically for human ingress/egress.

4.8 MC SAMPLING

During the first phase, MC soil sampling will only be conducted if breached MEC is identified. Sampling will be conducted by appropriate personnel, namely the SUXOS following direction from the UXOSO and a determination that the sample location is safe. The sampler will don protective equipment (i.e. gloves) to protect the sampler from contaminant exposure. A discrete soil sample will be collected beneath the item and analyzed for a tailored suite of explosives based on item identified via USEPA Method 8330A. Soil sampling will be conducted in accordance with SOP025 (Appendix C). Sample designation/labeling will be completed in accordance with Table B-3 which is included in Appendix F.

During the second phase MC soil sampling will be conducted to determine nature and extent. Proposed sampling will be detailed in the Addendum to this Work Plan. Soil samples will be collected within areas of concern identified during the first phase of the RI, as needed. The objective of soil sampling during the second phase is to fully characterize the vertical and horizontal extent of potential contamination within fNYOP study area and provide sufficient data to support human health and ecological risk assessments. Based on historic munitions identified at the fYNOP study area, soil samples will likely be analyzed for select metals including antimony, barium, copper, lead nickel and, zinc using USEPA Method 6020A and select explosives including 2,4 DNT, 2,6-DNT, and NG using USEPA Method 8330A. In the event a breached MEC is identified which is different than items previously encountered, a soil sample may be collected and analyzed for a different/tailored suite of explosives based on item identified. The field team would contact Harley-Davidson and report the finding and request approval to expand the list of analytes.

MC soil sample locations will be mapped with GPS and coordinates will be transmitted daily by the Task Manager to the Geographic Information System (GIS) Specialist who will incorporate the data into GIS. Data will be reviewed for completeness and accuracy. All data will be provided to Harley-Davidson project ArcGIS database manager (refer to section 5.9 for additional details).

4.8.1 Sample Custody and Documentation

Chain of Custody (COC) forms will be initiated by the field personnel at the time samples are collected for contract laboratory analysis. The COC will be transported with the samples to Test America Denver where the sample custodian will accept custody of the samples by signing the COC. A copy of the COC will be retained onsite. An example of the laboratory COC form is provided in Appendix D. Field personnel will enter site-specific information at the top of the form and specific sample information into the following areas:

- Sample designation (e.g., MRS 1-SS-01)
- Date and time (military time, i.e., 0800, 1300, etc.) of sample collection
- Check the "Grab" column indicating that the sample cores represent discrete sampling intervals
- Requested analytical name and parameter (e.g., Metals 6020A) for each sample
- Enter his/her signature and enter the date and time (military time), enter printed version of his/her name, and his/her title in the appropriate boxes at the bottom of the form
- Indicate the required turn-around-time and requested MS/MSD (if applicable) in the "comments" section on the right side of the form.

Custody seals will be used on the shipping containers to ensure the integrity of the samples should they be left unattended or when they are relinquished to a delivery service until the shipping containers are opened by the laboratory. All samples will be shipped in insulated shipping containers, and each shipping container will be sealed with at least two custody seals at opposite corners of the container and covered with clear packing or strapping tape. The seals will be affixed to each shipping container so that it is necessary to break the seals to open the shipping container.

4.8.2 Sample Packing and Shipping

Samples will be placed into the appropriate containers with applicable preservatives. A label indicating the sample designation, sample interval, sample date and time, and requested analysis will be placed on each container. Sample containers will be individually wrapped in bubble wrap and placed in zipper-type plastic bags.

Samples will then be placed into coolers for transportation to the laboratory for analysis. Samples will be placed on ice, if required, prior to and during shipment to the laboratory. Bubble wrap will be used to line the bottom and sides of the sample cooler and fill voids where needed to cushion the sample containers during transportation. The completed COC representing the packaged samples will be taped to the inside of the cooler lid. The required turnaround time will be noted on the COC. The request for MS/MSD analysis, if required, will also be noted on the COC. A copy of the COC will be maintained onsite. The cooler will be sealed with packing tape and custody seals, and delivered via courier to:

Test America Denver
4955 Yarrow Street,
Arvada, Colorado 80002
Phone: (303)736-0156
www. testamericainc.com
Attention: Sample Custodian

4.8.3 Field Documentation

Field documentation to include field logs, calibration logs, quality control reports, Health and Safety reporting, photologs, etc. will be collected during field operations. Original field logs and records will be maintained by the UXOQCS as part of the project files. The initial project file will be structured to include a copy of the following documents and information:

- Schedule and progress reports
- Work plans, industry standards, and procedures including addenda and modifications
- Work orders and other contract modifications
- UXO information forms/incident reports
- Equipment manufacturer's certificates
- Equipment check records
- Location and survey records
- Telephone conversation logs
- Meeting minutes and agenda
- Inspection logs and schedules
- Site maps
- Qualifications and training records of all site personnel
- Photo documentation
- Non-conformance and corrective action reports.

The filing structure may be expanded or reduced as necessary to include relevant information. Additional details regarding record collection and related QC are provided in Section 5.7.

4.9 MUNITIONS MATERIAL MANAGEMENT AND DISPOSAL

4.9.1 Munitions with the Greatest Fragmentation Distance

Historically MEC and MD from the following munitions have been observed at the fYNOP:

- 3-inch rounds
- 20mm Target Practice (TP) projectiles
- 40mm anti-aircraft practice projectiles
- 37mm inert projectiles

During the first phase of the RI there are no planned intrusive operations. Therefore a MGFD has not been identified. Based on the findings of the first phase of the RI, an MGFD will be selected for intrusive operations proposed during the second phase of the RI. The MGFD will be identified in the Addendum to this Work Plan.

4.9.2 Minimum Separation Distances

The MSDs associated with candidate MEC items potentially present at fYNOP. Only one team is being used onsite; therefore, MSDs have not been identified. As noted in 4.3.4, no MSD is identified for the 20mm practice round; however, the potential exists that other items could be found during RI activities; therefore, in the event a second team is used an MSD of 200 feet will be used between teams.

4.9.3 MD Inspection and MDAS Storage and Disposition

MD will be inspected in accordance with DoD Instruction 4140.62/DoD 6055.9-M and EM 385-1-97. MD inspection procedures are detailed in SOP012, Munitions Debris Inspection. MDAS will be stored in 55-gallon drums or other suitable sealable and lockable containers, which will be shipped to a recycling facility pending Harley-Davidson approval for final disposition. Disposal will be coordinated with Harley-Davidson. Total weight of MDAS is documented during certification and verified upon receipt by the recycle facility. Each container is kept closed and locked, except when materials are being loaded into the container or the contents of the container are being inspected. Each container is closed in a manner that requires that the container seal be broken to gain access to the interior of the container. The plan is to use 55-gallon, sealable/ drums, which will be stored inside the lockable job trailer. With Harley-Davidson approval, the material will be shipped to a recycle facility, at the end of the project or periodically, as required, for final disposition. Refer to SOP012 (Appendix C), Munitions Debris Inspection for additional details.

4.9.4 MEC Removal and Demolition Procedures

EA will not be performing MEC removal or demolition procedures during the first phase of the RI. In the event MEC is identified, the item location will be flagged, GPS coordinates will be collected and the Harley-Davidson Project Champion or designee will be notified. The Harley-Davidson Project Champion or designee will contact the local authority (i.e. Springettsbury Township) to arrange for disposal of any suspect MEC identified during the surface clearance. Based on the findings of the first phase of the RI, it may become necessary to revise this procedure during the second phase of the RI when intrusive operations will likely be proposed to complete the RI. Any changes will be detailed in the Addendum to this Work Plan.[10]

[10] If notified by Harley-Davidson, EA will engage in discussions with Harley-Davidson, USACE and additional stakeholders if necessary to include DEP Bureau of Mines in the Pottsville Office to identify necessary procedures and approvals to place a Type II, Bureau of Alcohol, Tobacco, and Firearms (ATF) approved, temporary magazine on-site for storage of suspect MEC items. The determination to store items in the magazine will be dictated by Harley-Davidson.

4.10 INVESTIGATIVE-DERIVED WASTE PLAN

Investigative-derived waste generated during the RI field efforts is expected to consist of non-munitions debris, removed during the magnetometer assisted surface clearance and/or intrusive investigations, as well as expendable materials used in completing the investigation (disposable gloves, general trash).

4.10.1 Non-Munitions Debris

During the surface investigation non-metallic non-munitions-related debris that is uncovered will be inspected, collected, removed from the site, characterized, and disposed in accordance with State laws and regulations. Metallic non-munitions-related debris will be collected, stored and recycled off-site. All disposal operations will be coordinated with Harley-Davidson. In existing landfill/disposal areas, EA will not be performing surface clearance to remove surface debris.[11]

4.10.2 Decontamination Materials

All non-disposable equipment will be decontaminated. All decontamination fluids will be collected, containerized, characterized, and disposed in accordance with State laws and regulations. Disposable sampling equipment will be utilized when possible and will be disposed of as general refuse. Currently, no non-disposable sampling equipment is planned for the first phase. If needed during the next phase of the RI this section will be updated.

4.10.3 Other

Vegetation removed (i.e. mulched) during site clearing activities will be left as ground cover on-site. Any vegetation, or debris from tree removal, will be taken off-site and recycled (if possible) at a location approved by the Harley-Davidson project champion. Other waste materials generated during the RI will be collected, removed from the site, and disposed in accordance with State laws and regulations. These wastes will consist primarily of sampling materials (i.e. gloves, scoops, etc.), waste paper, food and beverage containers, and expendables. As practicable, any recyclable material will be segregated for disposal at a State licensed recycling facility. EA will not comingle RI waste materials with existing Harley-Davidson waste streams without permission from the Harley-Davidson Project Champion.

4.11 MEC HAZARD ASSESSMENT

If MEC is identified during the RI, EA will prepare a risk assessment for MEC using the MEC Hazard Analysis (USEPA 2008) as a qualitative assessment to evaluate the MEC risk present. Alternatively, if MEC is not identified during the RI, EA will complete a MEC probability assessment as per DoD 6055.9-M and USACE EM 385-1-97. A summary of the MEC HA process is provided below.

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[11] Specifically as noted in Figure 9, a known disposal area exists within the RI footprint area. This area will not be cleared of any surface debris unless MEC/MD is identified. If MEC or MD is identified EA will communicate with the Harley-Davidson Project Champion to determine the path forward.

A qualitative MEC screening-level risk assessment for potential explosive safety risks will be conducted based on data gathered up to through the RI. An explosive safety risk is the probability for a MEC item to detonate and potentially cause harm as a result of human activities. An explosive safety risk exists if a person can come near or in contact with MEC and act on it to cause a detonation. The potential for an explosive safety risk depends on the presence of three elements: a source (presence of MEC), a receptor (person), and interaction (e.g., touching or picking up an item).

The exposure route for a MEC receptor typically is direct contact with a MEC item on the surface or through subsurface activities (e.g., digging during construction activities). MEC tends to remain in place unless disturbed through human activity or other natural forces (e.g., storm events, frost heaving, and erosion). If MEC movement occurs, the probability of direct human contact may increase, but may not necessarily result in direct contact or exposure.

Each of these primary risk factors will be used to evaluate the field and historic data to generate an overall hazard assessment rating of either low, moderate, or high. The MEC source is based on the MEC type, sensitivity, density, and depth distribution. The likelihood of exposure and thereby injury may be severe (lethal if detonation occurs), moderate (minor or major injury if detonation occurs), or low (no detonation, and consequently, injury occurs). MEC sensitivity, the likelihood of detonation and severity of exposure (fuzing and weathering, for instance), may be very sensitive (e.g., electronic fuzing, land mines, booby traps), less sensitive (standard fuzing), and insensitive/inert (residual risk or no injury).

Site characteristics are based on site accessibility (no restrictions, limited restrictions, and complete restrictions to access) and site stability (stable, moderately stable, and unstable). Finally, human interaction includes the type of human contact (low, moderate, and significant) and population number and frequency of access (low, moderate, high). Possible receptors will include residents, site workers, construction workers, and recreational users.

Based on these criteria, low, moderate, and high MEC risks are defined in Table 4-2. As noted in Section 2.7, the SI concluded that there is a low risk of MEC at fYNOP (low probability of encountering MEC) given previous removal actions and findings to date.

Table 4-2: Low, Moderate, and High Munitions and Explosives of Concern Risk Assessment Categories

MEC Factor	Low MEC Risk	Moderate MEC Risk	High MEC Risk
MEC Source	Low MEC Type (no detonation and no injury) Insensitive/Inert MEC	Moderate MEC Type (minor/major injury) Moderate Sensitive MEC	Severe MEC Type (lethal) Very Sensitive MEC
Site Characteristics	Complete restrictions to access Stable (no MEC exposure by natural events)	Limited restrictions to access Moderately stable (MEC may be exposed by natural events)	No restrictions to access Unstable (MEC exposure most likely by natural events)
Human Interaction	Low potential for and frequency of contact (e.g., no general public access, infrequent site access primarily by site personnel, no subsurface activity)	Moderate potential for and frequency of contact (e.g., a limited number of the general public has open and somewhat frequent access, few site uses, surface/subsurface intrusive activity possible)	High potential for and frequency of contact (e.g., general public has open and frequent access, high potential for surface/subsurface intrusive activity)

4.12 MUNITIONS CONSTITUENTS BASELINE RISK ASSESSMENT

Baseline human health and ecological risk assessments will be conducted for the site. The latest USEPA risk assessment guidance (RAGS) will be used for conducting these risk assessments.

The screening levels will be used to determine chemicals of potential concern in the baseline risk assessment for the data collected during this RI. The screening levels will come from several sources. Screening levels for the protection of human health will be the USEPA Regional Screening Levels (RSLs). These values are updated approximately every 6 months, and the most recent values at the time future reports are prepared will be utilized. The screening levels for non-carcinogenic compounds, except lead, will be divided by 10 to account for potential occurrence of adverse non-carcinogenic health effects due to exposure to multiple non-carcinogens. Ecological screening values for metals in soil are USEPA Ecological Soil Screening Levels (EcoSSLs), Screening Levels guidance (EPA 2003). It should be noted that surface soil and subsurface soil ecological screening levels have been identified for surface soil (0 to 12 inches) and subsurface soil (greater than 12 inches) based on the type of ecological receptor that would likely come into contact with the media.

4.13 FOLLOW-ON ACTIVITIES

The EA team will prepare an Addendum to the Work plan to describe Phase II activities. Following completion of field activities an RI report will be prepared to document the results of the RI field activities. Based on the findings of the RI, Harley-Davidson may use the data to support an FS to determine if further action is required, evaluate alternatives, and develop cost estimates for further action, if warranted. The FS is not a part of this RI work plan.

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5. QUALITY ASSURANCE PROJECT PLAN

5.1 QUALITY ASSURANCE PROJECT PLAN ORGANIZATION

The QAPP provides general information including definitions and generic goals for data quality, minimum requirements for QA/QC samples, field documentation, instrument calibration and maintenance, auditing, data management, corrective action requirements, and reporting. This QAPP includes elements taken from USACE guidance (EM 200-1-3) and EPA guidance.

5.2 PROJECT ANALYTICAL LABORATORY

Implementation of the project activities will be managed through an organized effort of scientific personnel and technical resources. QA/QC procedures are in place to ensure defensible data is obtained to support site evaluation and corresponding conclusions/recommendations. Analytical services will be provided by Test America Denver of Arvada Colorado, which is a Pennsylvania certified laboratory (009). Test America Denver is also an accredited DoD Environmental Laboratory Accreditation Program (DoD ELAP), version 4.2 laboratory. Test America Denver certifications are provided in Appendix B. Detailed information regarding laboratory personnel, facilities, and Lab SOPs are presented in the Test America Denver Laboratory Quality Assurance Project Plan (Laboratory QAPP) (Appendix B).

5.3 QUALITY ASSURANCE AND CONTROL OBJECTIVES FOR DATA MANAGEMENT

The overall objectives of the QAPP are to provide the methodologies and quality objectives for obtaining defensible data to support site evaluation and corresponding conclusions and recommendations. USEPA guidelines entitled *Guidance for the Data Quality Objectives (DQOs) Process* illustrate the process of developing a decision rule based upon the site problem statement. Inputs to the decision rule dictate the necessary data quality to achieve overall project objectives. DQOs define the performance criteria that limit the probabilities of making decision errors by considering the purpose of collecting the data; defining the appropriate type of data needed; and specifying tolerable probabilities of making decision errors. The seven steps of the DQO development process for this project are presented in detail in Section 4.1.

As summarized in Section Table 4-1, the RI will be performed using a two-phased approach as summarized below:

First Phase: The first phase of data collection is to include a complete (100%) magnetometer assisted surface clearance of 18.07 acres of the fYNOP to identify potential areas of concern. During the first phase of the RI, the collection of new MC soil data will be limited to locations where breached MEC are identified.

Second Phase: The MEC and MC sampling design will be based on the data gathered during previous investigations and the first phase of the RI and will be presented in an Addendum to this work plan. Analogue or digital geophysical data will be collected from MRSs and AOCs identified and the subsurface MEC data will be combined with the data collected from previous investigations to determine the nature and extent of MEC contamination and complete a MEC hazard assessment.

Soil samples will be collected from the MRSs and AOCs identified during the first phase of the RI and the additional soil data will be combined with data collected from previous investigations to determine the nature and extent of MC contamination and complete human health and ecological risk assessments.

Data quality will be maximized by following established Field SOPs and through use of standard, accepted, USEPA methods for sampling and analytical procedures. Use of standard analytical procedures and established data quality objectives will result in data suitable for use as inputs to the decision rule.

5.4 REGULATION AND GUIDANCE USED TO DEVELOP PROJECT SCREENING CRITERIA

Because Harley Davidson's ultimate goal is to obtain site release of liability under PADEP Act 2, the PADEP media-specific statewide health standards will be used as the site screening criteria for metal and explosives in soil. For the initial evaluation, sample results will be compared to the PADEP Act 2 SWHS. For soil, the applicable screening criteria are:

- PADEP Medium-Specific Concentrations for Ingestion of Regulated Substances in Non-Residential Surface Soil (0-2 feet): Direct Contact Numeric Values (mg/kg)

In addition, soil data, used in the risk assessments, will be screened against the EPA Interim Eco-SSL (USEPA Ecological Soil Screening Levels as of Nov 2010) and the EPA RSLs for Industrial Soil – (Nov 2014 EPA Regional Screening Level Industrial Soil, update Jan 2015) to adhere to the USEPA One Cleanup Program. Sample results for characterization of waste will be compared to the PADEP SWHS and to waste facility-specific criteria to determine ultimate disposition.

A summary of laboratory analytical methods, and a comparison of method detection and/or reporting limits to the screening criteria is presented below.

5.5 LABORATORY ANALYTICAL METHODS

Field activities will focus on determining nature and extent of MEC and MC in the AOCs and MRSs which include analysis of select explosives and metals in soils. Soil samples will be collected from areas containing MEC and MD and at locations where evidence of munitions related disposal operations are observed during surface clearance or follow on nature and extent investigations.

Methods to be employed for explosives and metals analysis in soils include USEPA Method 6020A for metals and Method 8330A for explosives. Detailed methodologies for the collection of environmental samples are provided in Section 4.8. QA/QC samples that will be collected as part of the sampling program are discussed below in Section 5.7 below. Laboratory Analytical SOPs for specific analytical methods included in the project sampling program are included in Appendix B.

5.6 ANALYTICAL PROCEDURES

5.6.1 Routine Laboratory Analyses

The analytical methods for samples collected will follow those specified in Section 5.5. Analytical SOPs for the methods included in the sampling program are included in Appendix B.

5.6.2 Method Detection Limits, Quantitation Limits, and Reporting Limits

Analytical sensitivity is an important component of data quality, and it is evaluated using analyte detection and quantitation levels compared to screening criteria. Analytical methods are selected based on the method detection and/or reporting limits being lower than the screening criteria.

A list of the analytes, the analytes standard/action levels, and Test America Denver method detection limits (MDLs) and lab reporting limits (RLs) are shown for soil samples in Table 5-1.

A comparison of the Project Screening Criteria (for each matrix/analyte) to the associated RLs and MDLs was performed to evaluate whether analytical sensitivity objectives were being met for all analytes. Project screening criteria for soil are the USEPA Interim Eco-SSL (November 2010), EPA RSL-Industrial Soil (January 2015), and PADEP MSCs for ingestion in non-residential surface soil (direct contact, 0-2 feet). For analytes with no corresponding Eco-SSL value, the USEPA Region 5 ecological screening levels (August 2003) were used. The review confirmed that laboratory RLs and MDLs are acceptable to meet project sensitivity requirements for the selected metals and explosive analytes expected at the fYNOP. The Site comparison criteria are shown in Table 5-1.

5.6.3 Laboratory Calibration Procedures

Laboratory instrumentation calibration procedures, frequency, and standards will be consistent with the requirements of the applicable analytical method, and are summarized in Appendix B.

5.6.4 Laboratory and MC Sampling Quality Control

To ensure data quality several types of QC samples are planned. The types of QC samples that will be analyzed during the sampling are summarized below.

Field Duplicate: A Field Duplicate is a sample collected from the same location as the “parent” sample to assess precision. For aqueous samples, a field duplicate is collected by alternating between the “parent” and field duplicate sample bottles during the filling of the bottles for each analysis. Aqueous duplicates will be analyzed for the same analysis as the parent sample. Soil duplicates will be collected by homogenizing, with the exception of the aliquot for volatiles analysis, prior to splitting between jars in the “parent” and duplicate sample. The aliquot for VOC analysis will be collected prior to homogenization of the remaining aliquots. Soil duplicates will be analyzed for the same parameters as the parent sample. The identity of duplicates will be withheld from the laboratory by using a specific sample identification code. The field duplicate sample will be recorded with the “parent” sample identification code on a sampling record form. A field duplicate sample will be collected for each matrix at a frequency of 10 percent (1 for every 10 samples collected per matrix).

Field Rinsate or Equipment Blank: A Field Rinsate (Equipment) Blank is a sample of certified metal-free and organic-free distilled/deionized water poured into or over or pumped through the sampling device, collected in a sample container, and transported to the laboratory for analysis. Rinsate blanks are used to assess the effectiveness of equipment decontamination procedures. Rinsate blanks will be collected immediately after the equipment has been decontaminated. For any non-dedicated equipment used to take samples, rinsate blanks will be collected at a rate of 10 percent (1 for every 10 samples collected using the equipment). Rinsate blanks will not be collected when precleaned, dedicated equipment is used for sampling.

Matrix Spike (MS) and Matrix Spike Duplicate (MSD): MS and MSD samples are spiked with known concentrations of surrogate compounds to assess recovery and possible matrix effects, as well as analytical precision. MS/MSD analysis will be requested at a frequency of 5 percent (1 per 20). Analyses will mirror the fullest suite of analyses requested for any sample included in the sample delivery group. Samples requested for MS and MSD analyses will be clearly identified on the accompanying COC form. Information associating normal samples with the requested MS/MSD (and other QC samples) will also be included on the COC, or referenced on the COC and included on an associated QC sample batching sheet.

Temperature blank: Temperature blanks verify that samples have been maintained at 4 degrees Celsius during transportation from a project site to the laboratory. The temperature blank which is provided by the lab will consist of a sample container filled with non-preserved potable or distilled water to be included in each cooler containing samples for analysis.

In addition to the above noted QC sample, the analytical laboratory also performs QC procedures to ensure data quality. Type and frequencies of specific QC samples performed by the laboratory are dependent upon analytical requirements specific to the method analyzed. Internal QC methods require performance on a sample batch basis and include analyses of method blanks, laboratory control samples (LCSs), and actual environmental samples as duplicates and MS/MSDs. Laboratory QC procedures will be consistent with the requirements of the applicable analytical method and are summarized in the Laboratory method SOPs (Appendix B).

Table 5-1. Evaluation of Potential Chemical-Specific Measurement Quality Objectives for Soil

Analyte	Abbreviation	Chemical Abstract Service Number	EPA Interim Eco-SSL (mg/kg)	EPA RSL Industrial Soil (mg/kg)	PADEP Medium-Specific Concentrations for Ingestion of Regulated Substances in Non-Residential Surface Soil (0-2 feet): Direct Contact Numeric Values (mg/kg)	Preferred Maximum Method Limit of Quantitation (LOQ), Soil (mg/kg)	Lab Method Limit of Detection (MDL) (mg/kg)	Lab Reporting Limit (RL) (mg/kg)
2,4-Dinitrotoluene	2,4-DNT	121-14-2	1.28 [a]	7.4	260	0.3	0.0498	0.25
2,6-Dinitrotoluene	2,6-DNT	606-20-2	0.0328 [a]	1.5	2,800	0.3	0.0542	0.25
Nitroglycerin	NG	55-63-0	NSL	82	280	6	0.78	5.1
Antimony	Sb	7440-36-0	0.27	470	1,100	2	0.014	0.2
Barium	Ba	7440-38-2	330	220,000	190,000	0.5	0.071	0.25
Copper	Cu	7440-50-8	28	47,000	100,000	1	0.071	2.5
Lead	Pb	7439-92-1	11	800	1,000	1.5	0.018	0.4
Nickel	Ni	7440-02-0	38	22,000	56,000	1	0.025	0.35
Zinc	Zn	7440-66-6	46	350,000	190,000	2	0.3	2.5

Notes:

EPA Interim Eco-SSL - USEPA Ecological Soil Screening Levels as of Nov 2010

EPA RSL Industrial Soil - Nov 2014 EPA Regional Screening Level Industrial Soil, update Jan 2015

PADEP Medium-Specific Concentrations - PADEP Non Residential Soil Direct Contact 0-2 ft, Jan 2011
a - USEPA Region 5 SQuiRT August 2003, http://epa.gov/region5/waste/cars/pdfs/ecological-screening-levels-200308.pdf
NSL - No screening Level

Laboratory Reporting Limits provided by Test America

5.7 FIELD QUALITY CONTROL

5.7.1 MC Sampling Quality Control

As discussed in Section 5.6, QC samples will be collected during MC sampling. QC samples will be collected at the following frequency:

- Field duplicate samples will be collected at a rate of 10 percent (1 per 10 samples)
- MS/MSDs will be collected at a rate of 5 percent (1 MS and 1 MSD per 20 samples from the same location)
- One temperature blank will be analyzed per cooler
- Rinsate (equipment) blanks (if non-dedicated sampling equipment is used) will be collected at a rate of 10 percent (1 per 10 samples).

5.7.2 Field Logs and Records

As presented in Section 4, original field logs and records will be maintained by the SUXOS and UXOQCS as part of the project files. As the project activities progress, the UXOQCS will monitor the usefulness of the project filing system for information retrieval. If additional files are needed, the filing structure may be expanded as necessary to include relevant information. A summary of field documentation and procedures used for the collection of quality field data during the RI activities is discussed below.

5.7.2.1 Field Documentation and Chain-of-Custody

Field documentation and COC procedures will be performed as indicated in Section 4. COCs will be reviewed to ensure consistency with the QAPP/work plan and to ensure the correct sample identification is used and correct analytes/methods are being requested. Data collection records generated during surface clearance and UXO investigation activities will be reviewed for completeness to ensure appropriate information is collected (to include but not limited to quantity of MD/MEC and cultural debris in each grid, qualitative evaluation of anomaly density per grid, and any other notable features within a grid).

5.7.2.2 Daily Quality Control Reports

Daily work activity summary reports will be maintained by the UXOQCS. These daily reports may include, but are not limited to, the following items:

- QC reports and findings
- Health and safety reports from the UXO SO (including activity log)
- Reports on any emergency response actions
- MPPEH/MEC discovery and classification of the item
- Records of site work and progress.

The Daily QC activities will be recorded on the Daily QC Report form (Appendix D). The daily QC Reports provide backup information and are intended to document field progress and findings and aid in the preparation of the monthly progress reports. QC reports will be checked daily by the Project Manager and or Task Manager to ensure appropriate information is being captured. At the conclusion of the project, the QC reports will become a permanent part of the record.

5.7.2.3 Field Log Books

Field personnel will be responsible for maintaining paginated, bound, and dated hard copy Field Log Books to record activities that occur each work day. The Log Book will document compliance with the health and safety plan. The following is a partial list of the types of information that may be recorded in the logbook:

- Name and title of author; date and time of entry; and physical/environmental (weather included) conditions during the daily field activities
- Documentation of the performance and content of daily health and safety meetings
- Names of field personnel. start and stop times of work, and break times
- Specific description of the work being conducted
- Any incidents or other unusual events that occur on that day
- Names and titles of all site visitors
- Sampling activity purpose and plan
- Type of sampled media (i.e., surface soil)
- Sample collection method (i.e., grab-into sample container)
- Number, type, and volume of samples taken
- Sample Identification (ID) number of each sampling point
- Description, location, and elevation of the sampling point
- Sample description
- Analysis, number of containers, and preservation required
- Date and time sample was collected
- Instrument operational check records
- Description of sample collection activities
- Overnight shipper air bill number for each shipment.

The log book will describe conditions or activities leading up to or contributing to a safety incident or lost time due to safety. Pertinent information regarding the site activities will be documented as near to real-time as possible. Entries in the logbook will be signed and dated. Log books will be checked periodically to ensure appropriate information is being captured. At the conclusion of the project, log book entries will become a permanent part of the record

Entries will be made in permanent, waterproof ink, and corrections made in the logbook will be marked through with a single line and then dated and initialed. After checking the validity of the data in the field notes, the Task Manager, SUXOS or his designee will reduce the data onto the daily/weekly field progress form.

5.7.2.4 Quality Control Log Book

The UXOQCS will maintain a separate QC Log Book that summarize field QC inspections. The log book will document compliance with the work plan and specify workmanship acceptability. Each log book will be portable and dedicated to the event or site. QC Log Books will be maintained as paginated, bound, and dated hard copy logs. The area and work function being inspected, and the date will be recorded. Each log book entry will be event-, area-, or site-specific and clearly noted accordingly. QC Log Books will be turned over to the Project Manager and become a permanent part of the contract record, in addition to the completed specific QC forms specified above.

5.7.2.5 Test, Maintenance, and Calibration Records

Instrumentation used in the field will be tested with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications. The method for measuring the instrument response will be to compare the readings to established concentrations and compare the response to the expected response. Testing, repair, or replacement records will be filed and maintained by the site manager and may be subject to audit at any time.

Equipment, instruments, tools, gauges, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's specified recommendation. The manufacturer's written maintenance schedule shall be followed to minimize the downtime of the measurement systems. The operator's responsibility will be to adhere to this maintenance schedule and to arrange necessary and prompt service as required. At a minimum, equipment used daily will be cleaned at the end of each workday and kept in good operating condition. Service to the equipment, instruments, tools, etc. shall be performed by qualified personnel. In the absence of manufacturer's recommended maintenance criteria, a maintenance procedure will be developed based upon previous use of the equipment. Field instruments will be calibrated per manufacturer recommendations and the calibration events will be documented in the field notebook or calibration worksheets.

Any equipment test, maintenance, or calibration task will be documented in a field log book by the individual performing the task. Testing and maintenance of equipment such as geophysical instruments, radios, cell phones, vehicles, and machinery will be performed per the manufacturer's specifications, this work plan, and applicable SOPs. Geophysical detection equipment will be tested daily, as specified in Section 4.3.3. At a minimum the test, calibration, or maintenance log will contain the date and time of the task, equipment name and identification numbers, name of individual performing the task, and results of the task. Upon project closeout, all tests, maintenance, and calibration records will be included in the project QC file.

Equipment Checks

- QC for GPS instruments will involve comparing a control point (i.e. existing benchmark noted in Figure 1) that was established using conventional survey or GPS to confirm GPS readings are within ±1 foot. The results will be documented, and assessed and summarized in the Daily QC Report.

- QC for the analog geophysical instruments (i.e., Schonstedt) will be accomplished through daily checks that the instruments are functioning before use for field activities. Each instrument will be tested on the instrument verification strip (IVS). If the instrument is not able to detect the item, it will be taken out of use until it is repaired.

- QC for mowing or earth moving machinery will be accomplished through daily checks that the equipment used for test pitting is functioning as per the manufacturer's and operator's instructions prior to field activities.

Process and Procedural Inspections:

- Checks for the process and procedures used during execution of this work plan will be conducted by the UXOQCS. Process integrity is defined as conformance to specifications (i.e., the requirements of the work plan, regulations, and industry standards). These checks will consist of visual observations of the methods used and will be part of the inspections conducted during the performance of the work and documented in the QC Log Book and the QC Report.

QC Inspections:

- Magnetometer Assisted Surface Clearance: After the dig team completes a magnetometer assisted surface clearance for a designated grid, the UXOQCS will perform a QC inspection of at least 10% of the grid using the same methodology, techniques and equipment originally used during the investigation. If the UXOQCS identifies MEC, MD, or metallic debris on the surface which meets or exceeds the size of a 20mm TP projectile it will be considered a failure.

- Intrusive Investigation (for use in Phase II): After the dig team intrusively investigates anomalies identified in a designated grid, the UXOQCS will perform a QC inspection of at least 10% of the grid using the same methodology, techniques and equipment originally used during the investigation. If the UXOQCS identifies an anomaly within a cleared hole which meets or exceeds the size of a 20mm TP projectile it will be considered a failure.

5.7.2.6 Training Records

The UXOSO will maintain a file for each site employee to document qualifications and the successful completion of the required training courses for that particular employee. The documentation may be a certificate, letter, memorandum, or other written form of documentation but must include the training completion date(s). If any required refresher training courses do not take place by the anniversary date of the employee's initial training, there should be a record in the employee's file indicating why the training has been delayed and when the training will be completed.

5.7.2.7 Photographic Records

Photographs will be taken onsite with a digital camera and periodically downloaded for storage and printing. Each photograph will have an entry in the field logbook indicating the date and time it was taken. Sampling points will be documented on film and, in some cases, actual photographs of samples will be taken. Photographs taken to document sample locations will have at least two reference points.

5.7.2.8 Daily Review of Field Data

At the conclusion of each work day, the field team will provide the UXOQCS any completed investigation forms, field notes, and inspection reports from that day's activities. Any issues arising from the day's activities will be discussed between the UXOQCS, and appropriate field personnel. The UXOQCS will record these discussions and resolutions or corrective actions arising from these discussions will be addressed during the following morning's safety meeting and recorded on the Daily QC Report.

5.8 DATA REDUCTION

Data reduction is the process by which raw analytical data generated from laboratory instrument systems are converted into usable concentrations. The raw data, which may take the form of area counts, instrument responses, or observations, are processed by the lab and converted into concentrations expressed in the parts-per-million or parts-per-billion range. Raw data from these systems include compound identification, concentrations, retention times, and data system print-outs. Raw data are usually reported in graphic form, bar-graph form, or tabular form. The laboratories will follow SOPs consistent with the data handling requirements of the applicable methods as described in Appendix B.

5.8.1 Calculations of Data Quality Indicators

Data Quality Indicators (DQIs) are analytical method-specific qualitative and quantitative descriptors used in interpreting the degree of acceptability or utility of the data collected. Principal DQIs include precision, accuracy (bias), representativeness, comparability, and completeness. Secondary DQIs include sensitivity, recovery, memory effects, limits of quantitation, repeatability, and reproducibility. Three of these parameters can be quantified: precision, accuracy, and completeness. Representativeness and comparability are qualitative descriptors of data integrity. Sensitivity is evaluated by direct comparison of project quantitation limits to screening criteria. Establishing QC acceptance criteria for the DQIs sets quantitative goals for the quality of data generated in the analytical measurement process or measurement systems. Precision and accuracy DQIs are based upon contract laboratory historical control limits and will be reported in laboratory data packages.

Precision quantifies the reproducibility or variability of measurements under a given set of field and laboratory conditions. Typical indices of precision are standard deviation, relative percent difference, variance, range of values, or coefficient of variation. The coefficient of variation is defined as the standard deviation divided by the mean, and may be multiplied by 100 to yield a percentage. The relative standard deviation (RSD) is synonymous with the coefficient of variation and may also be expressed as a percentage. Duplicate or repeated analysis of the same sample may be used to quantify precision.

For precision, the RPD (or absolute difference) will be calculated as shown below:

$$RPD = {(|X1 - X2|} \big/ {((X1 + X2)/2)))} \times 100$$

Where:

X1 and X2 = the two replicate values.

Accuracy represents the degree of bias in a measurement. This parameter is defined as the difference between the true value and the value yielded by the method (i.e., the percent recovery). The true value is generally determined from calibration curves in which known quantities of the target analyte are artificially introduced (spiked) into the medium from which the measurement is to be taken. Accuracy can be compromised during sample collection (perhaps the largest source of bias), sample transport, and final analysis in the laboratory.

In general, accuracy is measured in terms of percent recovery as shown below:

$$\%R = {(|SSR - SR|)} \big/ {SA}$$

Where:

SSR = measured value of the spiked sample

SR = measured value of the unspiked sample

SA = known amount of the spike in the sample

Completeness is the third and final DQI parameter that is quantifiable. It is defined as the portion of measurements for which valid values were determined compared to the total number collected. Similarly field sample collection completeness can also be evaluated by comparing the number of samples actually collected to the number proposed.

Completeness, as defined in WS # 12-1 will be calculated as shown below:

$$\%C = \left(V \big/ N \right) \times 100$$

Where:

V = number of measurements judged valid

N = total number of sample results

Representativeness is a qualitative indicator of how well the data set represents true conditions of the site. For example, a data set would not be representative if a source of contamination had been missed on a site and consequently had not been sampled.

Comparability is another qualitative DQI parameter that indicates the degree to which different data sets may be meaningfully compared. Conditions that influence comparability include similarity of sampling locations, sampling times, sampling techniques, units of concentration, and many other sampling and analysis steps. Finally, it is more difficult to compare data sets with different accuracy and precision.

Analytical sensitivity is an important component of data quality, and it is evaluated using analyte detection and quantitation levels compared to screening criteria. Analytical methods are chosen based on the method detection and/or reporting limits being lower than the screening criteria. However, it should be noted that the level of sensitivity required for comparison to some comparison criteria often exceeds that available using established methods.

QC Acceptance Criteria are method- and technology-specific protocols and specifications that demonstrate that data of known and sufficient quality are generated. QC acceptance criteria include specific limits for sensitivity, recovery, memory effects, limit of quantitation, repeatability, and reproducibility, and are designed such that if they are consistently met, the project measurement quality objectives will be achieved, and the resulting data will be sufficient to meet the project DQOs and support the project decisions.

5.8.2 Precision

5.8.2.1 MS/MSDs

Analytical precision is calculated as the percent relative percent difference (RPD) between individual measurements of the same property, under similar conditions. Compound and analyte-specific DQOs for MS/MSDs for each method-matrix combination are presented in Table 5-2. Failure to achieve project DQOs will result in the actions specified in Section 5.9.

5.8.2.2 Duplicate Analyses

A separate measure of the precision of analytical results, taking into account field variables, is the comparison of field duplicate results with normal sample results. The DQO for agreement between duplicate and normal results for organic and inorganic parameters for solid matrices is ±30 percent RPD. If precision falls outside acceptance limits, data may or may not be used at the discretion of the data user. Laboratory control sample duplicate precision objective is < 25 percent RPD.

5.8.3 Accuracy

Accuracy is the degree of agreement of a measurement with an accepted reference or true value. Accuracy measures the bias or systematic error of the entire data collection process. To determine accuracy, an LCS, which is a laboratory blank spiked at a known concentration, will be run with each preparatory batch, and MS/MSDs will be run at a rate of 1 per 20 project samples. The laboratory accuracy objective for the project is no target analyte concentrations ≥ 1/2 LOQ

<table>
<tr><th colspan="4">TABLE 5-2: Measurement Performance Criteria: Metals and Explosives in Soils
Matrix: Soil
Analytical Group or Method: Metals/Explosives
Concentration Level: Low
Sampling procedure: Grab
Analytical Method: Metals 6020A/Explosives 8330A</th></tr>
<tr><th>Data Quality Indicator (DQI)</th><th>QC Sample or Measurement Performance Activity</th><th>Measurement Performance Criteria</th><th>QC Sample Assesses Error for Sampling (S), Analytical (A), or Both (S&A)</th></tr>
<tr><td>Overall Precision</td><td>Field Duplicates</td><td>Relative percent difference (RPD) ≤ 30% when target elements are detected in both samples ≥ sample-specific level of quantitation (LOQ) ; Qualify affected sample results J/UJ for exceedances</td><td>S&A</td></tr>
<tr><td>Analytical Precision (laboratory)</td><td>Laboratory Control Sample Duplicates</td><td>RPD ≤ 25%; Qualify affected sample results J/UJ for exceedances</td><td>A</td></tr>
<tr><td>Analytical Accuracy/Bias (laboratory)</td><td>Laboratory Control Samples</td><td>Laboratory limits, as noted below Qualify affected detections J for recoveries above limits; Qualify affected results J/UJ for recoveries below limits; Reject affected non-detect results for recoveries < 10%
<table>
<tr><td>Sb</td><td>80-120</td><td>Pb</td><td>80-120</td><td>NG</td><td>80-120</td></tr>
<tr><td>Ba</td><td>80-120</td><td>Ni</td><td>80-120</td><td>2,4, DNT</td><td>80-120</td></tr>
<tr><td>Cu</td><td>80-120</td><td>Zn</td><td>80-120</td><td>2,6,DNT</td><td>80-120</td></tr>
</table></td><td>A</td></tr>
<tr><td>Analytical Accuracy/Bias (matrix interference)</td><td>Matrix Spike/ Matrix Spike Duplicates</td><td>Laboratory Limits, as listed below: Qualify affected detections J for recoveries above limits; Qualify affected results J/UJ for recoveries below limits; Reject affected non-detect results for recoveries < 10%
<table>
<tr><td>Sb</td><td>75-125</td><td>Pb</td><td>75-125</td><td>NG</td><td>75-125</td></tr>
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</table></td><td>A</td></tr>
</table>

TABLE 5-2: Measurement Performance Criteria: Metals and Explosives in Soils **Matrix: Soil** **Analytical Group or Method: Metals/Explosives** **Concentration Level: Low** **Sampling procedure: Grab** **Analytical Method: Metals 6020A/Explosives 8330A**			
Data Quality Indicator (DQI)	**QC Sample or Measurement Performance Activity**	**Measurement Performance Criteria**	**QC Sample Assesses Error for Sampling (S), Analytical (A), or Both (S&A)**
Overall accuracy/bias (contamination)	Blanks (method blank and field blank)	No target analyte concentrations ≥ 1/2 LOQ.	A
Sensitivity	LOQ Verification Sample (spiked at LOQ)	Recovery within ±25% of LOQ, will require assessment of direction of bias for associated outlier QC or calibration results For impact on usability of data for project purposes, use professional judgment	A
Completeness	90% Field Completeness 90% Analytical Completeness	***Field Completeness:*** Samples planned to be collected/ Actual number of samples collected. 90% field completeness goal. ***Analytical completeness***: Usable analyte results/total number of analyte results. Usable analyte results are those analytes not qualified as rejected. Data which is J-qualified data is usable, as long as the data validator recommends to the project team that it can be used. Data exhibiting a systemic matrix bias may be usable based upon data validator findings. 90% analytical completeness goal.	S&A

5.8.4 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is achieved through proper development of the field sampling program (field sampling plan is discussed in Section 4).

5.8.5 Completeness

Although the completeness objective for field sampling is ideally 100 percent, site-specific conditions or influences beyond the control of the field sampling team may impact this objective. Therefore, the completeness objective for this project is identified as >90 percent. The Laboratory completeness objective for the project is > 90 percent, which means having 10 percent or less of the analytes qualified as rejected. Any issues affecting this objective will be documented and brought to the immediate attention of Harley-Davidson.

5.8.6 Comparability

Comparability expresses the confidence with which one data set can be compared to another based on a comparison of sampling and analytical procedures as well as sampling results. Comparability will be controlled by using standardized operating procedures.

5.8.7 Sensitivity

A comparison of laboratory MDLs and laboratory reporting limits to standard/action levels was performed to evaluate whether analytical sensitivity objectives were being met. Table 5-1 illustrates the results of the evaluation.

As discussed in Section 5.5.2 and shown on Table 5-1, RLs achieved using standard laboratory methods are sufficiently lower than standards/Action levels so no method adjustments were necessary. Laboratory sensitivity project requirements include recovery with +- 25 percent of the LOQ.

A summary of QC procedures, responsibilities, criteria, and actions is presented in table 5-3.

5.9 DATA VALIDATION AND REPORTING

Laboratory data will be electronically downloaded into a database and validated. Laboratory data will be independently validated by a third-party. The electronic data will be submitted with the Final RI Report. Data validation qualifiers will be entered into the database and a data quality report prepared to document precision, accuracy (bias), representativeness, comparability, completeness and sensitivity. The validated laboratory data along with the field data will be used to prepare the RI Report. Laboratory MC data reports will meet the deliverable package and EPA data forms shown on Table B-5, and electronic data will be provided to Harley-Davidson and the

Leidos database administrator for use with ArcGIS database in accordance with the EDD format shown on Table B-6 (https://www.fynop.com) (Appendix F).

5.10 QC PERFORMANCE SYSTEM AUDITS

5.10.1 Field Audit Procedures

The EA Program QC Manager will be responsible for verifying compliance with this QAPP through audits and surveillance. The Project Manager will to inspect/audit the quality of work being performed and verify that the work practices conform to specifications of this work plan or other applicable guidance. Discrepancies will be communicated to the responsible individual and documented in the QC Log Book and Weekly QC Report. Corrective actions will be verified by the Program QC Manager and recorded in the Weekly QC Report. The Inspection

Table 5-3: Summary of QC Procedures, Responsibilities, Criteria, and Actions

Activity	Definable Feature of Work	Responsible Personnel	Procedure	Frequency	Pass/Fail Criteria	Action if Failure Occurs
Planning/ Pre-mobilization	Establishment of GIS	Task Manager, GIS Manager	• Gather all GIS data from provided historical records, georeferenced project location, and develop GIS maps for conceptual site activities (e.g., grid network, site boundaries).	Once	• Scales are in feet, measurable using engineering scale. • Key map included. • Project name and location correct. • Grid network proper size.	• Review all data/input with GIS staff. Do not proceed until corrections are reviewed and accepted by Lead STR. Notify PM and the Program Manager.
Planning/ Pre-mobilization	Document management and control	Task Manager, Technical Editor	• Follow established EA document control guidelines.	Once	• Document not in compliance with EA document control guidelines.	• Internal corrective action meeting.
Planning/ Pre-mobilization	Subcontracting	PM or Task Manager, Procurement Manager, Contracts Manager, Health & Safety Manager	• Issue subcontractor requests for proposal or review blanket purchase orders.	Once	• Verify qualifications, safety record, training, and appropriate licenses are up to date and acceptable. Subcontracts are executed.	• Review Terms and Conditions for corrective actions.

Table 5-3: Summary of QC Procedures, Responsibilities, Criteria, and Actions

Activity	Definable Feature of Work	Responsible Personnel	Procedure	Frequency	Pass/Fail Criteria	Action if Failure Occurs
Planning/ Pre-mobilization	Personnel qualifications	Task Manager, UXOQCS/ UXOSO, SUXOS	• Verify all health and training certification/qualifications for all proposed personnel are appropriate and current for assigned activities. • For UXO personnel, verify qualification in accordance with DDESB TP-18.	Once	• All personnel meet or exceed the training requirements and/or certifications for the assigned positions.	• Provide required training or replace personnel. Notify PM and the Program Manager.
Planning/ Pre-mobilization	Procurement of supplies/ materials	UXOQCS/ UXOSO, SUXOS, Task Manager, Procurement Manager, Corporate Equipment Manager	• Order all supplies in accordance with corporate procurement policy. • Establish purchase requisitions. • Reserve corporate equipment.	Once	• All supplies and materials received. • Inspect supplies and material for damage. • Function-check all equipment in accordance with operator or manufacturers' handbooks.	• Review purchase orders. • Review project schedule for schedule impacts. • Replace all defective supplies/materials and equipment. • Notify PM and the Program Manager.
Field Operations	Site-specific training	Task Manager, UXOQCS/ UXOSO, SUXOS	• Verify that all on-site personnel have been given the necessary site-specific training (e.g., GPS, data management, vendor escort, work plan, SOPs etc.).	Once (for each new personnel, throughout field operations)	• Demonstrated knowledge of site-specific training topics through Q&A, equipment operational review, etc.	• Escort individual from project and exclude from site or complete on-site training for individual.

Table 5-3: Summary of QC Procedures, Responsibilities, Criteria, and Actions

Activity	Definable Feature of Work	Responsible Personnel	Procedure	Frequency	Pass/Fail Criteria	Action if Failure Occurs
Field Operations	Survey MRS boundaries and grids	UXOQCS/ UXOSO, SUXOS, Data Manager, GIS Manager	• Verify that MRS boundaries are demarcated using GPS. • All grids nodes stakes marked with grid ID number. • All grid numbers entered into data system.	Initial and as required	• MRS boundaries and grids match CSM as described in work plan. • Grid nodes are marked per work plan. • GPS does not meet daily accuracy check of horizontal GPS ±1.0 foot of known benchmark coordinate.	• Review coordinate accuracy. • Check GPS for accuracy error. • Notify PM and the Program Manager.
Field Operations	Magnetometer-assisted surface clearance	UXOQCS/ UXOSO, SUXOS	• Identify, remove, and document all surface MEC/UXO and MD. Identify and remove all non-munitions related debris.	Daily/each anomaly	• All detectable surface MEC/UXO removed.	• Initiate corrective action request. • Notify PM and the Program Manager.
Field Operations	Mag and flag subsurface analog-detected anomalies (Phase II – if applicable)	UXOQCS/ UXOSO, SUXOS	• Mag and flag in accordance with work plan and SOP.	Daily/each anomaly	• Analog handheld magnetometers not operating in accordance with Operator Manual. • Equipment fails IVS. • Subsurface anomaly not detected and flagged.	• Replace or repair handheld magnetometers. • Initiate corrective action request.
Field Operations	Qualitative mapping of flagged anomalies	UXOQCS/ UXOSO, SUXOS	• Anomaly survey data downloaded, imported to GIS, mapped, and checked.	Daily/each GPS	• Data downloaded and cumulative anomaly map created; no mapping errors found.	• Do not produce final map until errors corrected.

Table 5-3: Summary of QC Procedures, Responsibilities, Criteria, and Actions

Activity	Definable Feature of Work	Responsible Personnel	Procedure	Frequency	Pass/Fail Criteria	Action if Failure Occurs
			• Survey GPS operating to project specifications.	Daily	• Horizontal GPS ±1.0 foot of known benchmark coordinate.	• Do not proceed with survey until GPS operates within accuracy limit.
Field Operations	DGM (Phase II- if applicable)	Project Geophysicist, UXOQCS/ UXOSO	• Perform DGM to project specifications • Verify instrument tests (daily static and dynamic at IVS)	Daily	• Established measurement criteria achieved	• Perform root cause analysis, identify issues(s), propose modifications (as needed). • Re-work, as needed.
Field Operations	Anomaly Reacquisition (Phase II – if applicable)	UXOQCS/ UXOSO	• Utilize GPS and magnetometer to reacquire anomalies, as identified on dig sheets.	Daily	• Horizontal GPS ±1.0 foot of known benchmark coordinate. • Unable to identify/locate anomaly	• Do not proceed with reacquire until GPS operates within accuracy limit. • Perform root cause analysis, identify issue(s). •
Field Operations	Intrusive investigation (Phase II – if applicable)	UXOQCS/ UXOSO, SUXOS	• Intrusively investigate all subsurface anomalies selected (at least 10% of total) within each grid.	Daily/each anomaly	• Selected anomaly detected to depth of detection of handheld magnetometers. • Following investigation, presence of MEC/UXO/MD at selected anomaly constitutes failure.	• Initiate corrective action request. • Notify PM and the Program Manager.

Table 5-3: Summary of QC Procedures, Responsibilities, Criteria, and Actions

Activity	Definable Feature of Work	Responsible Personnel	Procedure	Frequency	Pass/Fail Criteria	Action if Failure Occurs
Field Operations	MPPEH procedures	UXOQCS/ UXOSO, SUXOS	• Verify certification is per work plan MPPEH Management SOP and EM 385-1-97.	Daily/as required	• Discovery of any MPPEH within material certified as MDAS.	• Initiate corrective action request. • Notify PM and the Program Manager. • Re-investigate anomaly location.
Field Operations	MC sampling	Task Manager, UXOQCS/ UXOSO, SUXOS	• Collect soil sample beneath each compromised MEC with exposed explosives or high MD and post detonation for MC analysis. • Maintain chain of custody.	Each Compromised MEC or High MD Area	• Chain of custody broken. • Sample procedures not followed.	• Initiate corrective action request. • Notify PM and the Program Manager. • Re-sample.
Field Operations	Demobilization	Task Manager, UXOQCS/ UXOSO, SUXOS, Data Manager	• Verify MRS is returned to near original condition.	Once	• Walk through by the property owner. • Site condition found acceptable by the property owner.	• Develop final punch list of corrective actions to return the site to acceptable condition. • Notify PM and the Program Manager.
Field Operations	Evaluation of analytical data	PM/Task Manager, Project Chemist	• Review and validate data per the approved QAPP. • 100% of data will be reviewed and verified • 10% of data will be validated	Once	• No data rejected.	• Re-review or revise, as required. • Notify PM and the Program Manager. • Perform Corrective Action, as needed. • Re-collect data, as needed.

Table 5-3: Summary of QC Procedures, Responsibilities, Criteria, and Actions

Activity	Definable Feature of Work	Responsible Personnel	Procedure	Frequency	Pass/Fail Criteria	Action if Failure Occurs
Final Project Report and Closeout	Report preparation	PM/Task Manager, Lead Senior Technical Reviewer	• Verify that report has been prepared per guidance and provides the required information to meet project objectives.	Once per version submitted	• Report has been reviewed, comments addressed and resolved, and approved.	• Take appropriate action to obtain report approval.
Final Project Report and Closeout	Report preparation	Data Manger UXOQCS/ UXOSO, SUXOS,	• Audit of the following items: tabulation of all MEC, MD and other material recovered during the removal action is accurate and complete. • Daily records • Grid tracking system • QC reports and results • USACE 948 QA acceptance for all grids	Once	• Any missing report • Discrepancies in grid tracking	• Conduct corrective action meeting to determine discrepancies and required action.
Final Project Report and Closeout	Data archiving and closeout	PM/Task Manager, Project Chemist	• Have lab prepare Electronic Data Deliverable. Submit to Client.	Once	• Data is accepted by client.	• Revise data package and re-submit.
Final Project Report and Closeout	Data archiving and closeout	PM/Task Manager, Procurement Manager, Contracts Manager	• Verify purchase orders, vendors and subcontractors have been closed out. • Run internal accounting commitment reports to verify outstanding balances.	Once	• Release of claims not received.	• Resolve issues with Contracts Manager and Procurement Manager.

Schedule and Tracking Form is to be used by the Program QC Manager for planning, scheduling, and tracking the progress of audits (Appendix D). The information on the form is to be current and reviewed by the Program QC Manager. Audit activities and corrective actions are to be documented by the Program QC Manager in accordance with this chapter and the audit records are to be maintained as part of the project QC file.

A corrective action shall be initiated during the field work when precision, accuracy, completeness, representativeness, or comparability are not met or changes are made in the field that do not meet the scope of work requirements or other conditions are identified that are not acceptable. The PM or Task Manager will make unannounced trips to verify that work is being performed in accordance with the work plan. To document the findings, a report will be filed which lists the problems encountered and the corrective action implemented. A stop-work order may be issued by the PM or Field Task Manager, if no resolution can be reached. Additional discussions of corrective actions are presented below.

5.10.2 Laboratory Audit Procedures

If a particular analysis is deemed "out-of-control", corrective action will be taken to ensure continued data quality. Actions which may be taken include, but are not limited to:

- Rechecking calculations
- Checking QC data on other samples
- Auditing laboratory procedures
- Reanalyzing the sample if the holding time requirements have not been exceeded
- Accepting data with the acknowledged level of uncertainty
- Qualifying the data as unusable

The laboratory QA Manager will be responsible for initiating laboratory corrective action within 48 hours of the time it was noted. Additional corrective actions are discussed below.

5.11 PROCESS AND PROCEDURAL FAILURE

Process integrity is defined as conformance to specifications (i.e., requirements of the work plan, regulations, and industry standards). Checks for process integrity will consist of visual observations of the methods used and will be a significant part of the Follow-Up Inspections and documented on the Quality Control Surveillance Report for each inspection.

Defined as conformance to the requirements of the work plan, checks for procedural integrity will consist of observations of specific procedures used, and the accuracy of those methods. The results of these inspections will be documented on the Quality Control Surveillance Report.

Non-conformance with process or procedural requirements will be addressed by the UXOQCS with the appropriate team leader (e.g., SUXOS, survey crew leader, etc.). If the nonconformance is found to affect safety or overall product quality, work will cease until an appropriate resolution is identified and implemented, and the SUXOS/Field Task Manager will be notified. Once the UXOQCS, appropriate team leader, and SUXOS/Field Task Manager are satisfied with the suggested corrective action, the action will be implemented and documented in the log book and on forms contained in Appendix D.

If the failure directly affects product quality, or is otherwise determined by the UXOQCS to require a follow-up action, a Nonconformance Report will be prepared and submitted. The Nonconformance Report will include a detailed written description of the nonconformance item, and required follow-up actions, developed and signed by the UXOQCS. A copy of the completed form will be provided to the SUXOS and Project Manager as notification of the failure. In response, the EA project team will have a period of 2 working days to provide a plan for corrective action for the failure, and not more than 5 working days from the date of issue of the Nonconformance Report to complete the corrective action. Once the corrective action has been completed, it will be documented on the form and, if approved, will be signed by the UXOQCS and Project Manager. These signatures will indicate that the failed work has been corrected, accepted, and the Nonconformance Report will be closed. A copy of the Nonconformance Report and any relevant attachments will be placed in the project QC file, along with Follow-Up inspection documents.

If the failure of process or procedure occurs more than once for the area where a particular team is working, a Correction Action Request will be prepared. The Corrective Action Request will specify whether a Corrective Action Plan is needed. The UXOQCS will meet with the appropriate team leader and members to determine the corrective course of action. During follow-up QC inspections, the UXOQCS will ensure and document in the UXOQCS Log Book and the QC Report that agreed upon corrective actions have been implemented.

5.12 DEFICIENCY IDENTIFICATION AND RESOLUTION

While deficiency identification and resolution occurs primarily at the operational level, QC audits provide a backup mechanism to address problems that either are not identified or cannot be resolved at the operational level. The project team is responsible for verifying that deficiencies are identified and documented as prescribed herein and corrected in a timely manner. Deficiencies identified by the project team will be corrected by operational staff and documented by the UXOQCS.

5.12.1 QC Failure Criteria

QC failure is defined as non-conformance with: 1) provisions of the work plan and 2) industry standards. QC pass/fail criteria are presented in Table 5-2. In the event of a QC failure, a follow-up corrective action is required using the procedures described below. For surface clearance and intrusive investigation, grids that fail the Pass/Fail Criteria, or Quality Assurance (QA) surveillance, will be re-cleared.

5.12.1.1 Equipment Failure

If equipment is not operating properly, it will be repaired or taken out of service and replaced with suitably operating equipment. On a case-by-case basis, the UXOQCS will evaluate whether the equipment failure has compromised data quality and will determine the appropriate corrective action.

Should any detection instrument fail to function or cannot detect items during the daily check, the operator and field team leader will determine and resolve the equipment failure. If the failure cannot be determined and repaired, the instrument will be shipped offsite for repair. A replacement will be used once it has successfully processed through the daily check and has been confirmed and documented by the UXOQCS. The UXOQCS will review this type of failure on a case-by-case basis to determine whether the failed instrument may have compromised data quality.

5.13 DATA CORRECTIVE ACTIONS

5.13.1 Introduction

Corrective actions are those measures taken to rectify a laboratory or field measurement system that does not comply with this QAPP. Any personnel engaged in project work that discovers or suspects a nonconformance is responsible for initiating corrective actions and reporting them to the Field Task Manager and PM.

A Correction Action Request can be issued by any member of the project team. If the individual issuing the Correction Action Request is also responsible for correcting the problem, then he/she should document the results on Part B of the Correction Action Request. Otherwise, the Correction Action Request should be forwarded to the Project Manager who is then responsible for evaluating the validity of the request, formulating a resolution and developing a corrective strategy, assigning personnel and resources, and specifying and enforcing a schedule for corrective actions. Once a corrective action has been completed, the Correction Action Request and supporting information will be forwarded to the Program QC Manager for closure. Sufficient information will be provided to allow the QC reviewer to verify the effectiveness of the corrective actions.

The recommendations provided in the Correction Action Requests and implemented in the work plan will be reviewed during Follow-Up QC inspections. The purposes of this Correction Action Request review are to ensure that established protocols are implemented properly, verify that corrective action commitments are met, ensure that corrective actions are effective in resolving problems, identify trends within and among similar work units, and facilitate system root cause analysis of larger problems.

The Program QC Manager will determine whether a written Corrective Action Plan is necessary, based on whether or not any of the following are met: the Correction Action Request priority is high, deficiency requires a rigorous corrective action planning process to identify similar work product or activities affected by the deficiency, or deficiency requires extensive resources and planning to correct the deficiency and to prevent recurrence. The Corrective Action Plan will be developed by the Project Manager and approved and signed by the Program QC Manager. The Corrective Action Plan will indicate whether it is submitted for informational purposes or for review and approval. In either event, operational staff is encouraged to discuss corrective action strategy with the UXOQCS throughout the process.

5.13.2 Field Corrective Action

Corrective action will be undertaken when a non-conforming condition is identified. The sampling team shall record any problems requiring corrective action in the field notebook, and notify the Field Task Manager at or before the end of the sampling day. If further action is required, the Field Task Manager will report the problems to the PM, who will report them to Harley-Davidson if necessary. All correspondence will be recorded either in the field notebook, in archived emails, and/or in written reports. A non-conforming condition occurs when QA/QC objectives are not met, or when procedural practices or other conditions are not acceptable.

5.13.3 Laboratory Corrective Action

Corrective action will be taken by the laboratory to ensure continued data quality. Laboratory corrective actions procedures are outlined in the Laboratory QAPP in Appendix B. Laboratory corrective actions will be reported to the Task Manager or PM and documented in project records.

5.13.4 Corrective Action Request Tracking

Each Correction Action Request must be given a unique identification number and tracked until corrective actions have been implemented in the field, documented, and the Correction Action Request submitted to the Project Manager for verification and closure.

5.14 LESSONS LEARNED AND OTHER DOCUMENTATION

The lessons learned through the discrepancy management process are documented on Correction Action Requests and Corrective Action Plans. To share the lessons learned, these documents will be submitted to Harley-Davidson through a Weekly QC Report, which summarizes the week's QC activities and includes a grouping of the Daily QC Reports and any other pertinent reports created during the week.

Correction Action Requests should be cited in the Weekly QC Report. Minor deficiencies identified during a QC audit that are readily correctable and can be verified in the field are to be documented in the QC Log Book and Weekly QC Report without initiating a Correction Action Request. Discrepancies that cannot be readily corrected will be documented by the UXOQCS on a Correction Action Request and in the Weekly QC Report. Copies of Correction Action Requests will be referenced in and attached to the Weekly QC Report. Corrective Action Plans will also be attached to Weekly QC Reports to document the final outcome of the deficiency. Similar or related deficiencies may be addressed on a single Corrective Action Plan.

5.15 PREVENTATIVE AND CORRECTIVE ACTIONS TO ENSURE QC

The preventative and corrective actions incorporated within this QAPP are designed to prevent and correct quality problems that may arise during the RI. The procedures facilitate process improvements and describe the available mechanisms to identify, document, and track discrepancies until a corrective action has been verified.

5.15.1 Preventative Maintenance

Periodic preventive maintenance is required for sensitive equipment. Instrument manuals will be kept on file for reference. The troubleshooting chapter of factory manuals may be used in assisting personnel in performing maintenance tasks. The frequency of preventive maintenance for field equipment is indicated in each operating instruction manual. Field equipment is checked by field personnel under the supervision of the field coordinators.

Major instruments in the laboratory are covered by annual service contracts with manufacturers. Under these agreements, regular preventive maintenance visits are made by trained service personnel. Maintenance is documented and maintained in permanent records by the individual responsible for each instrument. Laboratory management is responsible for preparation and documentation of the program. Laboratory maintenance practices are described in Appendix B.

5.15.2 Preventive Measures

While the entire QC program is directed toward problem prevention, certain elements of the program have greater potential to be proactive. Should these preventive measures fail, tracking and communicating discrepancies also provide a mechanism for preventing recurrence.

5.15.3 Continual Improvement

A continual improvement process will be implemented for the project. Project staff at all levels will be encouraged to provide recommendations for improvements in established work processes and techniques. The intent is to identify activities that are compliant but can be performed in a more efficient or cost-effective manner. Typical quality improvement recommendations include identifying an existing practice that can and should be improved (e.g., a bottleneck in production) and/or recommending an alternative practice that provides a benefit without compromising prescribed standards of quality. Project staff should bring their recommendations to the attention of the UXOQCS/ UXOSO, UXO Team Lead through verbal or written means.

Deviations from established protocols will not to be implemented without prior written approval. Where a staff-initiated recommendation results in a tangible benefit to the project, public acknowledgment will be given the Project Manager.

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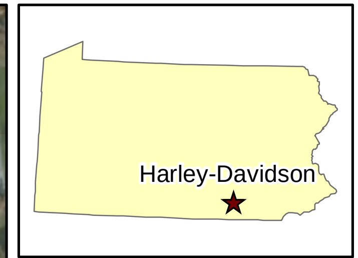
Figures



Legend

- Access Gate used for Site Entry
- Benchmarks
- Fenceline
- Current Harley-Davidson Boundary
- Former York Naval Ordnance Plant Boundary
- York County Industrial Development Authority Boundary
- AOC Boundary
- MRS Boundary

L:\GISData\Northeast\Pennsylvania\HarleyDavidson\MXD\2015 Figures\Figure 1 - AOC and MRS Location Map.mxd

Figure 1 - AOC and MRS Location Map
MMRP RI Former York Naval Ordnance Plant

Source:
ESRI 2012

Projection: NAD 83 Maryland StatePlane Feet
Date: April 2015

0 400 800
Feet

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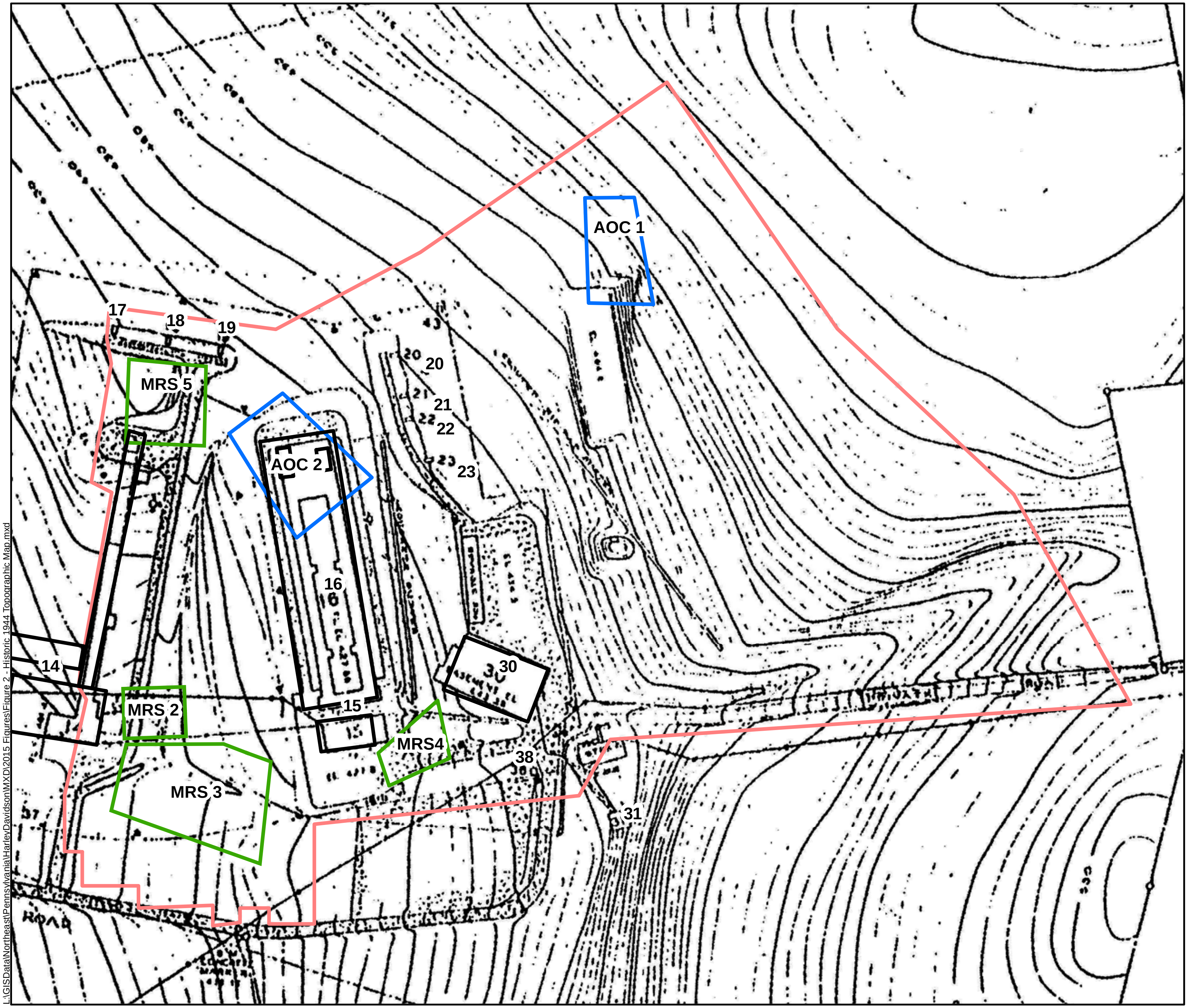

Legend

- Proposed RI
- MRS Boundary
- AOC Boundary

Figure 2 - Historic 1944 Topographic Map
MMRP RI Former York Naval Ordnance Plant

Source:
ESRI 2012

Projection: NAD 83 Maryland StatePlane Feet
Date: April 2015

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Feet

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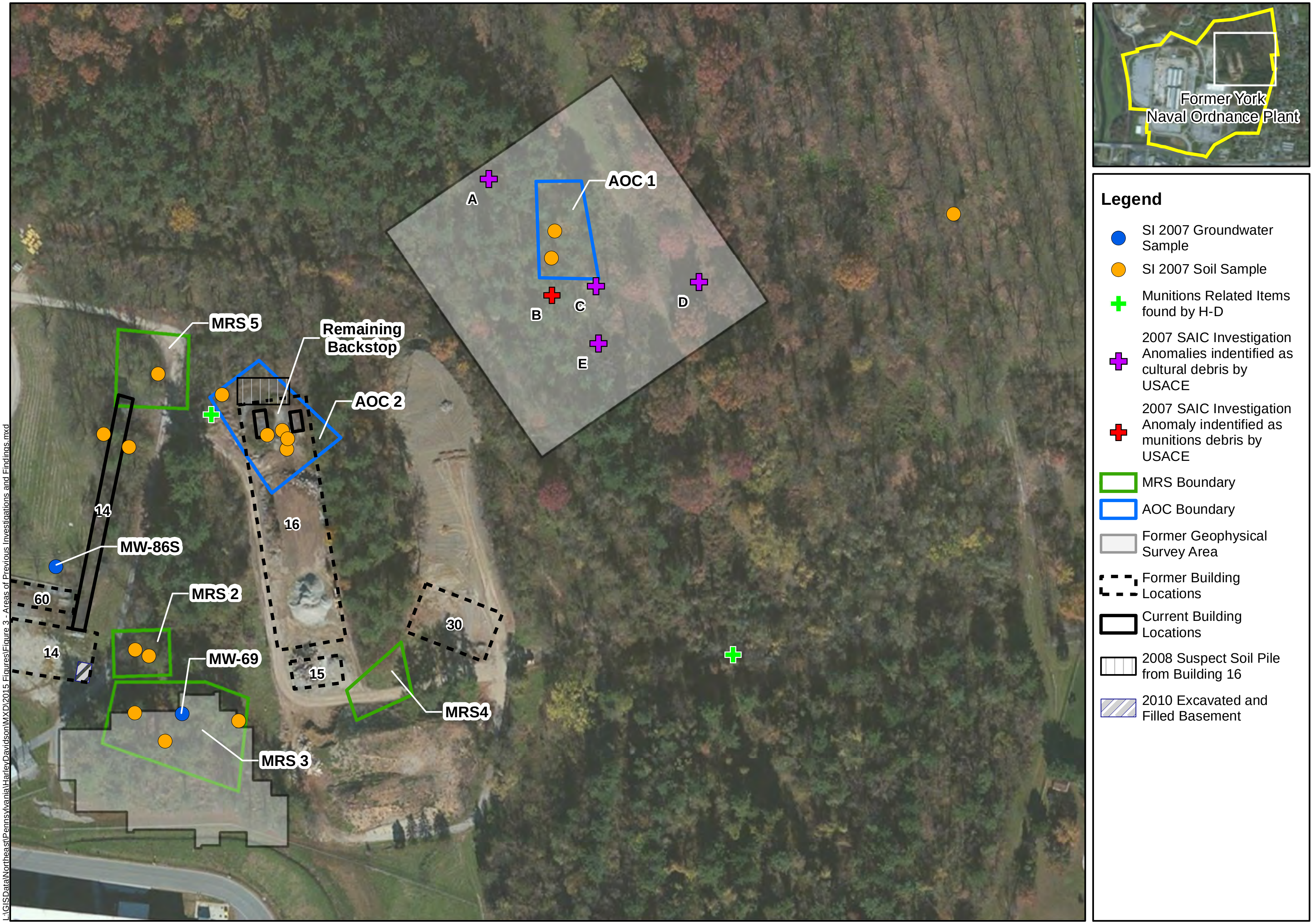

L:\GISData\Northeast\Pennsylvania\HarleyDavidson\MXD\2015 Figures\Figure 3 - Areas of Previous Investigations and Findings.mxd

Figure 3 - Areas of Previous Investigations and Findings
MMRP RI Former York Naval Ordnance Plant

Source:
ESRI 2012

Projection: NAD 83 Maryland StatePlane Feet
Date: April 2015

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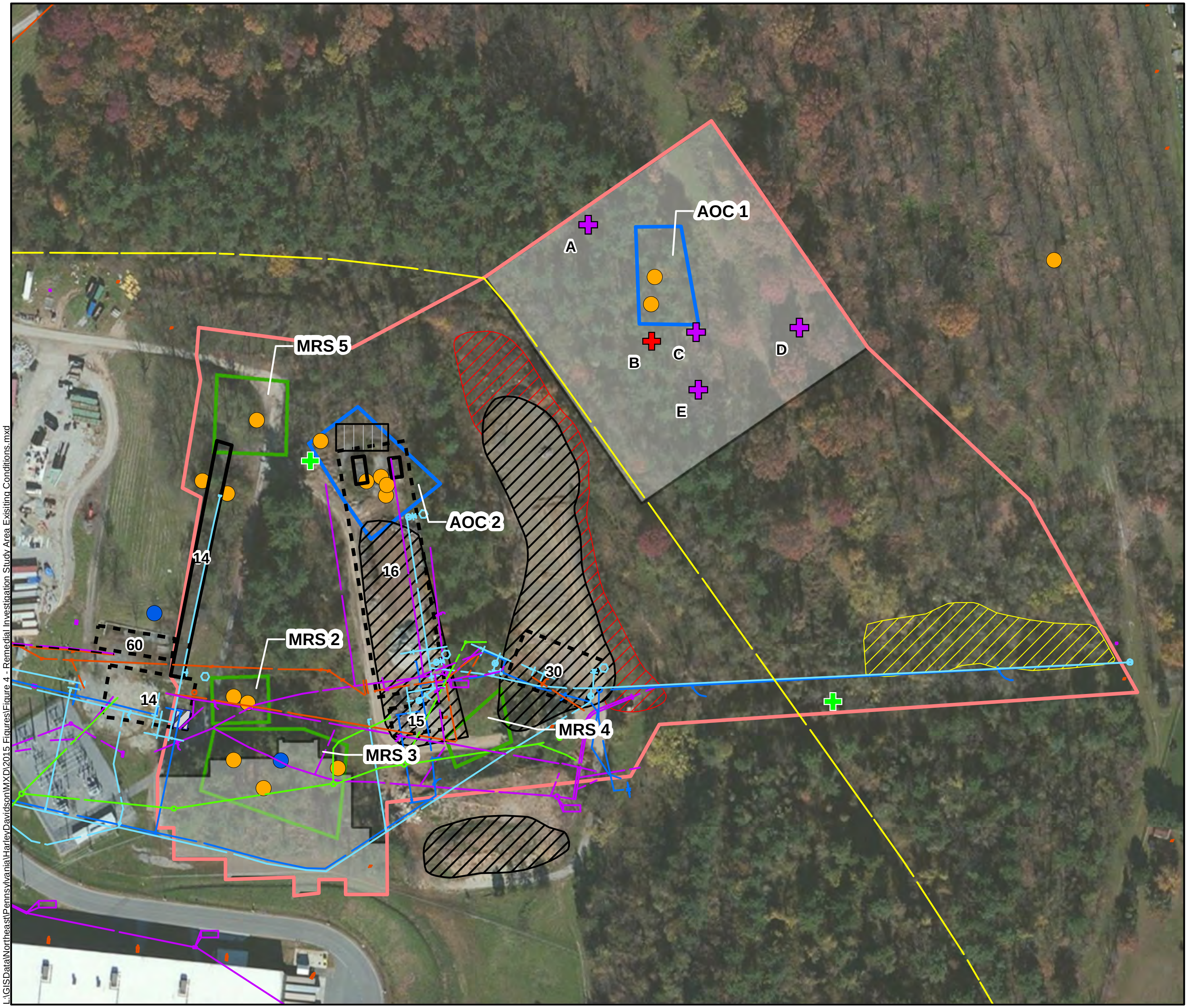

Legend

- SI 2007 Groundwater Sample
- SI 2007 Soil Sample
- 2007 SAIC Investigation Anomalies indentified as cultural debris by USACE
- 2007 SAIC Investigation Anomaly indentified as munitions debris by USACE
- Munitions Related Items found by H-D
- Proposed RI Boundary (20.34 acres)
- MRS Boundary
- AOC Boundary
- Former Geophysical Survey Area
- 2010-2011 Fill Material
- 2002 Fill Material
- Former Landfill
- Former Building Locations
- Current Building Locations
- 2008 Suspect Soil Pile from Building 16
- 2010 Excavated and Filled Basement

Utilities

- Compressed Air
- Drinking Water
- Electrical
- Fire Protection
- Natural Gas
- Sanitary Sewer
- Stormwater

L:\GISData\Northeast\Pennsylvania\HarleyDavidson\MXD\2015 Figures\Figure 4 - Remedial Investigation Study Area Exisiting Conditions.mxd

Figure 4 - Remedial Investigation Study Area with Existing Utilities
MMRP RI Former York Naval Ordnance Plant

Source:
ESRI 2012

Projection: NAD 83 Maryland StatePlane Feet
Date: April 2015

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Feet

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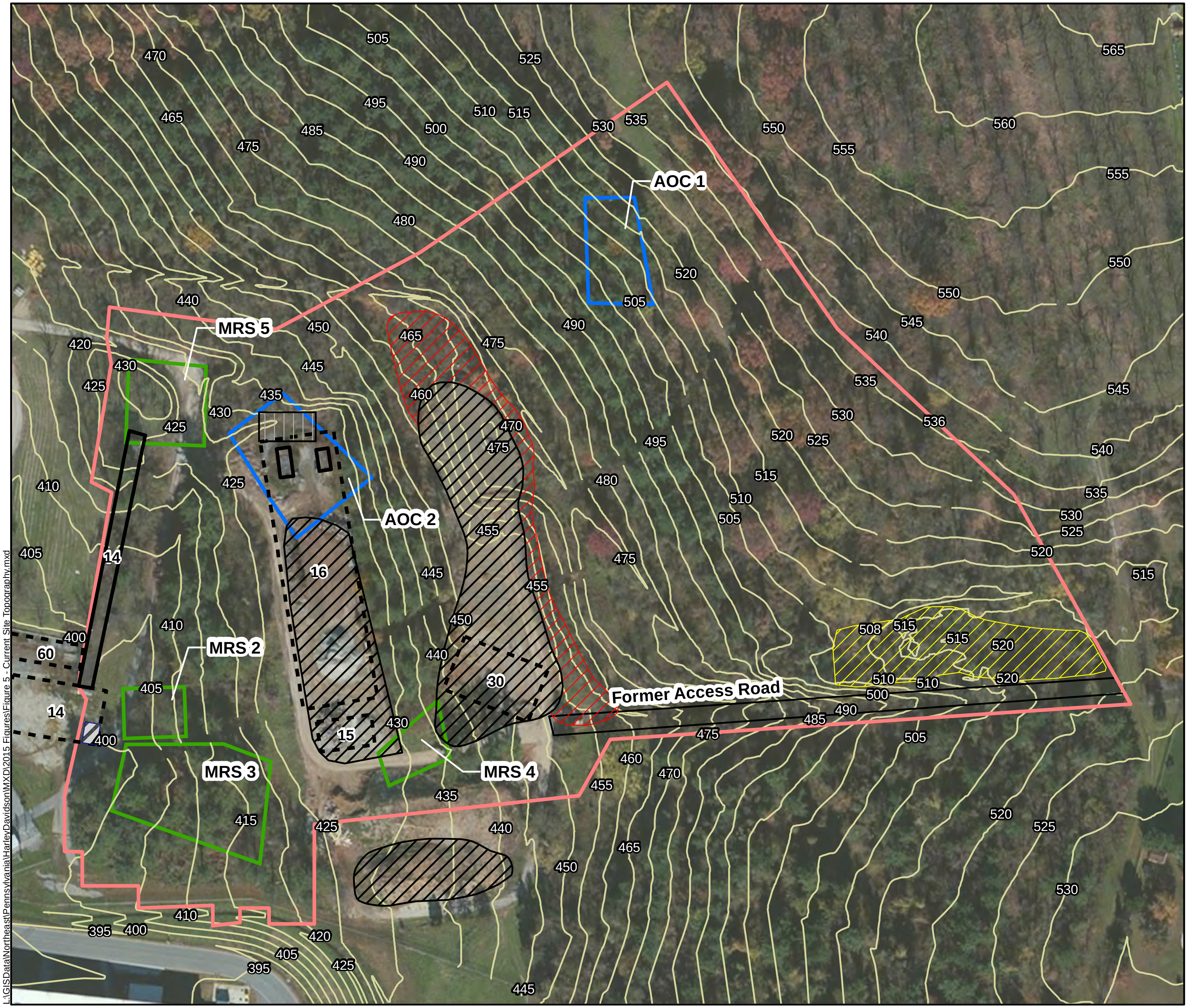

Legend

- Elevation Contour (5 foot interval)
- Proposed RI Boundary (20.34 acres)
- MRS Boundary
- AOC Boundary
- 2010-2011 Fill Material
- 2002 Fill Material
- Former Landfill
- Former Building Locations
- Current Building Locations
- 2008 Suspect Soil Pile from Building 16
- 2010 Excavated and Filled Basement

Note:
Total RI Acreage: 20.34 Ac
Total Fill Acreage: 1.97 Ac
Total Landfill Acreage: .62 Ac
Accessible RI Acreage: 17.75 Ac

Total RI Acreage excludes Fill Material and Former Landfill acreages

L:\GISData\Northeast\Pennsylvania\HarleyDavidson\MXD\2015 Figures\Figure 5 - Current Site Topography.mxd

Figure 5 - Current Site Topography
MMRP RI Former York Naval Ordnance Plant

Source:
ESRI 2012

Projection: NAD 83 Maryland StatePlane Feet
Date: April 2015

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Feet

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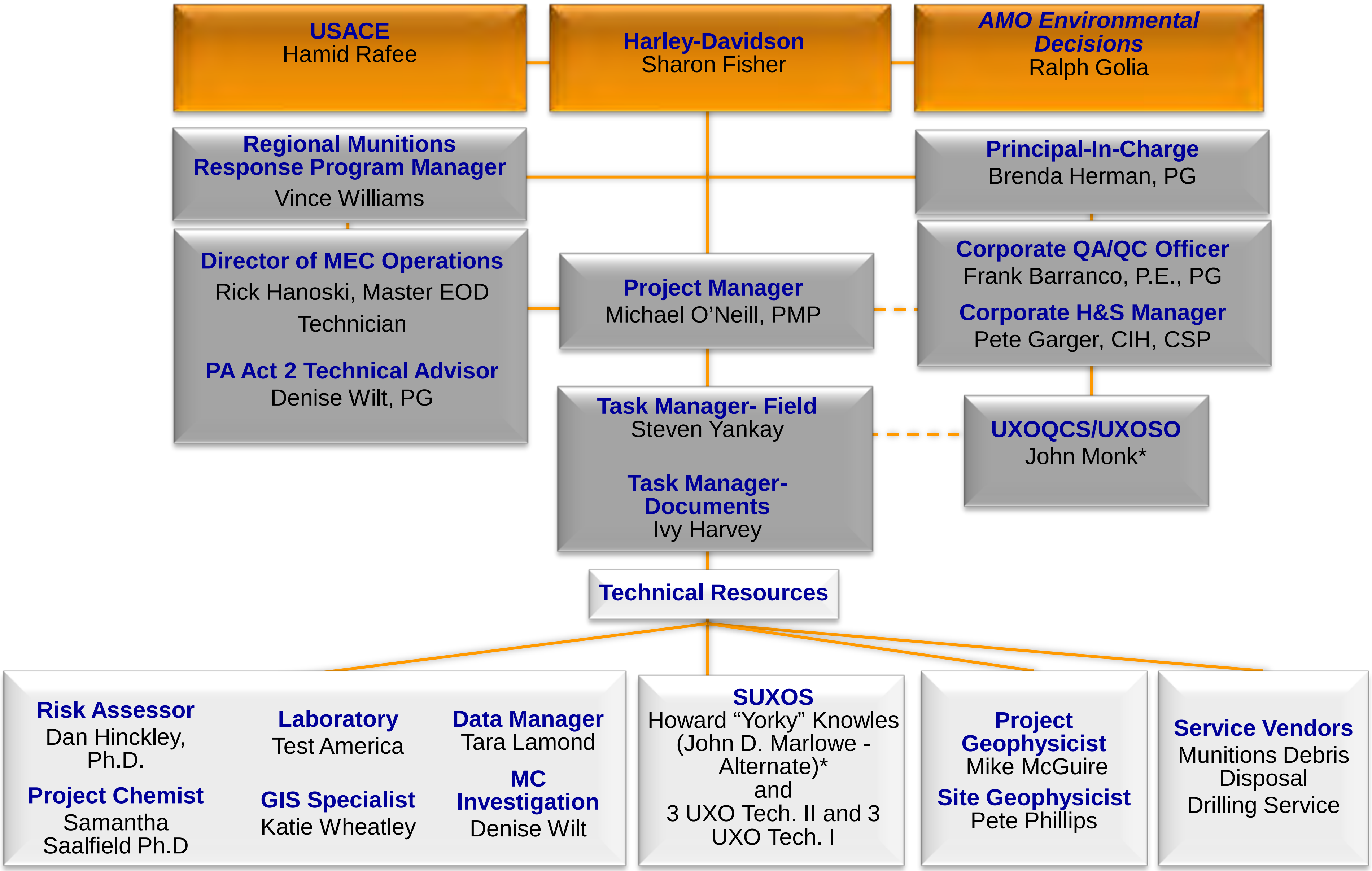
Figure 6 Organizational Chart



*Depending on the timing of the fieldwork, a suitable qualified alternate may be used for UXO technician categories

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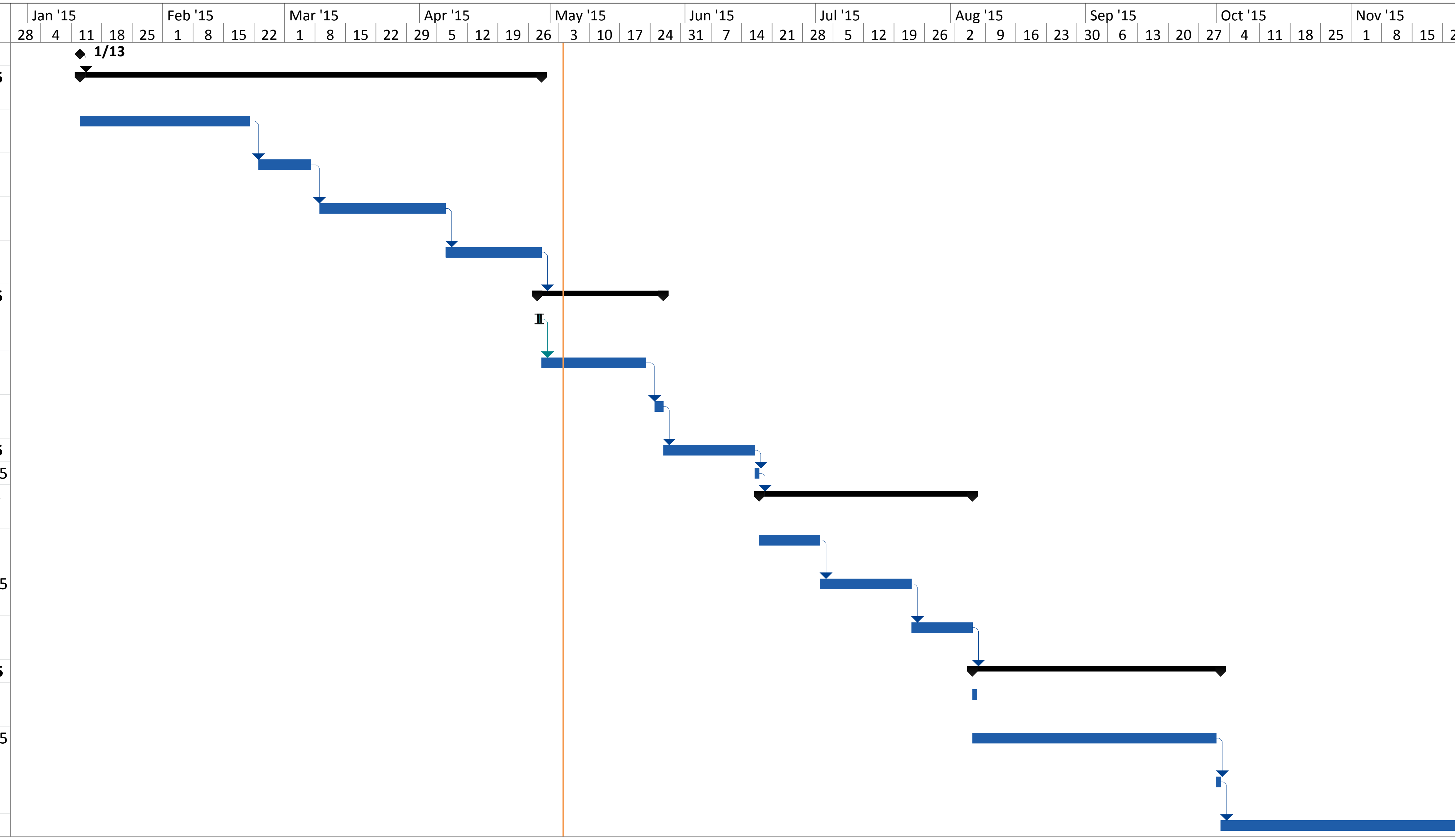
FIGURE 7
FYNOP REMEDIAL INVESTIGATION SCHEDULE

Task Name	Duration	Start	Finish
Project Kickoff Meeting	0 days	Tue 1/13/15	Tue 1/13/15
Prepare First Phase Planning Documents	**76 days**	**Tue 1/13/15**	**Tue 4/28/15**
Submit Draft Copy of RI Work Plan	29 days	Tue 1/13/15	Fri 2/20/15
Review of Draft Copy RI Work Plan	10 days	Mon 2/23/15	Fri 3/6/15
Prepare Final Copy of RI Work Plan	21 days	Mon 3/9/15	Mon 4/6/15
Receive Notice to Proceed and Conduct kickoff Meeting	16 days	Tue 4/7/15	Tue 4/28/15
Conduct First Phase of RI	**21 days**	**Tue 4/28/15**	**Tue 5/26/15**
First Phase Mobilization	1 day	Tue 4/28/15	Tue 4/28/15
First Phase RI Field Work	18 days	Wed 4/29/15	Fri 5/22/15
First Phase Demobilization	2 days	Mon 5/25/15	Tue 5/26/15
Prepare Interim Summary Repor	**15 days**	**Wed 5/27/15**	**Tue 6/16/15**
First Phase Summary Meeting	1 day	Wed 6/17/15	Wed 6/17/15
Prepare Second Phase Planning Documents	**35 days**	**Thu 6/18/15**	**Wed 8/5/15**
Submit Draft Copy of RI Work Plan Addendum	10 days	Thu 6/18/15	Wed 7/1/15
Review Draft Copy of RI Work Plan Addendum	15 days	Thu 7/2/15	Wed 7/22/15
Prepare Final Copy of RI Work Plan Addendum	10 days	Thu 7/23/15	Wed 8/5/15
Conduct Second Phase of RI	**41 days**	**Thu 8/6/15**	**Thu 10/1/15**
Second Phase Mobilization	1 day	Thu 8/6/15	Thu 8/6/15
Second Phase RI Field Work	40 days	Thu 8/6/15	Wed 9/30/15
Second Phase Demobilization	1 day	Thu 10/1/15	Thu 10/1/15
Prepare Final RI Report	**70 days**	**Fri 10/2/15**	**Thu 1/7/16**



Task
Split
Milestone
Summary
Project Summary
External Tasks
External Milestone
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
Deadline
Progress

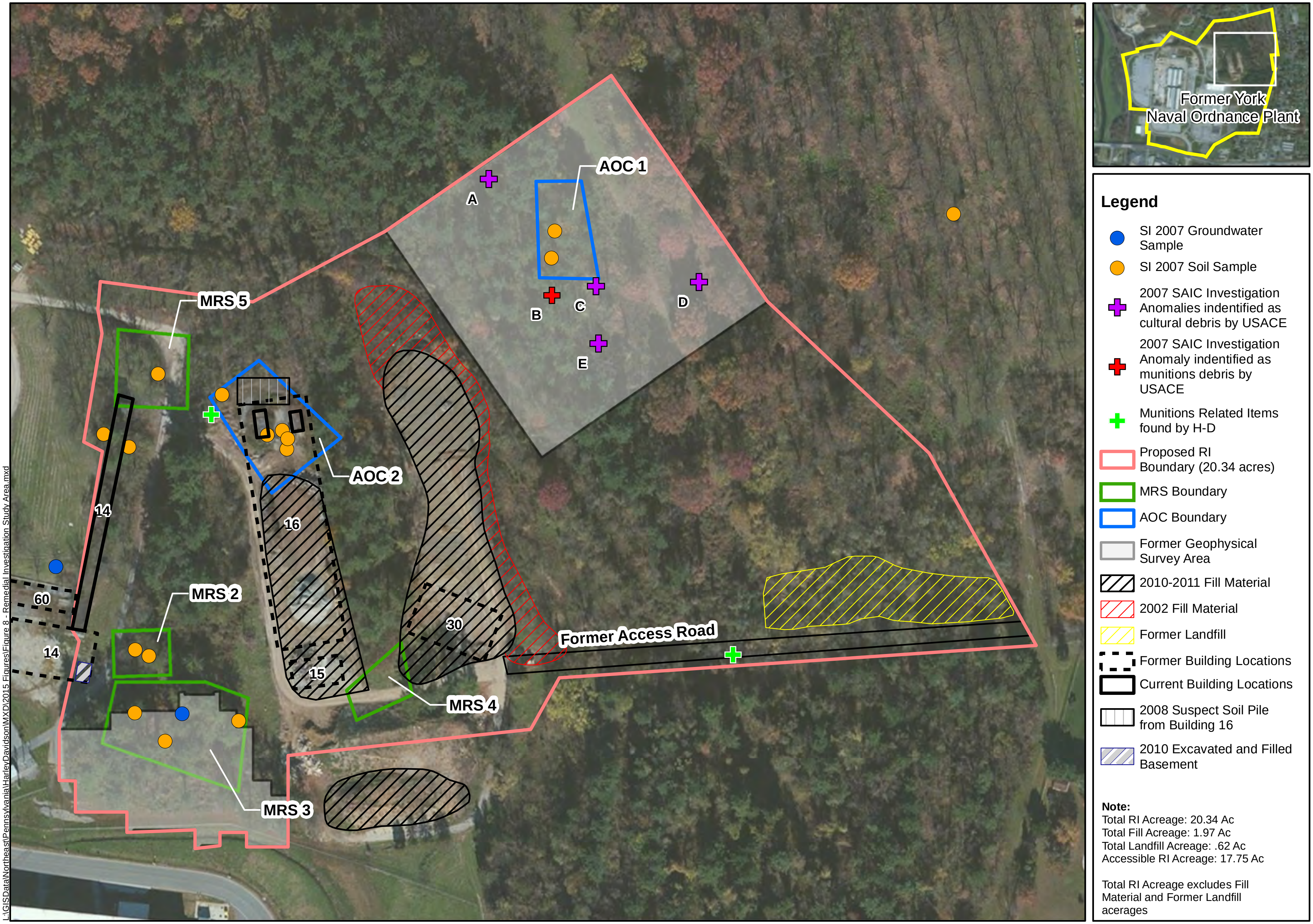


Figure 8 - Remedial Investigation Study Area
MMRP RI Former York Naval Ordnance Plant

Source:
ESRI 2012

Projection: NAD 83 Maryland StatePlane Feet
Date: April 2015

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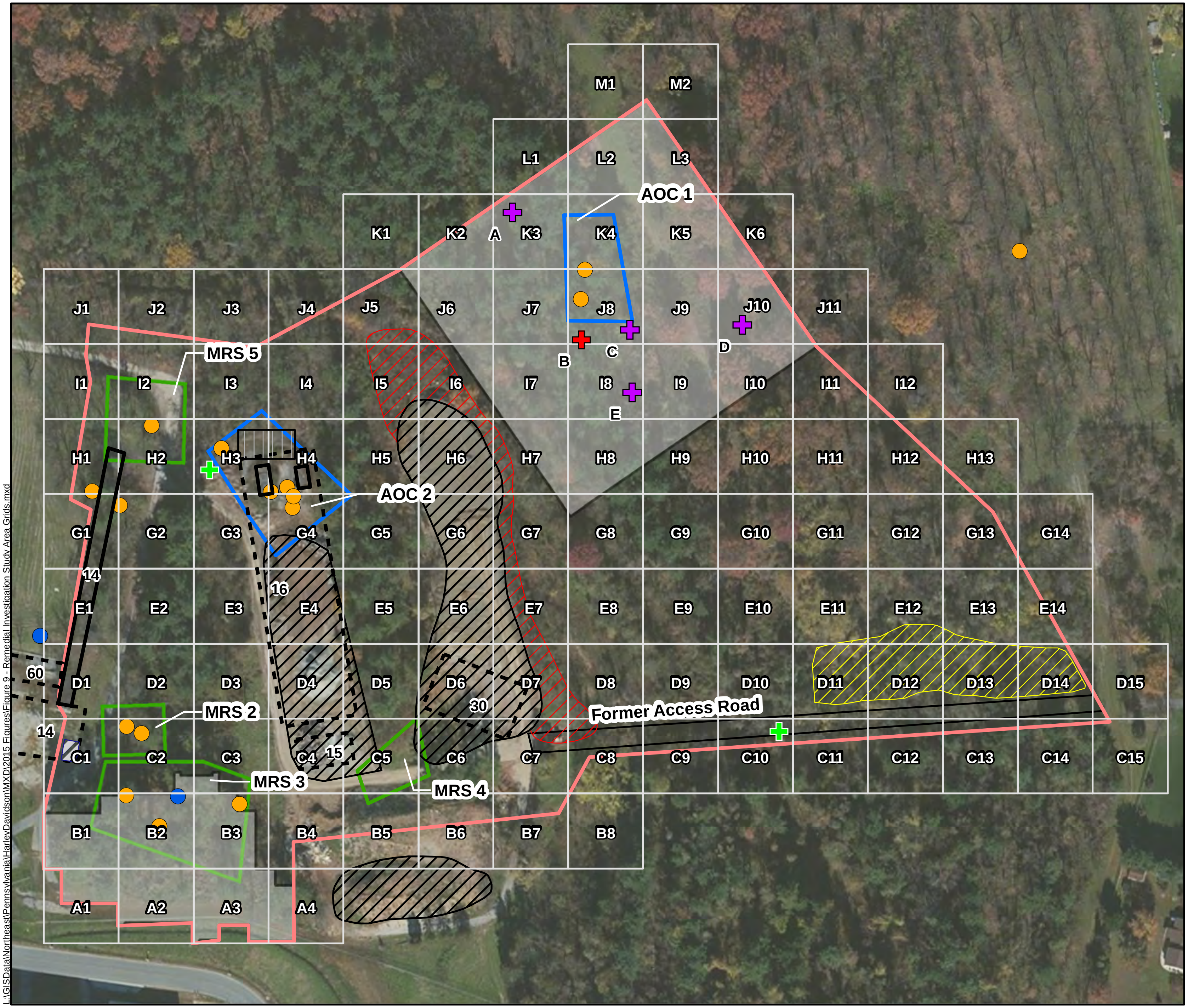

Legend

- SI 2007 Groundwater Sample
- SI 2007 Soil Sample
- 2007 SAIC Investigation Anomalies indentified as cultural debris by USACE
- 2007 SAIC Investigation Anomaly indentified as munitions debris by USACE
- Munitions Related Items found by H-D
- Proposed RI Boundary (20.34 acres)
- MRS Boundary
- AOC Boundary
- Former Geophysical Survey Area
- 2010-2011 Fill Material
- 2002 Fill Material
- Former Landfill
- 100x100 foot grid
- Former Building Locations
- Current Building Locations
- 2008 Suspect Soil Pile from Building 16
- 2010 Excavated and Filled Basement

Note:
Total RI Acreage: 20.34 Ac
Total Fill Acreage: 1.97 Ac
Total Landfill Acreage: .62 Ac
Accessible RI Acreage: 17.75 Ac

Total RI Acreage excludes Fill Material and Former Landfill acreages

L:\GISData\Northeast\Pennsylvania\HarleyDavidson\MXD\2015 Figures\Figure 9 - Remedial Investigation Study Area Grids.mxd

Figure 9 - Remedial Investigation Study Area Grids
MMRP RI Former York Naval Ordnance Plant

Source:
ESRI 2012

Projection: NAD 83 Maryland StatePlane Feet
Date: April 2015

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Appendix A

Site-Specific Health and Safety Plan

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SITE SPECIFIC ADDENDUM TO THE GENERAL HEALTH AND SAFETY PLAN FOR THE FORMER YORK NAVAL ORDNANCE PLANT

Prepared for:

Harley-Davidson Motor Company Operations, Inc.
1425 Eden Road
York, Pennsylvania 17402

Prepared by:

EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle
Hunt Valley, Maryland 21031

April 2015

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This document shall be maintained on site with the *Project Work Plan.* G*eneral Health & Safety Plan (GHASP) for Hazardous Waste & Environmental Services conducted by the Site Characterization and Remediation Group of EA Engineering Science & Technology (July 2014).*

Client: Harley-Davidson Motor Company Operations, Inc.

Project Name/Number: Former York Naval Ordnance Plant (fYNOP)

Site Location/Address: 1425 Eden Road, Springettsbury Township, York, Pennsylvania

Site Description/History: The formerly used defense site (FUDS) was operated under a contract for the manufacture and assembly of 40 millimeter (mm) twin and quadruple guns and gun mounts, 37 mm guns and carriages, 3-inch and 90mm anti-aircraft gun mounts, and Navy shields and gun slides. Two proof testing ranges were constructed onsite for the testing of machine guns (including the 40 mm, 3-inch and 37 mm guns). Facilities constructed in the proof testing area (referred to as the Magazine Area in 1959) included proof testing ranges (Buildings 14 and 16) along with ammunition storage buildings/magazines (Buildings 17 through 23).

In the early 1950s, during the Korean War, the FUDS was used for the manufacture of 3-inch and .50-caliber guns and 20-mm aircraft machine guns. Toward the end of 1955, the plant began to manufacture power drive units for the 5-in./54-caliber guns along with the 20-mm aircraft machine guns. It is likely that proof testing was continued during this period. In addition, it is noted that a mission statement presented in historical documents indicated the YNOP also was authorized to "dispose of unserviceable and/or dangerous ammunition and explosives, from whatever sources received". No information was found to indicate that this process was conducted onsite. In addition, historical maps do not document the location of an open burn/open detonation (OB/OD) area which would likely have been used for this type of operation.

Munitions associated with the .50-caliber, 20-mm, 37 mm, 40 mm and 3-inch guns were likely stored onsite and fired in the proof testing ranges. Previous investigations at the FUDS have identified five range areas (some labeled as disposal areas) along with two areas of concern (AOCs) related to former proof testing operations at the FUDS.

Work Description: The first phase consists of: 1) assessing the presence or absence of MEC and identifying potential AOCs within the FUDS; 2) removing metallic debris from the surface to facilitate additional investigation using analogue or digital geophysics, and; 3) assessing the presence or absence of MC in soil. The second phase consists of: 1) assessing the nature and extent of MEC within AOCs identified in the first phase; 2) assessing the nature and extent of MC contamination (to include 2,4-dinitrotoluene, 2,6-dinitrotoluene, nitroglycerine, antimony, barium, copper, lead, nickel, and zinc) in soil within the AOCS identified in the first phase, and; 3) assessing the risk from MEC using the MEC Hazard Assessment and the risk from MC to human health and the environment.

APPROVALS:

This Addendum to the July 2014 GHASP has been prepared under the supervision and review of a Certified Industrial Hygienist certified by the American Board of Industrial Hygiene

Program Health and Safety Manager: ______________________ 22 April 2015
Pete Garger, CIH (ABIH No. 3118) Date

Project Manager: ______________________ 22 April 2015
Mike O'Neill Date

EMERGENCY CONTACT INFORMATION:

Contacts	Name	Phone Number(s) work/cell
Project Manager	Mike O'Neill	410-584-7000/410-207-1500
Program Health and Safety Manager	Pete Garger	410- 584-7000 / 410-790-6338
Task Manager	Steven Yankay	410-584-7000/717-487-6632
Site Manager	Steven Yankay	717-487-6632
Unexploded Ordnance Quality Control/Safety Officer	John Monk	410-584-7000/717-487-6632
Senior Unexploded Ordnance Officer/Site Manager	Yorky Knowles	727-688-4856
Client Contact	Sharon Fisher Ralph Golia Rodney Meyers (Leidos)	717-852-6544/717-818-6516 215-230-8282/267-249-0417 H-D Office: 717-505-7325 Cell: 717-468-1439
Poison Control		800-222-1222
National Response Center		800-424-8802
EA Medical Services	AllOne Health	800-350-4511
Corporate Health and Safety Director	Peter Garger	410-584-7000 / 410-790-6338
Other (as applicable)	Harley-Davidson (Central Security)	717-852-6000 Onsite: *999

MEDICAL EMERGENCY:

Distance to Nearest Hospital (with emergency room): 2.3 miles

Hospital Name: Memorial Hospital

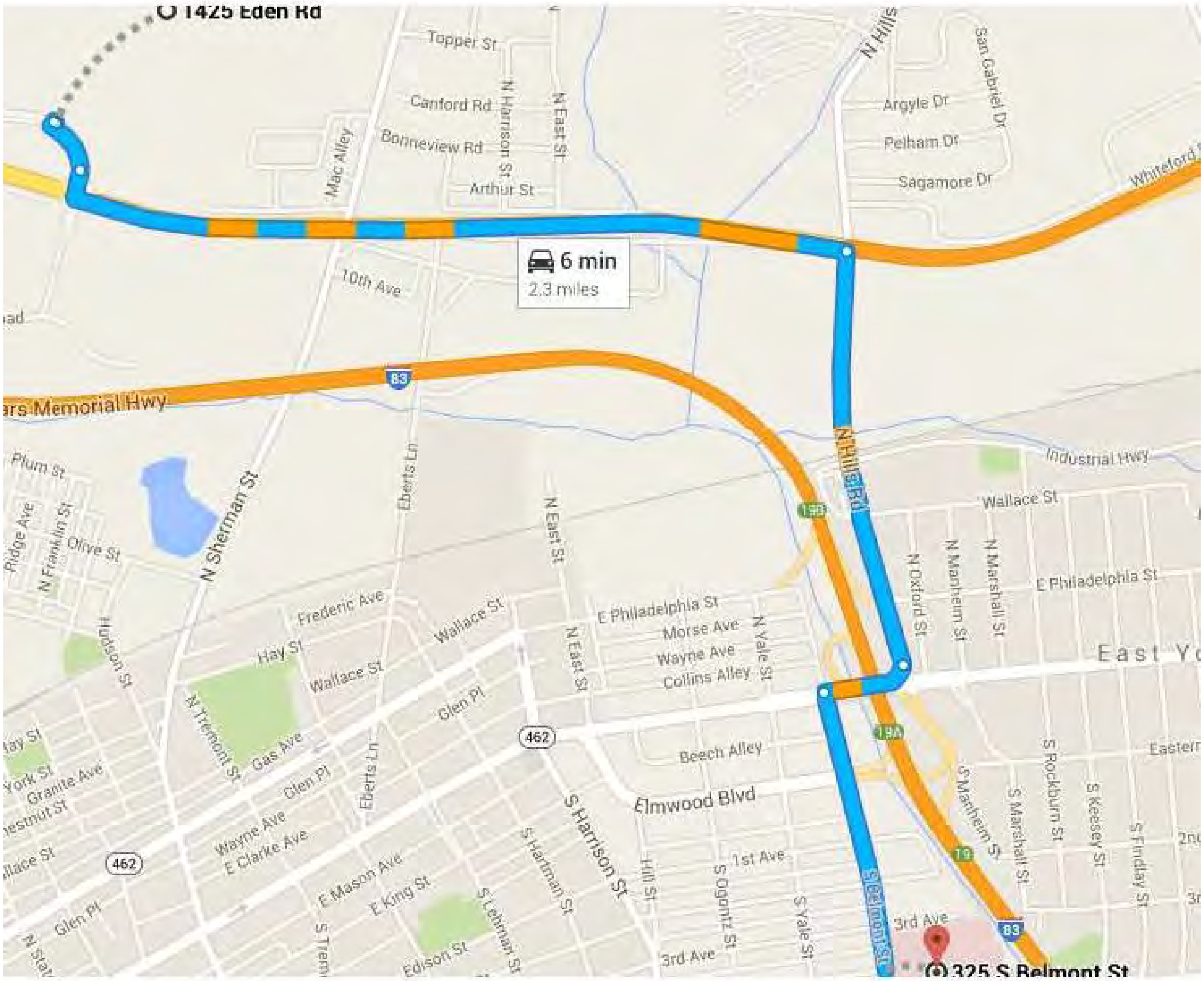
Hospital Phone: (717) 843-8623

Hospital Address: 325 South Belmont Street, York, PA 17403

Route to Hospital (See Map Below)

- Turn LEFT on U.S. 30 East – 1.1 miles
- Turn RIGHT onto North Hills Road – 0.6 miles
- Turn RIGHT onto PA-462 West/East Market Street – 0.1 miles
- Turn LEFT onto South Belmont Street – 0.4 miles

HOSPITAL ROUTE MAP



HAZARDS OF CONCERN: Check as many as are applicable. See Section 6 of SCR GHASP for Chemical, Physical, and Biological Hazards.

(X) Heat Stress ( ) Reactive ( ) Oxygen Deficient (X) Insect Bite
(X) Cold Stress (X) Noise ( ) Corrosive (X) Snake Bite
(X) Explosion/Fire (X) Inorganic ( ) Toxic ( ) Excavations
(X) Biological ( ) Organic ( ) Inert (X) Vegetation
( ) Radiological (X) Utilities ( ) Excavations ( ) Electrical
( ) Volatile (X) Lifting (X) General Physical
( ) Confined Space (see Section 9 of GHASP)
( ) Other, specify: ____

CONTROLS OR PROTECTIVE MEASURES: Check as many as are applicable.
(X) Pre-entry Briefing/Safety Meetings (X) PPE (X) Site control
( ) Operator Training
( ) Permits ____
( ) Engineering Controls ____
( ) Work Practices ____

( ) Other

EXPOSURE PATHWAYS: (X) Inhalation (X) Ingestion (X) Dermal ( ) Injection

POTENTIALLY IMPACTED MEDIA:

( ) Air (X) Dust/Soil ( ) Surface Water ( ) Sediment ( ) Groundwater ( ) Other

FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium (X) Low

SURROUNDING POPULATION: (X) Residential (X) Industrial ( ) Rural ( ) Urban

ANTICIPATED LEVEL OF CHEMICAL EXPOSURE: (List potential contaminants of concern, media, and concentration levels if known. Include previous air sampling if any):

( ) High ( ) Medium (X) Low

Antimony, barium, copper, lead, nickel, zinc, nitroglycerine, and trinitrotoluene degradation products

OVERALL HAZARD RANKING: ( ) High ( ) Medium (X) Low

JUSTIFICATION OF HAZARD RANKING: (brief narrative of how work activities may encounter hazards and their controls):

Workers may encounter hazards during MEC avoidance; however, appropriate PPE and standard operating procedures will provide protection to workers.

CHEMICAL HAZARDS (condensed from Table 6-1 of SCR GHASP, add/delete as required):

Compound	PEL or TLV/STEL	IDLH	Route of Exposure	Symptoms
Metals				
Antimony (Sb)	0.5 mg/m^3	50 mg/m^3	Inhalation and Ingestion via particulates, Skin/Eye Contact	Irritated eyes, skin, nose, throat, mouth; coughing, dizziness, headache, nausea, vomiting, diarrhea, stomach cramps, insomnia, loss of smell.
Barium (and soluble compounds as Ba)	0.5 mg/m^3	50 mg/m^3	Inhalation and Ingestion via particulates, Skin/Eye Contact	Upper respiratory irritation, muscle spasm, slow pulse, irritated eyes, skin.
Copper (Cu)	1 mg/m^3 0.1 mg/m^3 for fumes as Cu	100 mg/m^3	Inhalation via particulates, Skin/Eye Contact	Irritated eyes, upper respiratory system; metal fume fever: chills, muscular ache, nausea, fever, dry throat, cough, weakness, lassitude; metallic or sweet taste; discoloration of skin, hair.
Lead (and inorganic compounds as Pb)	0.050 mg/m^3 0.030 mg/m^3 AL	100 mg/m^3 (as Pb)	Inhalation and Ingestion via particulates, Skin/Eye Contact	Lassitude, insomnia, pallor, anoxia, weight loss, constipation, abdominal pain, colic, anemia, wrist paralysis.
Nickel (Ni)	1.5 mg/m^3 elemental 0.1 mg/m^3 soluble inorganic compounds 0.2 mg/m^3 insoluble inorganic compounds	Ca 10 mg/m^3	Inhalation and Ingestion via particulates, Skin/Eye Contact	Sensitive skin, asthma, nasal cavity irritation, pneumonitis, carcinogen.

IDLH	Immediately Dangerous to Life and Health
PEL	Permissible Exposure Limit
TLV	Threshold Limit Value
STEL	Short Term Exposure Limit (15 min)
Ca	Carcinogen
Skin	Skin absorption can contribute to overall body dose
mg/m^3	Milligrams per cubic meter
AL	Action Level (OSHA)

WORKING ALONE: (X) No ( ) Yes, explain precautions

UTILITY CLEARANCE:

One-Call Utility Services (X) Not Required ( ) Required, explain

Facility-Provided Clearance or Permit ( ) Not Required (X) Required, explain Prior to initiating intrusive work during Phase 2, EA will complete the requirements of Harley-Davidson's "Subsurface Protocol and Utility Clearance" work instruction (YS2.03.300) and form (YS2.03.300.01). Both the work instruction and form are shown in Attachment A.

Geophysical, Pipe Locator, or Other Contractor (X) Not Required ( ) Required, explain

CONTINGENCY PLANS: Summarize below (Evacuation, assembly point, contingency leader)

If unknown or threatening conditions are experienced, personnel will immediately cease work activities and evacuate the Site. The rally point for evacuation will be the automated security gate located near Gate 5. The evacuation point will be identified to the field crew prior to initiating field activities and during each working days daily safety meeting.

DEVIATIONS/VARIATIONS FROM GHASP:

None.

MEDICAL SURVEILLANCE:

Do Hazardous Waste Site Workers and Supervisor (s) have Documentation of Required Medical Exams?

(X) Yes ( ) No, Explain

TRAINING REQUIRED:

(X) HAZWOPER WORKER (X) HAZWOPER SUPERVISOR (X) FIRST/CPR

( ) CONFINED SPACE (X) OTHER, explain Prior to beginning field work, all personnel will review Harley-Davidson's "Contractor Rules and Practices" (Work Instruction HS2.03.119) and the Training Tracking Form (HS2.03.119) will be updated. Both forms are located in Attachment A. In addition, all personnel will review Harley-Davidson's Alcohol and Drug Policy (Attachment C) and complete the associated release form, as well as, Harley-Davidson's Ordnance Safety Awareness training.

PROTECTIVE EQUIPMENT: Protective equipment should be specified by the type of task and site (e.g., soil boring and sampling at landfill). Indicate type and/or material, as necessary. Use additional pages as necessary.

TASK 1: Mobilization and site preparation
INITIAL LEVEL: A - B - C - D - Modified (Circle applicable)

Respiratory: (X) Not needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not needed
(X) Safety Glasses:
( ) Face Shield:
( ) Goggles:
(X) Hard Hat: as needed

Hearing Protection: ( ) Not needed
(X) Plugs: if needed
( ) Muffs:

Boots: ( ) Not needed
(X) Safety Boots:
( ) Overboots:

Protective Clothing: (X) Not needed
( ) Encapsulating Suit:
( ) Splash Suit:
( ) Apron:
( ) Tyvek Coverall
( ) Saranex Coverall
( ) Coverall:
( ) Other:

Gloves: ( ) Not needed
( ) Undergloves:
(X) Gloves: Nitrile
( ) Overgloves:
(X) Other: Leather gloves

TASK 2: MEC Avoidance
INITIAL LEVEL: A - B - C - D - Modified (Circle applicable)

Respiratory: (X) Not needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not needed
(X) Safety Glasses:
( ) Face Shield:
( ) Goggles:
(X) Hard Hat: as needed

Hearing Protection: (X) Not needed
(X) Plugs: as needed
( ) Muffs:

Boots: ( ) Not needed
(X) Safety Boots:
( ) Overboots:

Protective Clothing: (X) Not needed
( ) Encapsulating Suit:
( ) Splash Suit:
( ) Apron:
( ) Tyvek Coverall
( ) Saranex Coverall
( ) Coverall:
( ) Other:

Gloves: ( ) Not needed
( ) Undergloves:
(X) Gloves: Nitrile
( ) Overgloves:
(X) Other: Leather

MONITORING EQUIPMENT: Monitoring equipment should be specified by task and type of site. Indicate type, as necessary. Attach additional sheets, as necessary.

TASKS: Mobilization, site prep/clearing/MEC avoidance

See GHASP for Calibration Procedures or attach if different. Attached table specifies monitoring requirements and action levels

INSTRUMENT	ACTION GUIDELINES
Combustible Gas Indicator\\O_2 (X) Not needed	0-10% LEL Continue. 10-20% LEL Potential explosion hazard, continuous monitoring. >20% LEL Explosion hazard; interrupt task/evacuate.
Oxygen (O_2) Percentage:	20.8% - O_2 normal. <20.8% - O_2 deficient, investigate cause. <19.5% O_2 Interrupt task/evacuate.

Type: __________

Photoionization Detector Specify: (COCs)
( ) 11.7 ev ( ) 10.6 ev ( ) 09.8 ev ( ) __ ev
Type: __________
(X) Not needed

Flame Ionization Detector Specify: (COCs)
Type Photovac or OVA (circle applicable or list other):
(X) Not needed

Detector Tubes Or Chemical Detector Specify: (COCs, Range, Interferences)
Type __________
(X) Not needed

Dust Monitor Specify: (COCs, Nuisance)
Type __________
(X) Not needed

Radiation Survey Meter Specify: (Radioisotopes; alpha, beta, gamma, x-ray)

> Background	Contact RSO/SSHO and PM
3 x Background	Notify CIH and stop work
2.5mR/hr	Interrupt task/evacuate

(X) Not needed Note: Annual Exposure not to exceed 100 mrem/yr or 50 urem/hr average

Other Instruments Specify:

ENVIRONMENTAL MONITORING REQUIREMENTS

Instrument	Location of Monitoring	Frequency	Action Level	Response
None	None	None	None	None
			None	None

DECONTAMINATION PROCEDURES:

Summarize personnel decontamination/containment and disposal method
( ) Not needed

Wash hands with soap and DI water before touching the sampling equipment, and bottles (including labels). Don new nitrile gloves before, during, and after sampling. Do not wipe bottles dry on clothing. No eating, drinking, or smoking. Paper towels will be disposed of as municipal refuse. PPE will be properly removed and disposed of as municipal refuse.

Summarize equipment decontamination/containment and disposal method
( ) Not needed

Sampling equipment will be dedicated and disposable, and other equipment will be washed with DI water and soap.

Summarize heavy equipment decontamination/containment and disposal method
(X) Not needed

Investigation Derived Waste (IDW) and Waste Disposal
( ) Not needed

PPE and other disposable sampling equipment will be bagged and disposed of as municipal waste.

HEALTH AND SAFETY PLAN REVIEW RECORD

SITE: ___________________________________

EA Project No.____________________________

I have read the Health and Safety Plan (s) and have been briefed on the nature, level, and degree of exposure likely as a result of participation of field activities. I agree to conform to all the requirements of this Plan.

Name	Signature	Affiliation	Date

SITE ENTRY AND EXIT LOG

Project/Site : ______________________________

Project No.: ______________________________

Date	Name	Representing	Time	
			In	Out

HEALTH AND SAFETY ACTIVITY REPORT

Site: ____ Location:_____________________

Weather Cond.: ______________________ Onsite Hours: From _______ To _______

Changes in PPE Levels* | Work Operations | Reasons for Change

____
____
____
____
____
____
____

Site Safety and Health Plan Violations | Corrective Action Specified | Corrective Action Taken (yes/no)

____
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Observations and Comments:

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Completed by:____ Date: ________________________

Site Health and Safety Supervisor

*Only SSHO may change PPE levels, using only criteria specified in GHASP.

ENVIRONMENTAL MONITORING RECORD

SITE: ____

PROJECT NO.:____

INSTRUCTION: ____

CALIBRATION: Gas: _____________ Conc: __________ Span: ___________

Time	Monitoring Location	Reading	Corrective Action Taken[a]
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Comments: ____

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(a) Corrective actions taken must be documented whenever readings at or above action levels are reached.

Recorded By: ___________________________________ Date: _______________

Site Health & Safety Supervisor

Attachment A

Harley-Davidson Work Instructions

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Process Owner: Paul Antonneau Updated by: Paul Antonneau Effective: 10/16/2014 Scope: HDMC	**Work Instruction** **Contractor Safety** ***** Uncontrolled ***** ***** DOCUMENT ***** **Please destroy this document after use** **Assoc. Policy/Directive/Cert:** HEALTH AND SAFETY POLICY **Assoc. Procedure:** HS2.03 **Assoc. Work Instr:** none	Site: H-D Corporate Dept: Safety Group: ALL Number: HS2.03.119 Version: 5 Status: Active Legacy Number:

Purpose:	These work rules and practices have been prepared to ensure that outside contractors perform their work in a safe and compliant manner to reduce the risk of injury or damage to the environment while working at domestic Harley-Davidson Motor Company (HDMC) facilities. These work rules and practices are not intended to be all inclusive or replace Local, State or Federal environmental, health and safety regulations.
Scope:	a) These work rules and practices apply to all contractors engaged in performing business activities in US Harley-Davidson Motor Company facilities. b) All sales-type business is subject to the visitor's health and safety requirements for each facility, but not the requirements set forth in this presentation. c) Due to their relationship, contingent employees, as supplied by CHAPS or other contract temporary employment agencies, will be subject to a separate health and safety training (orientation) process. d) If any Section in this document references a work instruction that does not exist for the facility where work is being performed, only the requirements outlined in this document are applicable. Contact the appropriate Harley-Davidson resource with questions or for clarification. e) Facilities will have 90 days from the date of approval to implement this work instruction. Contract organizations and employees who are already in the system have until their 1 year expiration from the date of approval to update documents associated with this version of the work instruction.
Definitions:	a) Contractor: any person, partnership or corporation that is furnishing labor, material, or equipment to HDMC. HDMC has defined the following classifications of contractors: i) Escort Required Contractors: are prohibited from entering the HDMC facilities unless accompanied by an H-D Employee. ii) Grey Badge Contractors: are given badge access to the HDMC facilities on a daily basis. iii) Sign and Go Contractors: are required to sign in with security prior to being given unescorted facility access. iv) Construction Contractor: any person, partnership or corporation which has a contract with HDMC facilities and/or

	their Contractors to furnish labor, material, or equipment as part of the work performed are required to sign in with security prior to being given facility-wide access. b) Subcontractor: a third party called upon by a contractor to perform a task or to provide a service. Subcontractor personnel hereafter are included in any reference to contractor personnel. c) Harley-Davidson Contractor Employee Training Tracking Form: The form used to document all contractors' employees, who have received the orientation, reviewed and understand the HDMC Contractor Health and Safety Rules and Practices. d) Project Champion: H-D Engineer, Supervisor, Manager or H-D Employee who is in charge of the activity or project /task work that is being performed at the H-D Facility. This person is responsible for coordinating all project or task related activity specific to an agreement. This is the H-D employee, who has sponsored or requested that work be performed at the H-D facility. e) Imminent Danger: any condition or work practices that exist which could cause death or serious physical harm.

Responsibilities

a) Contractor

i) Contractor assumes and has full responsibility and liability for the safety of its employees and for the compliance of its subcontractors. This guide contains the minimum safety rules and procedures for performance of work by contractors while at the H-D Facility. The rules and regulations covered are not all inclusive. You must look to your employer for additional safety instructions and standards that apply to you and your job.

ii) In addition to complying with H-D work practices, contractors, their employees and subcontractors are responsible for compliance with federal environmental, health and safety regulations, including, but not limited to, "*OSHA part 1910, Occupational Safety and Health Standards*," and part 1926, "*Safety and Health Regulations for Construction*," as well as all local and state regulations. In any instance where this document conflicts with federal, state or local laws, the more stringent law takes precedence.

iii) All contractors will submit to the H-D facility's Project Champion the completed Standardized Contractor Safety Pre-Qualification Form (SCSPF). After review, Harley-Davidson may request the contractor to submit a copy of their written Safety Program.

iv) All contractors' employees will receive a copy and must be able to furnish the "Harley-Davidson Motor Company Contractor Safety Rules and Practices Booklet" upon request; failure to do so may result in enforcement action.

v) All contractors will review the following material with all contractor employed personnel and subcontractor employees that will be working at the H-D facility:

(1) Contractor Orientation Presentation (video and Powerpoint) as appears on H-DSN.com.

(2) Site-specific Environmental Work Instruction as appears on H-DSN.com.

(3) Site-specific Waste Disposal Activities Work Instruction as appears on H-DSN.com.

(4) The Harley-Davidson Contractor (Supplier) Employee Training Tracking Form shall be used to document this training and forwarded to the H-D facility's Project Champion prior to performing work at the H-D facility. Failure to comply with any of the information contained in this document and/or the Contractor Orientation Presentation material will result in the removal of the offending person from the H-D facility.

(5) The training tracking form is required to be submitted to each site for each contractor employee for which access is being requested. Note: Environmental requirements, Contractor Safety Rules and Practices Booklets and emergency information will vary site-by-site.

(6) Signature on the training tracking form is required and indicates the contractor has been trained and informed of environmental requirements, including annual refresher on the ISO 14001 Environmental Management System, where applicable.

(7) Material described in (a)(v)(1), (2) and (3), above, are required to be reviewed initially and annually thereafter based on the review date in order for the contractor to be allowed access to the site. If the date of the review exceeds more than one year, upon the return of the contractor, the review will be required to regain access to the facility. This review will be tracked in the policy tracker software

system.

vi) Advise personnel of all known hazards associated with the task to be performed including any hazard information provided by the H-D facility's Project Champion.

vii) Maintain all equipment and tools in safe operating condition.

viii) Keep work area free from health and safety hazards.

ix) Inform the H-D facility's Project Champion immediately of any inspection requested by a representative of the Local, State or Federal Government. If a regulatory official intends to come on site, Security must be contacted and access granted through Security prior to the official gaining entry to the site. A H-D escort must accompany any governmental inspector.

x) All contractors will re-certify their employees on an annual basis.

b) Harley-Davidson Project Champion

i) Will be primary point of contact between the H-D facility and the Contractor for the project.

ii) Communicate this work instruction to all contractors involved with the project and ensure

iii) Periodically inspect the work area to ensure contractors and their employees comply with this work instruction and all other applicable HDMC work instructions.

iv) Schedule a pre-project review with the Health and Safety Department and Department Manager to review the project and identify potential health and safety issues.

v) Review the Standardized Contractor Safety Pre-Qualification Form (SCSPF) provided by the Contractor with the H-D Health and Safety Department Representative(s) prior to permitting the contractor to perform work on the H-D Facility.

vi) Communicate the work being performed to H-D employees in the affected areas of the project.

vii) Limit the entry of H-D personnel to contractor work areas to avoid hazards created by the contractor and advise the contractor when it is necessary for H-D personnel to be in the work area.

viii) Inform the contractor of the required response of his personnel to emergency signals.

ix) Identify, with the assistance of Maintenance/Facilities personnel, connection points for all services such as steam, water, electricity, fall protection anchor points, etc and defining any limitations as to the use of these services.

Process

1) Enforcement

a) It is the responsibility of the contractor to enforce these rules, and ensure that the work is performed in a safe manner.

b) Every H-D employee has a responsibility to ensure that the H-D facility functions safely. Therefore, any employee may notify a contractor of violation / safety concern if they observe one. In response, the contractor has an obligation to correct the noted violation. If a contractor fails to respond to an H-D employee or is found in violation on more than one occasion, the job supervisor will be notified and must address the contractor's misconduct through coaching, counseling and/or discipline.

c) Certain offenses may be severe enough to result in immediate removal of the contractor by H-D Management, and include but are not limited to:

i) Failure to use lockout/tagout procedures and/or standard operating procedures to ensure proper energy isolation is achieved.

ii) Failure to follow confined space entry procedures

iii) Failure to follow safe electrical work procedures for both energized and de-energized systems

iv) Failure to observe and respect machine guarding.

v) Failure to use fall protection where required.

vi) Failure to safely operate or follow all rules and procedures for Powered Industrial Vehicles.

vii) Engaging in or allowing reckless behavior (such as horseplay).

viii) Bringing alcoholic beverages and/or controlled substances on the H-D Facility.

ix) Suspected of being under the influence of alcohol or a controlled substance.

x) Possession of firearms or ammunition.

xi) Stealing

xii) Intentionally disrupting plant operations.

xiii) Any form of industrial espionage.

xiv) Taking pictures of plant equipment.

d) In addition, legal action may be taken if deemed appropriate.

2) General Expectations

a) Identification

i) All contractor personnel and/or subcontractor personnel must be prepared to identify themselves and their employer to H-D Security Personnel.

ii) The Security Department maintains a daily log of contractor activity.

iii) Security and/or the H-D Project Champion has the authority to grant or deny access to the H-D Facility.

iv) Badges and other identification issued by Harley-Davidson must be clearly displayed at all times while on H-D premises.

v) Contractors shall immediately notify H-D Security of any of their employees who have terminated or suspended employment, regardless of reason, with the contractor. It is the contractor's responsibility to recover the identification badge and return it to H-D Security.

b) Facility Access Restrictions

i) Contractor and/or subcontractor activity within the facility shall be restricted to the area of work and a direct path between that area and the point of entrance.

ii) No roaming is permitted.

iii) No sprinkler system shall be shut off or placed out of service unless the appropriate sprinkler impairment process has been completed and appropriate notifications have been made.

iv) The Contractor and/or subcontractor will be responsible to maintain a fire watch for the entire duration that the sprinkler system is out of service.

c) Personal Protective Equipment

i) There are areas within every Harley-Davidson facility that require the use of ANSI-certified safety glasses with side shields and ASTM-certified safety shoes.

ii) Contractors and their employees are required to wear the appropriate protective equipment in areas where Harley-Davidson has deemed protective equipment as mandatory.

3) Harley-Davidson Contacts and Emergency Information

a) Use of H-D Facility phones is restricted to business use only.

b) Key telephone numbers for H-D departments have been provided in the site-specific Contractor Safety Rules and Practices Booklet. If additional contact telephone numbers are required, the contractor is expected to work with the H-D Project Champion to obtain those numbers.

c) Emergency contact numbers and information have been provided in the site-specific Contractor Safety Rules and Practices Booklet. **Note:** To facilitate the efficient response, all emergencies must be initially reported through the site Security Department.

d) Emergency Information

i) First aid equipment, fire extinguishers, fire sprinkler system components, eyewash fountains, egress routes, etc. are not to be removed or blocked without permission of the H-D Health and Safety Department.

ii) Accidents and First Aid

(1) In the event of a non-serious injury involving contractor personnel, first aid type care is available through the Health Services department.

(2) For immediate emergency assistance, use any plant phone to contact the site Security Department who will initiate the emergency medical response team.

(3) Harley-Davidson personnel, including the Health Services Department and Project Champion, must be notified immediately of any injury to a contractor or subcontractor employee while working on H-D property.

iii) Fire Emergency

(1) In the event of a fire, individuals discovering a fire shall activate the fire alarm system by activating a pull station.

(2) If this person can do so safely, he/she should contact the Security Department to provide details about the fire emergency. Site security is responsible for contacting and coordinating outside fire emergency services.

iv) Evacuation Emergency

(1) Prior to beginning work at the facility, the contractor shall determine the meeting location and an alternate location for evacuated contractor personnel and appoint head-counting responsibility.

(2) In the event of an evacuation, there will be activation of an audible alarm accompanied by a strobe light, all contractor employees shall report to the predetermined location for headcount.

(3) The headcount person shall report any missing persons to the Security Department.

v) Hazardous Material Release Emergency

(1) In the event of a hazardous material release (which can include spills outdoors, improper disposal of chemicals and uncontrolled leaks indoors), contractor employees shall contact the Security Department from the closest phone to report the problem.

(2) If the area needs to be evacuated, activate a fire alarm pull station.

4) Access Control

a) Contractor Facility Access

i) All contractors are to be directed to Security during normal business hours.

ii) For after-hours access, the H-D Project Champion will provide instructions to the appropriate entrance.

iii) Contractors will be required to present a valid government issued photo ID.

iv) Contractors will be required to be escorted by their project champion, unless pre-authorization is granted.

v) Contractors are not permitted to escort another visitor without proper access credentials.

vi) Harley-Davidson Security reserves the right to refuse access to the facility.

vii) Harley-Davidson Security reserves the right to inspect any/all packages, bags, briefcases, purses, tool boxes, equipment, parts, etc. upon entering or exiting the property.

b) Contractor Gate Access

On the occasion when there is a need to drive inside the facility, the following rules need to be observed:

i) Driving inside the fence line is a <u>privilege, not a right</u>.

ii) Contractors should make every effort to limit the number of vehicles parked inside the fence line.

iii) Driving inside the fence line is reserved for contractors who have a true need to work out of their vehicle. All other vehicles may obtain a 30 minute pass to drop equipment at their work area and the vehicle is expected to be parked in an approved parking area.

iv) All vehicles inside the fence line must have a placard/logo on the side with the official company name.

v) Parking should not block or impede traffic, delivery areas, or cause any type of safety issue.

vi) Vehicle passes issued by Security must be fully visible on the dashboard with appropriate information filled out.

vii) All H-D Safety, Security and Environmental policies must be followed.

viii) All vehicles are subject to search by H-D Security at any time.

ix) NO personal vehicles are permitted.

x) Any special needs should be brought to the attention of your Project Champion and Security

Management.

xi) Any violations may result in driving privileges being suspended or terminated from the H-D campus.

5) Alcohol, Drugs, Firearms, etc.

a) Alcoholic beverages, non-regulated drugs, explosives, guns, knives, etc. are not permitted on the H-D premises.

6) Asbestos and Lead Paint

a) Only Certified Asbestos and Lead Paint Contractors are permitted to handle asbestos containing material or lead paint.

b) Should you encounter suspected ACM (Asbestos Containing Material) or lead paint items immediately stop work and contact the Project Champion.

c) Prior to removal of asbestos materials or lead paint items on site, an approval must be obtained from the H-D Health and Safety Department, as well as the Environmental Department. During any removal project, all applicable Federal, State, and local regulations must be followed.

d) Waste is to be disposed in accordance with environmental regulations.

e) Waste disposal must be coordinated with the Environmental Department. Do not take these wastes off-site unless written authorization is provided.

f) Installation of new materials that contain asbestos is prohibited.

7) Bulk Liquids

a) Bulk deliveries of fuels, oils, coolants, or other materials present an increased risk of spills. Immediately notify site security of any spill or emergency.

b) Equipment must be in good working order and Contractor personnel must remain with their load at all times.

c) During bulk liquid offloading and loading, wheels must be chocked and Contractor must have an emergency communication device. Please note spill kit locations prior to offloading / loading.

8) Cameras

a) Cameras are prohibited unless specific permission has been requested and granted through the Harley-Davidson Communications Manager.

b) Under no circumstances will permission be granted to photograph any Harley-Davidson manufacturing or design process, vehicle or component under construction unless it is strictly related to the performance of the contractor's project.

c) H-D Security may request additional procedures, such as tamper-proof seals, and/or review of cell phones with photograph and/or video capability.

9) Chemicals

a) All chemicals and compressed gases used by contractors to which H-D employees may be exposed must be approved through the site chemical approval process before being brought onto property. The contractor must supply the Project Champion with a Material Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) for each chemical / compressed gas required to complete the project. The Project Champion is responsible for completing the Material Acquisition Request Submittal (MARS) process for the chemical/compressed gas. For additional details, see the site-specific Hazard Communication work instruction. ***NOTE:*** Safety Data Sheets are a new requirement by OSHA under the Hazard Communication standard transition to the Globally Harmonized System (GHS).

b) In addition, if a chemical will be used in a manner other than the original process description, including but not limited to method of application (spray vs. brush) or mixture concentration (dilution %), the Project Champion is responsible for the MARS approval to be completed and approved before the modified process can be used. For additional details, see the site-specific Hazard Communication work instruction.

c) The contractor is responsible for providing their employees and subcontractors with Right-To-Know training on the chemicals that will be used on the project.

i) The Project Champion will review with the contractor the list of Harley-Davidson chemicals used in the area where the contractor will be working. During this discussion all known chemical hazards associated with the area in which they will work will be discussed. This will include area ventilation requirements or restriction, PPE usage, H-D employees working in the area, etc. In addition, any special known hazards related to their work as it involves the plant will also be discussed.

ii) MSDSs or SDSs for each Harley-Davidson chemical used in the area are available for reference.

iii) If a contractor will be using an H-D chemical that is already onsite, the H-D Project Champion will discuss the chemical and it's usage with the Contractor. The contractor will be provided with a copy of the MSDS to review and will be responsible for training its' employees on the associated hazards and controls to be used with that chemical.

iv) Contractors are required to notify the Project Champion and Area Manager, for the area where the chemical is used AND associated areas where it would be reasonable and predictable for H-D employees to be exposed to the chemical, of the hazards associated with the chemical and control methods being used. It is the responsibility of the Project Champion and associated Area Manager(s) to ensure that all employees in the affected areas are trained on the hazards and controls associated with the chemicals being used by the contractor.

v) The contractor may request copies of MSDS or SDS by contacting the H-D Project Champion or Health and Safety Department. If the H-D Project Champion or Health and Safety are not available, contact Security with the MSDS or SDS request.

vi) If, in the course of the work, the contractor finds hazardous or unlabeled materials which must be relocated in order to perform the work safely, contact the H-D Project Champion.

vii) If, at any time a contractor's employee is splashed with a chemical, immediately wash it off. Know the location of the nearest emergency showers and eyewash stations. Splashes in the eye are particularly critical. Wash eyes immediately for a period of no less than 15 minutes.

viii) Contractor personnel should be aware of the meaning and contents of the H-D labeling system. H-D uses the Hazardous Material Labeling System (HMIS) and National Fire Protection Association (NFPA) labeling systems for secondary chemical container labeling. Contact the Environmental Department with questions regarding labeling for waste chemicals and chemical by-products.

ix) Discharging or dumping of chemicals into the sanitary or storm sewer system is not allowed. To dispose of chemicals, contractors must contact the H-D Environmental Department.

x) The contractor must ensure that each chemical container being brought and/or stored on-site has a chemical label that identifies the contents and associated hazards.

xi) The quantity of chemicals the contractor stores on-site must be limited to the amount necessary, and must be contained in appropriate storage facilities / cabinets.

(1) In the event of a chemical spill, the contractor must immediately notify Security. The contractor should evacuate the spill area if a safety hazard exists.

(2) If worker exposure hazards are not present and if containment activities can be performed in a safe manner, then the contractor shall attempt to contain the spill to prevent it from entering a plant sewer system.

(3) The contractor is responsible for the implementation of spill containment and clean up measures.

(4) H-D will assist in clean-up activities if it is an imminent danger to employees or a release to the environment.

(5) The contractor will be liable for all costs incurred by H-D for clean-up of spills caused by the contractor and the treatment / disposal costs.

(6) Special care must be taken for the handling, use, and storage of flammable and combustible liquids.

(a) No paint, adhesives or solvents will be used in such a way that it will be detrimental to the health and/or life of any H-D or contractor employees.

(b) Adequate ventilation must be provided when H-D employees may be exposed to vapors of these materials. If the area of use can be isolated, those contractor employees working in the area should use the appropriate personal protective equipment.

(c) Extreme caution must be used where flammable materials are used to ensure that there are no sources of ignition such as smoking, spark producing equipment, etc. that could cause a fire or explosion.

(d) Flammable liquids must be dispensed in safety cans with flash screens. These containers must be clearly identified as to their contents. Flammable liquids shall be kept in closed/covered containers when not actually in use.

(e) Flammable paints and solvents must be stored in an approved cabinet when storage is required inside the building. The amount stored shall not exceed 25 gallons of class IA liquids in containers or 125 gallons of class IB, IC, II or III liquids in containers. Containers must be stored properly when not in use.

(f) Acids, alkalines and flammables must not be stored together.

d) Asbestos-containing materials, PCBs, explosives, ozone depleting substances (unless in approved refrigerants) and chlorinated solvents are prohibited.

e) All pesticide and herbicide applications must be done in conformance with FIFRA and applicable state and local laws.

  i) If your work requires a pesticide or herbicide, you must submit the training and applicable licenses for your personnel to your H-D Project Champion.

  ii) All pesticides and herbicides must be used in accordance with packaging instructions and labels.

  iii) Conspicuous signs warning others of the application of pesticides or herbicides must be posted.

f) Work involving refrigerants must follow the H-D refrigerant management program.

  i) All refrigerant work must include a report that documents the work performed, the amount of refrigerant used, the amount of refrigerant lost, and the leak rate calculation for the device or equipment.

  ii) All licenses for employees doing refrigerant work must be submitted to the H-D Project Champion and the Environmental Department prior to beginning work on site.

10) Compressed Gas Cylinders

a) Valve protection caps shall be in place when compressed gas cylinders are transported, moved, or stored (use carts when transporting).
b) Cylinder valves shall be closed when work is finished and when cylinders are empty or are moved.
c) Tank pressure relief and valves should not be altered in any manner.
d) Compressed gas cylinders shall be secured (roped or chained to a cart of strong structural member) in an upright position at all times except when cylinders are actually being hoisted or carried into the user's location.
e) Cylinder gases must be strapped to and transported in a cylinder cart. Incompatible gases may not be transported or stored together.
f) Cylinders shall be kept at a safe distance or shielded from welding or cutting operations, heat or heat sources. Cylinders shall not be placed where they can contact an electrical circuit.
g) Oxygen and gas regulators shall be in proper working order while in use. Use only those regulators specifically recommended for the gas. Torch assemblies must be equipped with reverse flow check valves.
h) Hoses must be stored or otherwise protected from damage, including pedestrian and vehicle traffic.
i) If a leak develops in a cylinder, stop the leak if possible and immediately notify the Security Department at the emergency phone number.
j) Matches, candles, or other open flames must never be used to trace for leaks.
k) Cylinders should be permanently marked or stenciled to identify them.

11) Confined Space Entry

a) Personnel that perform confined space entry work must have appropriate training. Documentation of training must be provided upon request.
b) Harley-Davidson has posted warning signs at the entrances of permit-required confined spaces identified at their facilities. However, it must be recognized that situations and tasks may create a hazardous atmosphere that will require a permit in non-posted confined spaces.
c) The H-D Project Champion must authorize confined space entry work.

d) Any entries involving both contractor and Harley-Davidson personnel will be jointly monitored and managed.
e) The facility Confined Space Entry Work instruction applies to all contractor personnel.

12) Construction Areas

a) Construction areas must be clearly identified through the use of barricades, ropes, stanchions fences, cones, and appropriate signs. This includes any area used by contractor performing work on premises regardless of the length of time required to do work or type of work to be done.
b) The contractor shall provide any safety markers, barricades, ropes, stanchions, fences, cones, or appropriate signs necessary that are required to keep people out of the construction area.
c) Excavations must be guarded by barriers and by lights (at night). Openings in the ground or in floors (open manholes, pits, sewers, etc.) must be guarded. Excavations must be properly shored to prevent cave-ins.
d) Hard hats must be worn in areas and on projects where there is a danger to the head from falling objects.

13) Cranes and Hoists

a) Contractors must meet the requirements as defined by 29 CFR 1926.550 to operate cranes and derricks at Harley-Davidson facilities.
b) All hoist and crane operators must be qualified to operate the equipment.
c) Mobile cranes, including portable crane derricks, power shovels, or similar equipment, should not be operated within 50 feet of overhead electrical power lines unless specific approval has been obtained by the contractor from H-D Project Champion.
d) Accessible areas within the rear-swing radius of the revolving superstructure shall be barricaded to keep unauthorized persons away.
e) Hoisting of equipment or material over the roof of H-D buildings is not allowed unless there is no alternative method. In such a case, the H-D Project Champion must be notified and will consult with the H-D Health and Safety Department to take appropriate action regarding persons occupying the building.
f) When there is no alternative to operating over existing H-D buildings, the following procedures must be followed:
   i) The load must be kept to a minimum height over the building's roof.
   ii) Additional personnel or tag lines must be used to guide the material over the roof area.
   iii) An observer trained in the use of hand signals must be used when the load is out of sight of the operator.
   iv) The facility space under the lifting area needs to be appropriately secured with occupants relocated outside of the space.
g) Contractor personnel are not permitted to use hoists and lifting apparatus belonging to H-D unless approval is obtained from the H-D Project Champion and appropriate training documentation provided.

14) Electrical Safety / NFPA 70E Requirements

a) NFPA 70E Requirements
   i) All contractors and suppliers working on energized electrical circuits operating at 50 volts or more at the H-D Facility will be required to follow the requirements outlined in the NFPA 70E standard.
   ii) An Arc Flash study has been conducted at the facility and Arc Flash Hazard labels have been placed on the equipment to identify the type and severity of the hazard.
   iii) Contractors and suppliers working with energized electrical circuits operating at 50 volts or more will be required to have the appropriate training as outlined in the NFPA 70E standard to classify them as a "Qualified Person". The Contractor must provide training documentation to the H-D Project Champion prior to performing this type of work at the H-D Facility.
   iv) Contractors and Suppliers are required to provide their own Personal Protective Equipment (PPE) and any other equipment required to comply with the NFPA 70E standard. Failure to follow this standard will result in removal from the site. **Note:** H-D requires 8 cal/cm2 protective clothing to be worn for Hazard Classifications 2 or less. For additional details, see the site Safe Electrical Work work instruction.
   v) When working on electrical systems, the following procedures must be followed:
      (1) A safe electrical work condition must be created including de-energizing all electrical circuits 50 volts or greater inside the electrical box. Performing trouble-shooting activities are exempt from this requirement.
      (2) Whenever possible, the circuit shall be LOCKED OUT AND TAGGED.
      (3) If lockout is not possible, tagout MUST be used.
   vi) If it is not practical or possible to de-energize and lock out the circuit, the area must be barricaded

and identified to keep unauthorized persons clear of any energized electrical hazard. All energized circuits shall be properly insulated or covered to prevent accidental contact.
    - vii) A Live Electrical Work Permit must be completed for any energized electrical work. Trouble-shooting activities are exempt from this requirement.
    - viii) Precautions shall be taken to make any necessary wiring inaccessible to unauthorized persons.
    - ix) When pulling wires, the breaker box must be de-energized.
- b) The non-current carrying metal parts of fixed, portable, or plug-connected equipment should be grounded. Portable tools and equipment protected by an approved system of double insulation need not be grounded.
- c) No electrical appliances such as crock pots, radios, TV's, etc. will be allowed.
- d) Extension Cords
    - i) Extension cords shall be the three-wire type.
    - ii) Romex, and similar types of makeshift power extension cords shall not be used. In addition, worn or frayed cords shall not be used. Cords shall be properly rated for the job.
    - iii) Extension cords should not be run across aisle ways and corridors where they may create a tripping hazard. They should be hung overhead to reduce the possibility of traffic cutting or fraying the cord.
    - iv) Extension cords and temporary lighting cords shall not be fastened with staples, hung from nails or suspended from wires.
    - v) Exposed bulbs on temporary lights shall be guarded to prevent accidental contact except where bulbs are deeply recessed in the reflector. Temporary lights shall not be suspended by their electrical cords unless designated for this use.
    - vi) Receptacles for attachment plugs shall be of the approved, concealed contact type. Where different voltages, frequencies, or types are supplied receptacles shall be of such design that attachment plugs are not inter-changeable.
- e) Performance of electrical work shall be done in accordance with existing Occupational Safety and Health Standards, as well as the current National Electric Code and NFPA Electrical Standard for industrial Machinery, if applicable.
- f) If there are any questions regarding the H-D Safe Electrical Work requirements, contact the H-D Project Champion or reference the site Safe Electrical Work work instruction.

15) Floor Openings

- a) Floor openings 4 feet or greater to the next level shall be guarded by a standard guardrail, including a top rail, mid rail, and 4-inch toe board.
- b) If the standard guardrail is not feasible or needs to be by-passed (removal, climb over, elevated above, etc.), an alternate means of fall protection, such as a personal fall arrest system, will be required.

16) Hazardous Materials Transportation

- a) All applicable federal, state and local requirements for bills of lading, hazardous materials and wastes, manifests and materials of trade must be followed.
- b) Excess chemicals brought on site by Contractor must be removed in a compliant manner, including all applicable DOT requirements.

17) High Hazard Areas

- a) Although this list may not be inclusive, there are certain areas and operations where, because of the nature of the hazards, extra precautions must be taken. Before entering any of the following areas, the contractor is required to check with the H-D Project Champion to review any additional Health and Safety rules which apply.
    - i) Confined spaces
    - ii) High noise level area
    - iii) Chemical or waste storage and dispensing areas
    - iv) Roofs
    - v) Heat treat
    - vi) Overhead wire cages
    - vii) Tunnels

18) Hot Work (Cutting, Welding and Open Flames)

- a) Hot Work (HW) permits are required to perform work tasks considered "hot work," including but not limited to cutting, welding, brazing, grinding and/or other work involving open flames or the production of ignition sources.

b) Hot Work permits can be arranged through your H-D Project Champion. H-D site Security and Health & Safety must be notified of any hot work prior to initiating the work.
c) Contractor foreman/supervisor will complete a HW permit and is responsible for ensuring all appropriate protections are in place to prevent the ignition of a fire, including posting a trained Fire Watch for the requisite period of time, clearing the area, using tarpaulins and providing at least 2 fire extinguishers (in addition to facility fire extinguishers).
   i) Where practical, combustible material shall be relocated at least 35 feet from the worksite.
   ii) Welding or cutting is not permitted in or near areas containing flammable liquids, vapors or dust.
   iii) Welding or cutting is not permitted on containers which have contained flammable liquids until the containers have been thoroughly rinsed or otherwise purged of the presence of all flammable vapors. Air tests must be performed to verify the elimination of flammable vapors.
   iv) Non-combustible or flame proof shield or screens must be provided to protect employees from sparks and direct rays of arc.
   v) When tarpaulins are required for the deflection of hot slag, dust, paint droppings, etc., they must be flame resistant and in good condition.
d) Contractor foreman/supervisor will provide site Security with Part 1 of completed HW permit prior to initiating the work.
e) Contractor foreman/supervisor will post Part 2 of HW permit at the worksite.
f) Fire Watch will be maintained for a period of 1 hour after the hot work is completed.
g) The contractor foreman/supervisor will perform the final inspection 1 hour after completion of the hot work and return Part 2 of the HW permit to Security prior to leaving the site.
h) Security will monitor the hot work area for a period of 3 hours after the final inspection.
i) The top and bottom copies will be matched and stored together after all of the inspections have been completed.
j) No cutting or welding is permitted in sprinkler equipped buildings while sprinklers are out of service.
k) Personnel that perform cutting, welding, brazing must have appropriate training.
l) The H-D facility "Hot Work" work instruction applies to all contractor personnel.

19) Housekeeping

a) Material should be carefully stacked and located so that it does not block aisles, doors, self-contained breathing apparatus, fire extinguisher, fire blankets, emergency eyewash fountains, emergency safety showers, fixed ladders, or stairways.
b) Form and scrap lumber and all other debris shall be removed after the project is complete. The waste shall be placed in designated containers either staged on site by H-D or ones acquired specifically for the project.
c) Daily cleaning procedures shall include broom sweeping of all affected areas.
d) At the completion of a project, the area will be thoroughly cleaned by such means as vacuuming, hosing down, etc.
e) Combustible scrap, waste materials, and debris shall be removed daily.
f) Containers shall be provided for collection and separation by type of waste either staged on site by H-D or ones acquired specifically for the project. Covers shall be provided on containers used for flammable, combustible, or harmful substances.
g) Overhead storage of debris, tools, equipment, etc. is prohibited. No loose material shall be left in the area above suspended ceiling panels.
h) Contractors shall not store any equipment, materials, work carts, tools, trash, or debris in front of exit stairways, doors, electrical panels, or emergency equipment.
i) It is the contractor's responsibility to dispose of spent or excess materials used at the site. Chemicals and other materials must be disposed of in compliance with applicable federal, state and local regulations. Contact the site Environmental representative for any additional questions.
j) Smoking is permitted in designated smoking areas ONLY. Do not throw cigarettes, cigars, or matches in trash containers or on the ground. Designated smoking material disposal containers are staged in the designated smoking areas.

20) Industrial Hygiene

a) Contractors shall not perform operations that create excessive noise in areas where H-D employees will be affected unless the H-D Project Champion has approval from the H-D Health & Safety Department. The plant wide Hearing Conservation Program applies to all contractor personnel.
b) Contractors shall not perform operations that create excessive gasoline or diesel engine exhaust in areas where

H-D employees will be affected unless the H-D Project Champion has approval from the H-D Environmental and Health & Safety Departments.

c) Contractors shall not perform operations that create excessive dust, odors, fumes, and vapors in areas where H-D employees will be affected unless the H-D Project Champion has approval from the H-D Environmental and Health & Safety Departments.

21) Ladders

a) When working on ladders, do not work from top rung or step.
b) Portable ladders must be inspected prior to use each day.
c) The use of ladders with broken or missing rungs or steps, broken or split handrails or with other faulty/defective construction is prohibited.
d) Portable metal ladders shall not be used for electrical work or where they may contact electrical conductors.
e) Portable ladders must be equipped with safety feet.
f) Ladders must not be constructed on the job and "homemade" ladders must not be used.
g) Ladders must be of appropriate length to safely perform the job. Makeshift extensions are not permitted.
h) Additional requirements for ladder use are described in the H-D facility work instruction for walking and working surfaces which applies to all contractor personnel.

22) Lockout / Tagout

a) Contractor personnel that perform lockout/tagout to control hazardous energy must have appropriate training. Documentation of training must be provided upon request.
b) Contractors shall supply locks and tags for their employees. The tag must identify both contractor company name and the contractor employee name.
c) Group lockout will need to be performed when working with Harley-Davidson personnel.
d) Locks must only be removed by the person who applied the lock. Contractors will be responsible for any lost production or financial loss incurred by Harley-Davidson as a result of an unattended lock.
e) The H-D facility Lock-out/Tag-out work instruction applies to all contractor personnel.

23) Overhead Work

a) Personnel that perform overhead work must have appropriate training. Documentation of training must be provided upon request.
b) The H-D facility Fall Protection (Walking and Working Surfaces) work instruction applies to all contractor personnel.
c) Work areas must be appropriately marked and barricaded where overhead work will be performed. No overhead work may be performed when there is the possibility of an unprotected contractor or Harley-Davidson employee at risk of being struck by a falling object.

24) Parking and Plant Entry

a) Vehicular traffic within the H-D facility and on the property poses numerous risks to our employees. While there are posted stop signs as well as painted lines, they alone cannot ensure safety. Emphasis must be placed on eliminating on site vehicular traffic to further ensure the safety of the pedestrians within the facility.
b) To this end, contractors are requested to eliminate all unnecessary on site vehicular traffic. The only exceptions to this rule would be if you are transporting something into the facility that cannot be carried into the facility and if the vehicle that is needed on site is to perform a specific function such as a dump truck, bucket truck etc. Other than for extraordinary circumstances as described above, all entry to this facility is to be on foot.
c) Unless otherwise posted, the speed limit on Harley-Davidson property is 15 m.p.h.
d) Contractor employees shall use the parking facilities designated by Harley-Davidson, only.
e) No material may be stored outside unless approved by the Project Champion and the Environmental Department.
f) Entry to Company property, including parking areas, is deemed consent to inspection of person, vehicle and personal effects at any time, including while entering or leaving the property.
g) Upon entry to the H-D facility, contractors and employees may be asked to provide additional information, documentation or identification dependent to their level of security access.

25) Permit Systems

a) Special permit systems are in place to ensure the appropriate communication, work expectations and approvals are obtained prior to and while performing the work. The following require special permits prior to initiating work on-site:
   i) Hot Work

ii) Confined Space Entry
iii) Energized electrical work beyond trouble-shooting
iv) Fire Protection System Impairments

b) Contractors must follow the expectations and training requirements of the permit system. If there are questions, contact the Project Champion or the site Health and Safety Department.

26) Personal Protective Equipment

a) In certain H-D operations and areas, personal protection equipment such as safety glasses, protective footwear, goggles, hearing protection, respirators, hard hats and other protective equipment are required. The type of protective equipment to be worn will be determined by exposure to the potential hazard and/or area. When in doubt of safety measures to be followed, consult the Project Champion.
b) Contractors shall ensure that their employees are equipped with approved personal protective equipment and shall enforce its use. H-D will not supply such equipment to contractors.
c) The H-D facility Eye and Face Protection work instruction applies to all contractor personnel.
d) The H-D facility Foot Protection work instruction applies to all contractor personnel.
e) The H-D facility Hand Protection work instruction applies to all contractor personnel.
f) The H-D facility Hearing Conservation Program applies to all contractor personnel. The use of personal headset radios is prohibited.

27) Powered Industrial Vehicles

a) Contractor personnel that operate powered industrial vehicles must have appropriate training. Documentation of training must be provided upon request.
b) Gasoline powered or other internal combustion engines must not be operated inside Harley-Davidson facilities without the prior approval from the Harley-Davidson Project Champion. Precautions must be taken to appropriately ventilate the facility of any exhaust and odor.
c) The Project Champion must authorize the use of powered vehicles in the plant.
d) The H-D facility Powered Industrial Vehicle work instruction applies to all contractor personnel.

28) Roof Work

a) Fall protection shall be provided while performing work on unprotected roof edges with a ground-to-eves height greater than 15 feet. Individuals are not allowed to access the roof alone. At least 2 people are required at all times.
b) Warning lines are to be used when roof work is more than 10 feet from the roof's edge. Workers, equipment, or material will not be allowed beyond the perimeters of the warning line.
c) Guardrails, positioning systems, or fall arrest systems shall be used when roof work is within 10 feet of the roof edge.
d) Designated hoisting areas are required and are the only places allowed for hoisting materials to and from the roof. These areas shall be protected with guardrails to prevent an accidental fall.
e) Extension ladders used to gain access to the roof must be secured to the edge of the building and must extend at least three (3) feet above the roofline.
f) Additional requirements for roof work are described in the H-D facility Fall Protection Work instruction which applies to all contractor personnel.

29) Scaffolds

a) The erection, alteration, and removal of scaffolds, must be under the direction of a competent person.
b) Upright scaffolds should be plumb, secure, and have firm footing.
c) Narrow-base portable maintenance staging must be equipped with outriggers. Stationary metal upright scaffolds should be secured to the building or other adequate structures.
d) Platforms and planks shall be secured or cleated to the scaffold to prevent platform slippage.
e) Platforms should be at least two planks wide and extend over the supporting surfaces or edges not less than 6 inches or more than 12 inches. A plank is defined to be at least 12 inches wide.
f) A safe means shall be available for access to the work platform.
g) Scaffolds more than 6 feet above the ground must have guardrails and toe boards on all open sides and ends.

30) Special Conditions

a) Some unique environments exist, such as those commonly controlled by automatic monitoring, alarm or fire control systems. The H-D Project Champion will make the contractor aware of any of the systems before performing

any work.
b) Connections to fire sprinkler systems, chilled water, steam and condensing systems, compressed air systems, etc. must be scheduled through the H-D Project Champion and the Maintenance/Facilities Department prior to the work being started.

31) Tobacco Use

a) Starting January 1, 2015, the use of Tobacco Products is prohibited on Harley-Davidson, Inc. company property. The policy does not prohibit visitors from using Tobacco Products in designated areas at the Harley-Davidson Museum, but does prohibit Harley-Davidson employees, contractors, contingents, consultants and others who are working on behalf of the Company from using Tobacco Products while working at the Museum.
b) ***Tobacco Products*** include pipes, cigarettes, e-cigarettes, cigars, snuff, chewing tobacco, and all other tobacco-related products. Tobacco Products does not include FDA-approved tobacco cessation methods such as lozenges, chewing gum, skin patches and other approved methods according to the FDA.
c) ***Company Property*** includes: 1) all buildings, grounds, parking lots, and ramps owned, leased, rented and/or maintained by Harley-Davidson in the U.S.; 2) grounds, streets or sidewalks within 50 feet of any Company building entrances/windows/ventilation systems; and 3) all vehicles owned or leased by Harley-Davidson in the U.S. ***Note:*** *Use of tobacco in personal vehicles that are parked and/or operating on Harley-Davidson property will be considered to be in violation of the tobacco use policy.*

32) Tools

a) Hand and power tools should be kept in safe operating condition.
b) Safety guards must be kept in position on power tools and any machines with moving parts. All tools must be guarded in accordance with OSHA 1910 and 1926.
c) All power tools and equipment must be grounded or UL approved as double insulated (see section on Electrical Safety).
d) Tools operated by explosives are not permitted in Harley-Davidson facilities without prior approval.
e) Non-sparking tools may be necessary in certain areas where flammable solvents or materials are handled or where sparks could create an explosion.
f) Generally, the use of H-D tools and equipment by contractors is prohibited. However, if unique circumstances arise, approval may be obtained from the H-D Project Champion.

33) Utility Clearance

a) Before a contractor performs any excavation work, the existence and location of underground utilities must be determined. Your H-D Project Champion can assist in obtaining this information.
b) When contractors are working on utilities, the work must be coordinated through the H-D Facilities Department.
c) The H-D facility Utility Clearance work instruction applies to all contractors.

34) Training

a) It is the responsibility of the contractor to ensure that their employees are trained in the application of this work instruction in order to complete their work at the H-D facility.
b) Documentation of all training requirements (see contractor responsibilities below) must be submitted for each employee prior to the employee being allowed to work at the H-D facility.
c) All training records identified in any Section above must be available and provided by the contractor to verify the completion of regulatory or other required training for each employee in the H-D facility upon request.

35) Waste Minimization

a) Bring only enough materials to complete the job.
b) Contractor is responsible for all housekeeping and proper disposal of materials and wastes while working at H-D. Please consult the Waste Disposal Activities Work Instruction and/or the Environmental Department regarding proper disposal of typical waste streams.
c) All hazardous wastes you generate must be properly packaged, labeled, manifested, transported and disposed. Wastes which remain the responsibility of H-D must be handled by H-D authorized personnel or contractors.
d) Numerous containers for recyclables are available throughout H-D facilities. While on site, contractors are

expected to observe the signs, labels and posted instructions for recyclables.

36) Workplace Violence

a) Harley-Davidson has an established Workplace Violence Policy with the purpose of establishing and communicating our zero-tolerance towards threats, threatening behavior, or acts of violence conducted by anyone against employees, visitors, guests, or other individuals on Harley-Davidson property including its facilities and parking areas.

b) If you witness or receive any threats, or if you have been told about a threat a coworker has witnessed or received, notify your Work Group Advisor, Supervisor, Human Resources Representative or Site Security Supervisor immediately. The Site Security Supervisor will contact Corporate Security.

c) If you witness any behavior that may be regarded as violent, contact Site Security immediately or call 911 for outside assistance.

d) Prohibited conduct on Harley-Davidson property includes, but is not limited to, the following examples:

   i) Physical possession of firearms (including air-pistols and air-rifles), switchblades, spring-loaded knives or other knives not required for one's job, explosive materials, toxic agents, and any other object carried for the purpose of injuring or intimidating others. Please be aware that public law enforcement officers, licensed armored courier services or other officials in the performance of their official duties may be in possession of some of these items while on Harley-Davidson property.

   ii) Abusive or threatening language or behavior, including verbal threats, harassing phone calls and stalking.

   iii) Unwanted physical contact such as hitting, fighting, pushing, shoving, or throwing of objects.

   iv) Damaging property as a result of violent acts.

   v) Possession of a weapon in violation of federal, state or local law.

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Attachment Table

Attachment Title [**AttachmentName** **ParentDocumentNumber** **AttachmentVersionLevel**]
Contractor Training Form, HS2.03.119 v3
HDMC_Std Contractor Safety PreQual, HS2.03.119 v2
Contractor Management Guidelines, HS2.03.119 v3

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Quality Records

Record Description	**Record Series ID Number** **[3 alpha & 4 numeric values]**
Standardized Contractor Pre-Qualification Form	FAC0201
Contractor Employee Training Tracking Form	FAC0201

Attachments:

HDMC_Std Contrator Safety PreQual Form HS2.03.119 v2.pdf	450.3K	11/1/2013 09:37 AM
Contractor Training Form HS2.03.119 v3.doc	50.0K	4/25/2014 01:20 PM
Contractor Management Guidelines HS2.03.119 v3.pdf	160.9K	4/25/2014 01:20 PM

If there are associated records with this document you can retrieve retention information by following this path: RIDE/Resource Centers/Legal/Records and Information Management (RIM)/Record Retention Schedules Home/[choose the appropriate schedule].

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Dale Sukow
Jeff (KC) Thomas
Darrell Jeffries

Signed by

Harley-Davidson Contractor (Supplier) Employee Training Tracking Form

Place an "X" in each column under "Required Training" after each employee completes the training identified below.

Contractor Company Name:			**Required training***			
Employee Name	**Signature**	**Date of Training (MM/DD/YR)**	**A**	**B**	**C**	**D**

Required training expectations** ***(Mark with an "X" when completed; Use NA where not applicable):
A – Contractor Safety Video
B – Contractor Safety Presentation
C – Contractor Safety Rules and Practices Work Instruction
D – Site-Specific Waste Disposal & Environmental Review Work Instructions

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Updated by: Rodney Myers Effective: 09/11/2008 Scope: HDMC	**Work Instruction** **Subsurface Protocol and Utility Clearance** ***** Uncontrolled ***** ***** DOCUMENT ***** **Please destroy this document after use** **Assoc. Policy:** HS1.1 **Assoc. Procedure:** HS2.03 **Assoc. Work Instr:** YS2.03.637	Site: York Dept: ALL Group: ALL Number: YS2.03.300 Version: 4 Status: Active Legacy Number: Y09M

Purpose: To minimize liability and associated risks in conducting subsurface excavations at Harley-Davidson York.

Scope: This work instruction identifies the responsibilities and requirements for performing a utility clearance, and identifying environmental hazards with soil or groundwater prior to conducting subsurface excavations.

Instruction: Applies to all employees and contractors who are involved with excavation activities

Definitions:

Plant Engineering: Consists of plant engineers and environmental engineers who are both required to assess the excavation area to determine the potential impact from utility and environmental hazards aspects prior to subsurface excavations.

H-D Champion: H-D employee responsible for project that requires subsurface excavation which may encounter utilities or soils or groundwater.

Contractor: Supplier(s) authorized by H-D and may be H-D personnel authorized by the H-D Champion for a project that requires subsurface excavations that may encounter utilities soils or groundwater.

Subsurface Excavation: Any man-made cut, cavity, trench or depression made into the earth's surface (or beneath asphalt/concrete) that is formed by earth removal.

Low-impact excavation: Low-impact excavation includes any excavation method that is sufficiently gentle to minimize the potential for damaging buried utilities. Examples include manual excavation with shovel, hand auger, or vacuum drilling ("air knife" or water-based system).

Work Instruction:

The following Subsurface Protocol and Utility Clearance Work Instruction (hereinafter the "WI") identifies the responsibilities of the Contractor and Harley-Davidson Motor Company (H-D) for obtaining environmental and utility clearances prior to conducting any subsurface activities at the York Facility. This WI will help to ensure proper protection and safety for workers (H-D employees and contractor's employees) and compliance with H-D requirements and applicable environmental regulations. Nothing contained herein, and no action by Harley-Davidson pursuant to this WI, is intended or shall be deemed to diminish or eliminate any and all responsibilities, obligations and liabilities of the Contractor under all applicable laws, regulations, rules, standards, guidelines, procedures, agreements and contracts. To the extent there is an actual or perceived conflict between the terms of this WI and other contract terms between Harley-Davidson and the Contractor, the terms of this WI shall govern. The terms of this WI are incorporated into any contract between Harley-Davidson and the Contractor and shall be controlling unless specific terms of such contract impose more specific and stringent requirements with respect to utilities and environmental conditions.

1. EVALUATION OF ENVIRONMENTAL CONDITIONS

There are five (5) zones of environmental excavation constraint across the property. Plant Engineering must be contacted to determine which zone(s) are applicable for your work area. These zones include:

Zone A - Clean, unrestricted environmental excavation areas. Subsurface work may be conducted without

any special environmental inspection, training or investigation;
Zone B - Environmental caution areas. In these areas, the potential exists to encounter areas of soil contamination, even though none are confirmed to exist. In this zone, excavations may proceed, but work MUST cease if any suspect soil or potential environmental hazard is encountered and Plant Engineering MUST be contacted;
Zone C - Restricted environmental constraint areas. Precautions must be followed prior to conducting any excavation or subsurface work in these areas. Special training and/or designs may be needed, or environmental investigation or sampling may be required to clear the area for normal construction. Environmental inspection will generally be required for all subsurface work in these areas; and
Zone D - Prohibited excavation for normal construction work. In this zone, potentially hazardous chemicals are known to exist, and excavation should be avoided. When excavation is necessary, special training and planning must be implemented and approved by Plant Engineering prior to proceeding. Environmental inspection is required for all subsurface work in these areas.
Zone E - Prohibited excavation for normal construction work. In this zone, there is a possibility of former military munitions debris, and excavation should be avoided. When excavation is necessary, an ordnance specialist may be needed to clear the area, and work must be approved by Environmental within Plant Engineering prior to proceeding.

H-D Champion and Contractor Responsibility:

1. Site mark-out (see Section 3) and documentation (see Section 4) including identification of the work area on a H-D site map must be conducted by the H-D champion or contractor.
2. Plant Engineering must be contacted to determine which environmental zone(s) are applicable for your work area, and to clarify what (if any) special training or requirements apply for the work area.
3. Due to the potential for worker exposure to hazardous chemicals, workers and contractor/subcontractor companies conducting subsurface work within prohibited or restricted environmental constraint areas (Zones C and D) may be required to meet the criteria of Occupational Safety and Health Administration (OSHA) standards 29 Code of Federal Regulations (CFR) 1910.120, governing hazardous waste operations. In accordance with this regulation, onsite workers shall have and provide proof of 40-hour OSHA training for Hazardous Waste Operations, and shall provide any required Health and Safety monitoring, supervision, and personal protective equipment (PPE). In addition, prior to starting field work, the contractor shall prepare and submit a site-specific Contractor Health and Safety Plan (CHASP), and shall have their own site health and safety representative. [See Plant Engineering's environmental engineer for the latest requirements.]
4. Contractors conducting subsurface work within prohibited or restricted areas must provide proof of insurance in accordance with Harley-Davidson requirements for Environmental Work. [See Plant Engineering's environmental engineer for the latest requirements.] Contractor must meet H-D's minimum Contractor Insurance Requirements at all times, regardless of zone.
5. During excavation activities, the Contractor is responsible to report to Plant Engineering all suspected areas of contamination, unusual odor in the subsurface, liquid, discoloration, buried materials, areas where groundwater is encountered, or where water seeps from an excavation.
6. When assigned, the Contractor is responsible to follow the directions of the Environmental Inspector (EI). The EI will have the authority to stop all work in any area suspected of being contaminated and to exclude access to the suspected area until sampling and analysis is completed or until appropriate procedures are activated.

Harley-Davidson Responsibility:

1. It is Harley-Davidson Motor Company's responsibility to make available to the Contractor data or environmental summaries of testing results within 50 feet of work areas identified within Zones C or D, if so requested by the Contractor.
2. Harley-Davidson Motor Company, will also, to the extent possible, make an employee, who is familiar with the area or areas that are to be subject to subsurface activities and with the relevant drawings of such areas, available to the Contractor for questioning, if so requested by the Contractor.
3. Harley-Davidson Motor Company will provide, when necessary, an Environmental Inspector (EI) or Ordnance Specialist to clear, observe or inspect subsurface work, when required. The primary

responsibility of the EI is to identify potentially contaminated areas, to limit access to suspected contaminated areas, to notify the Contractor of the results of laboratory testing and to direct the handling and disposition of excavated materials suspected of being contaminated.

General Subsurface Environmental Cautions:

1. Soil disposal restrictions apply site-wide. On- or off-site use or disposal of soil within prohibited or restricted environmental constraint areas (Zones C & D) will require testing of materials for proper disposition. No on- or off-site soil disposal is allowed unless it has been authorized, in writing, by Plant Engineering.
2. Groundwater contact restrictions apply site-wide. Groundwater is known to contain chemicals on the EPA's Priority Pollutant List. The depth to groundwater may be within 10 to 20 feet of the ground surface across the site. Surface springs on the property may also contain hazardous chemicals. Direct contact with groundwater and springs should be avoided, regardless of their location on the property. Pumping, discharging or other handling of groundwater, spring water or excavation water is prohibited unless it has been authorized in writing by Plant Engineering.
3. Stormwater management facilities should be designed to protect against infiltration to/from groundwater and springs, and may require certain watertight specifications. Stormwater utility construction and general subsurface work shall not impede the performance of the existing groundwater capture system.
4. There is a significant potential for sinkhole development within the western half of the property. Sinkhole investigations or repairs must be conducted in accordance with procedures approved by Plant Engineering. All excavation activity shall properly incorporate necessary engineering controls, and shall address and minimize stormwater run-off and infiltration potential, to minimize further potential for sinkhole development.

2. UTILITY INVESTIGATION

H-D Champion and Contractor Responsibility:

The H-D Champion and Contractor is responsible for requesting from Harley-Davidson the most recently dated utility drawings for the area or areas that are to be subject to subsurface activities. These utility drawings are to include electric, water, sanitary sewer, storm sewer, gas, steam, fuel, sprinkler, production process lines and any other utility which may be situated in the area or areas where the work is to be performed. The H-D Champion and Contractor shall be responsible for reviewing these drawings to determine whether the proposed subsurface work has the potential to damage or affect the operations of the subsurface utilities. There is always the potential for the existence of unmapped utilities and/or location errors in the utility drawings that are presented for review. Whether or not there are location errors in the utility drawings, the H-D Champion and Contractor is responsible to undertake all steps reasonably necessary to locate utilities, including unmapped utilities.

Harley-Davidson Responsibility:

It is Harley-Davidson Motor Company's responsibility to make available to the Contractor drawings of all utilities if such drawings exist and can be obtained through a reasonable search, including but not limited to those identified above, prior to the approval of any subsurface activity. Harley-Davidson Motor Company, will also, to the extent possible, make an employee, who is familiar with the area or areas that are to be subject to subsurface activities and with the relevant drawings of such areas, available to the Contractor for questioning, if so requested by the Contractor.

3. SITE MARKOUT

H-D Champion and Contractor Responsibility:

The H-D Champion or Contractor is required to mark on the ground surface the horizontal limits of the subsurface activities prior to proceeding with the work. The proximity of the marked area to all probable surface expressions of subsurface utilities (e.g. manhole covers, vent pipes, etc.) is to be observed and measured. The anticipated depth of excavation shall also be noted on the Subsurface Work Authorization form. In order to assist in verifying utility locations, these surface expressions are to be compared to the utility drawings supplied by Harley-Davidson Motor Company. After marking the ground surface and prior to penetration of the ground surface, the H-D Champion or Contractor must notify Harley-Davidson Motor Company of such location and give Plant Engineering the opportunity to inspect such location(s). In no event shall any subsurface work be performed prior to inspection by Harley-Davidson Plant Engineering.

All discrepancies between the drawings and the surface expressions are to be identified by the Contractor to Harley-Davidson Motor Company prior to the implementation of the work. In addition, Harley-Davidson Motor Company is to be informed by the Contractor of any subsurface utility that is believed to be situated within 10 feet of the proposed work area. In all such cases described in this paragraph, one or more of the following must be followed by the Contractor.

a) Following approval by Harley-Davidson Motor Company, the surface work is to proceed cautiously, with excavation performed by hand to the anticipated depth of the utility, if necessary.

b) Further investigation is to be performed by the Contractor in order to confirm the specific location of the utility in question. This investigation can include the use of metal detectors, geophysical instrumentation, or other means of tracing the utility line.

c) Following Approval by Harley-Davidson Motor Company, modify the work scope to remove the utility from harm's way (e.g., move the work area to a new location).

In situations where known utilities are located more than 10 feet from proposed subsurface work area, Harley-Davidson Motor Company may, at its discretion, still place conditions on the subsurface work. Work scope modifications or a requirement for additional investigation should be considered in instances when the mapped utility locations are suspect based upon the knowledge of Harley-Davidson Motor Company personnel, and/or when discrepancies between utility drawings or discrepancies between utility drawings and surface expressions of those utilities exist.

Harley-Davidson Responsibility:

It is the responsibility of Harley-Davidson Motor Company to inspect each marked limit of the proposed subsurface work to confirm the proximity of the work area in relation known subsurface utilities or environmentally sensitive areas. It is also Harley-Davidson Motor Company's responsibility to request work scope modifications or further investigations if it is not satisfied that the work proposed by the Contractor can be performed without impacting subsurface utilities.

4. DOCUMENTATION OF APPROVALS

H-D Champion and Contractor Responsibility:

It is the responsibility of the H-D Champion or Contractor to complete a Subsurface Work Authorization Form (**YS2.03.300.01**) in order to provide documentation that a utility mark-out and environmental evaluation was performed in accordance with these guidelines. The form is to be signed and submitted by the H-D Champion or Contractor to Plant Engineering for approval. No subsurface work is to proceed until this form is signed by three (3) designated Harley-Davidson Motor Company employees (plant engineer, environmental engineer and project champion) and returned to the H-D Champion and Contractor. Any inspections by or approvals of Harley-Davidson required hereunder and the signatures of the designated Harley-Davidson representatives on any authorization forms or any other action by Harley-Davidson pursuant to this WI shall not relieve the Contractor of its duties described herein and shall not negate or diminish the Contractor's responsibility or liability under this WI or any other agreement or under law.

Harley-Davidson Responsibility:

It is the responsibility of Harley-Davidson Motor Company to review the "Subsurface Work Authorization Form" prepared by the Contractor. Three (3) signatures of designated Harley-Davidson Motor Company employees (plant engineer, environmental engineer and project champion) will serve to acknowledge and confirm the information provided by the Contractor, and to authorize the subsurface work to proceed based upon conditions noted. No work is to be performed by the Contractor until all conditions are satisfied.

Quality Records:

Record Description	Record Series ID Number	Link to Retention Schedule
YS2.03.300.01 - Subsurface Excavation Clearance Form	**LEG-03 Legal - Environmental**	**https://hdride.harley-davidson.com/empPortal/pageflows/ContentLanding/showDoc.do?contentId=Documents/RRS-LEG-03_-_Legal_Environmental_032806.pdf**

Bill Frideger
Bill Law
Dave Adams
David Brautigan
Doug Mucci
Fred Gates
Keith Brodfuehrer
Rachel Kelley
Randy Christianson
Sharon Environmental Fisher

Signed by

SUBSURFACE EXCAV ATION CLEARANCE FORM

WORK DESCRIPTION:

Proposed Date(s) of Work: ______________________________
Contractor Name: ______________________________
Contractor Phone Number: ______________________________
Contractor Contact: ______________________________
Project ID (if applicable): ______________________________
Work Description: ______________________________
Harley-Davidson Project Champion: ______________________________

Proposed Work Area Location
(Provide sketch with dimensions to nearest structures or attach drawings if available)

CONTRACTOR SECTION:

1. **Yes** **No** Was the current Site-Wide Subsurface Protocol and Utility Clearance Instructions reviewed and understood? If Yes, proceed. If No, read the Site-Wide Subsurface Protocol and Utility Clearance Instructions and contact Plant Engineering if you have questions.

2. **Yes** **No** Were subsurface utility drawings reviewed? If Yes, please identify:
____
____
____

3. **Yes** **No** Were outside utility companies contacted (if applicable)? If yes, please identify:
____
____
____

4. **Yes** **No** Have the proposed work area limits been marked?

5. What is the maximum depth of excavation? ________________ feet

6. **<u>Yes</u>** **<u>No</u>** Based upon your review of available information, do any surface expressions of utilities such as manhole covers or vent pipes occur with 50 feet of the work area? If yes, please identify feature and distance to the work area:

____

____

7. **<u>Yes</u>** **<u>No</u>** Have the marked limits of the proposed work area been inspected by the appropriate Harley-Davidson Motor Company employee(s)? Please print the name of the employee(s):

____

____

____

8. **<u>Yes</u>** **<u>No</u>** Based upon your review of available information, are any subsurface utilities potentially located within 10 feet of the work area? If yes, please identify the precautions that will be taken, below:

Will hand excavate to the anticipated _____ foot depth of the subsurface utility.

Will perform further investigation. This investigation will include:

____

____

____

Will modify the work scope in the following manner:

____

____

____

Other Comments:

____

____

____

____

Contractor Name (If no contractor H-D champion): ____

Contractor Signature (If no contractor H-D champion): _____________________________________

Date: _____________________________________

HARLEY-DAVIDSON SECTION:

1. **Yes** **No** Was the current Environmental Excavation Constraint map reviewed? If Yes, identify Environmental Sensitive zone(s) (A, B, C, D, or E).

2. **Yes** **No** Is OSHA Training required?

3. **Yes** **No** Is a Contractor Health and Safety Plan required?

4. **Yes** **No** Is an environmental inspector or ordnance specialist required?

5. **Yes** **No** Do special Environmental Insurance requirements apply?

The subsurface work is:

- ☐ Approved with no conditions.
- ☐ Approved with the following conditions:

____
____
____

- ☐ Work is disapproved.

Other Comments:

____
____
____
____
____

Harley-Davidson Plant Engineer Name: ______________________

Signature: ______________________

Date: ______________________

Harley-Davidson Environmental Engineer Name: ______________________

Signature: ______________________

Date: ______________________

Harley-Davidson Project Champion Name: ______________________

Signature: ______________________

Date: ______________________

Attachment B

Activity Hazard Analysis

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ACTIVITY HAZARD ANALYSIS

Activity/Work Task:	**Mobilization**	Overall Risk Assessment Code (RAC) (use highest code from all subtasks):					**M**	
Project Location:	Former York Naval Ordnance Plant	Risk Assessment Code (RAC) Matrix						
Project Number:	6292101	Severity	Probability					
Date Prepared:	02 February 2015		1 Frequent	2 Likely	3 Occasional	4 Seldom	5 Unlikely	
Prepared By:	S. Yankay	1 Catastrophic	E	E	H	H	M	
		2 Critical	E	H	H	M	L	
		3 Marginal	H	M	M	L	L	
Reviewed By:	Pete Garger	4 Negligible	M	L	L	L	L	

Step 1: Review each "hazard" and determine RAC.

Probability = the likelihood to cause an incident, near miss, or accident. Identified as frequent, likely, occasional, seldom, or unlikely.

Severity = the outcome/degree if an incident, near miss, or accident did occur. Identified as catastrophic, critical, marginal, or negligible.

Step 2: Identify the RAC as E, H, M, or L for each hazard on AHA. Select the highest RAC and note at the top of the form.

RAC Chart
E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

TASK BREAKDOWN, HAZARDS AND CONTROLS: SITE MOBILIZATION

Work Task Steps	**Hazards**	**Controls**	**RAC Severity/ Probability /RAC**
General Mobilization Activities	Physical Hazard: Dust	Minimize generation of dust.	3/3/M
		Stay out of visible dust clouds.	
		Wet soil if necessary to eliminate visible dust.	
	Physical Hazard: Noise	Wear hearing protection when operating or working near heavy equipment.	3/3/M
	Physical Hazard: Electrical	Assure electrical work (if necessary) is performed by qualified personnel with verifiable credentials who are familiar with applicable code requirements.	3/3/M
	Physical Hazard: Slips, Trips and Falls	Make sure you have good solid footing and that walking/working surfaces are as clean and dry as possible.	3/3/M
		Inspect areas daily and record findings on daily inspection reports.	
	Physical Hazard: Hand Tools	Inspect tools prior to use; inform supervisors if tools require repair or replacement.	3/3/M
		Use tools for their intended use only.	
		Don’t use damaged tools.	
		Push, don’t pull wrenches.	
	Physical Hazard: Powered Machine Tools	Use, inspect and maintain power tools according to manufacturer’s recommendations. Equip power tools with designed guards.	3/3/M

Work Task Steps	Hazards	Controls	RAC Severity/ Probability /RAC
General Mobilization Activities *(continued)*	Physical Hazard: Powered Machine Tools *(continued)*	Provide electrical power control on each power tool to make it possible for the operator to cut off the power without leaving the point of operation.	3/3/M
		Connect all electrical power tools to an in-line GFCI.	
	Biological Hazards: Insects, Snakes, Wildlife, Vegetation	SSHO will walk site and identify potentially hazardous areas and these will be identified in the daily tailgate briefing.	4/3/L
		Use repellents and proper clothing for protection against insects including ticks and mosquitoes.	
		Wear protective clothing in areas where poison oak and poison ivy are present.	
		Wear protective clothing, including long pants and sturdy boots for protection against snakes and spiders.	
		Exercise caution when moving obstacles, items that could be home to snakes, spiders or other animals or insects.	
	Physical Hazard: Manual Lifting	Follow proper lifting techniques.	3/3/M
		Use caution and do not twist the back when carrying a load.	
		Do not attempt to lift bulky items or items assessed at over 50lbs. without assistance.	
		Use mechanical devices to move loads when possible.	
		Wear leather gloves for materials handling.	
	Physical Hazard: Cold Stress	Wear cold weather clothing and provide shelter as needed based on site conditions.	3/3/M
		Conduct temperature monitoring when temperatures fall below 45^{o} F.	
	Physical Hazard: Heat Stress	Make drinking water available to all workers and encourage workers to drink small amounts of water frequently.	3/3/M
		Adjust work/rest regimens during hot weather.	
	Physical Hazard: Extreme Weather	When there are warnings or indications of severe weather, monitor conditions and take precautions to protect personnel.	2/4/M
	Physical Hazard: Temporary Facilities (if used, not anticipated)	Anchor trailers with rods and cables or by steel straps to ground anchors designed to withstand winds and meet applicable standards.	3/4/L
		Post signs warning of the presence of construction hazards every 300 feet.	
		Provide one portable toilet with adequate ventilation on site.	
		Provide washing facilities at the portable toilet location to maintain sanitary conditions.	3/4/L

Work Task Steps	Hazards	Controls	RAC Severity/ Probability /RAC
General Mobilization Activities *(continued)*	Physical Hazard: Temporary Facilities (if used, not anticipated) *(continued)*	Provide type II 16-unit first aid kits and make these kits accessible at the site.	3/4/L
	Physical Hazard: Temporary Haul Roads (if used, not anticipated)	Construct haul roads with suitable width for safe operation at the speed anticipated.	3/4/L
		Post speed limits on haul roads.	
Mobilize Crew and Equipment	Physical Hazard: Driving/Vehicle Movement (including trucks, heavy equipment)	Obey traffic rules.	3/3/M
		15 mph is the maximum speed allowed in the work area.	
		Use caution when entering roadways.	
		Do not operate vehicles in unsafe conditions (e.g., on steep slopes, in deep mud).	
		Do not use cell phones when operating vehicles.	
		Secure all loads, including equipment within the cab, containerize small equipment and secure container.	
		Wear seat belts, including those provided in cabs of heavy equipment.	
		Use caution and wear orange vests if working near active roads or around heavy equipment.	
		Leave enough time to get to your destination without hurrying.	
		Be aware of heavy equipment and do not park or conduct work in the blind spot of the equipment operator; “blind spots” of some equipment can be very large.	
		Verify back-up alarms are functional for all heavy equipment. Pick-ups or SUVs with obstructed rear-view use a back-up alarm or a spotter when backing-up.	
		Rollover protective structures (ROPS) are required on all heavy equipment, with the exception of trucks used for over–the-road hauling.	
		Inspect drilling equipment and maintain according to the manufacturer’s recommendations.	
		Equipment will be immediately grounded if unauthorized personnel enter the work area.	
Utility Clearance	Physical Hazard: Electrocution or Explosion	If overhead utilities are present in work area, place warning signs at ground level.	2/4/M
		Always check for overhead utilities before using extendable equipment.	
		Maintain at least one mast length or 20 feet (whichever is greater) from all power lines.	
		Contact the utilities company if high voltage lines are present.	

Work Task Steps	Hazards	Controls	RAC Severity/ Probability /RAC
Utility Clearance *(continued)*	Physical Hazard: Electrocution or Explosion *(continued)*	Complete utility locates prior to intrusive work in areas where utilities have not been cleared through institutional knowledge by calling the local underground service alert center and/or coordinating with site personnel.	2/4/M
		Observe the area for indications of utilities.	
Handling Flammable Liquid During Fueling	Physical Hazard: Fire	Provide portable fire extinguishers in all equipment and in the field trailer.	2/4/M
		Inspect fire extinguishers monthly.	
		Obtain hot work permits prior to any welding or torch cutting activities.	
MEC Avoidance	Physical Hazard: Explosion	UXO Technicians will inspect any potential MEC.	2/4/M

REQUIRED EQUIPMENT, INSPECTION AND TRAINING:

Equipment	Inspection Requirements	Training Requirements (including Competent Person and Qualified Personnel, if applicable)
• Common hand tools • Common power tools (chain saws, brush trimmers) • Emergency equipment including first aid kit, eye wash, fire extinguishers	• Inspect PPE prior to each use • Inspect vehicles daily • Use appropriate PPE • Underground hazards require clearance • Inspect emergency equipment/supplies daily (first aid kit, eye wash, fire extinguisher)	• Use and limitations of PPE • Valid driver's license • Lifting • AHA review • First aid/CPR—at least 2 people on site • Hazardous waste sites require 40 hour HAZWOPER training, annual updates for any intrusive activities. • SSHO will require HAZWOPER Supervisor's Training and 30-hour OSHA Construction Safety Course.

ACTIVITY HAZARD ANALYSIS

Activity/Work Task:	**Brush Clearing**	Overall Risk Assessment Code (RAC) (use highest code from all subtasks):					**M**
Project Location:	Former York Naval Ordnance Plant	Risk Assessment Code (RAC) Matrix					
Project Number:	6292101	Severity	Probability				
Date Prepared:	02 February 2015		1 Frequent	2 Likely	3 Occasional	4 Seldom	5 Unlikely
		1 Catastrophic	E	E	H	H	M
Prepared By:	S. Yankay	2 Critical	E	H	H	M	L
		3 Marginal	H	M	M	L	L
Reviewed By:	Pete Garger, CIH	4 Negligible	M	L	L	L	L

Step 1: Review each "hazard" and determine RAC.

Probability = the likelihood to cause an incident, near miss, or accident. Identified as frequent, likely, occasional, seldom, or unlikely.

Severity = the outcome/degree if an incident, near miss, or accident did occur. Identified as catastrophic, critical, marginal, or negligible.

Step 2: Identify the RAC as E, H, M, or L for each hazard on AHA. Select the highest RAC and note at the top of the form.

RAC Chart

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

TASK BREAKDOWN, HAZARDS AND CONTROLS: BRUSH CLEARING

Work Task Steps	**Hazards**	**Controls**	**RAC Severity/ Probability /RAC**
Brush/Obstacle Removal	Physical Hazard: Driving/Vehicle Movement (including trucks, heavy equipment)	Remain out of the swing radius of excavating equipment, and make sure to have the attention of the equipment operator.	2/4/M
		Verify back-up alarms are functional for all heavy equipment. Pick-ups or SUVs with obstructed rear-view use a back-up alarm or a spotter when backing-up.	
		Equipment will be immediately grounded if unauthorized personnel enter the work zone.	
		If overhead power lines are in the vicinity of the work area, use a spotter to ensure that equipment maintains proper safe distance.	
		Obey traffic rules.	
		15 mph is the maximum speed allowed in the work area.	
		Use caution when entering roadways.	
		Do not operate vehicles in unsafe conditions (e.g., on steep slopes, in deep mud).	
		Do not use cell phones when operating vehicles.	
		Secure all loads, including equipment within the cab, containerize small equipment and secure container.	

Work Task Steps	Hazards	Controls	RAC Severity/ Probability /RAC
Brush/Obstacle Removal *(continued)*	Physical Hazard: Driving/Vehicle Movement (including trucks, heavy equipment) (*continued)*	Wear seat belts, including those provided in cabs of heavy equipment.	2/4/M
		Use caution and wear orange vests if working near active roads or around heavy equipment.	
		Leave enough time to get to your destination without hurrying.	
		Be aware of heavy equipment and do not park or conduct work in the blind spot of the equipment operator; "blind spots" of some equipment can be very large.	
		Rollover protective structures (ROPS) are required on all heavy equipment, with the exception of trucks used for over–the-road hauling.	
		Inspect drilling equipment and maintain according to the manufacturer's recommendations.	
	Physical Hazard: Manual Lifting	Follow proper lifting techniques.	3/3/M
		Use caution and do not twist the back when carrying a load.	
		Do not attempt to lift bulky items or items assessed at over 50lbs. without assistance.	
		Use mechanical devices to move loads when possible.	
		Wear leather gloves for materials handling.	
	Physical Hazard: Noise	Wear hearing protection when operating or working near heavy equipment (where shouting is required for face-to-face communication within three feet).	3/3/M
	Physical Hazard: Hand Tools	Inspect tools prior to use; inform supervisors if tools require repair or replacement.	3/3/M
		Use tools for their intended use only.	
		Don't use damaged tools.	
		Push, don't pull wrenches.	
	Physical Hazard: Powered Machine Tools	Use, inspect and maintain power tools according to manufacturer's recommendations.	3/3/M
		Equip power tools with designed guards.	
		Provide electrical power control on each power tool to make it possible for the operator to cut off the power without leaving the point of operation.	
		Connect all electrical power tools to an in-line GFCI.	
	Biological Hazards: Insects, Snakes, Wildlife, Vegetation Exposures	Inspect work areas when arriving at a sampling site to identify hazard(s).	4/3/L
		Use insect repellant as necessary.	
		Stay alert and safe distance away from biological hazards.	

Work Task Steps	Hazards	Controls	RAC Severity/ Probability /RAC
Brush/Obstacle Removal *(continued)*	Biological Hazards: Insects, Snakes, Wildlife, Vegetation Exposures *(continued)*	Workers with allergies should carry antidote kits, if necessary.	4/3/L
		Wear appropriate PPE including work gloves, long sleeves and pants, and snake chaps if probability of encountering snakes, ticks, poison ivy or oak	
	Physical Hazard: Cold Stress	Wear cold weather clothing and provide shelter as needed based on site conditions.	3/3/M
		Conduct temperature monitoring when temperatures fall below 45^{o} F.	
	Physical Hazard: Heat Stress	Make drinking water available to all workers and encourage workers to drink small amounts of water frequently.	3/3/M
		Adjust work/rest regimens during hot weather.	
	Physical Hazard: Slips, Trips and Falls	Make sure you have good solid footing and that walking/working surfaces are as clean and dry as possible.	3/3/M
		Inspect areas daily and record findings on daily inspection reports.	
	Chemical Hazard: Exposure to Contaminants of Concern	Wear safety glasses and nitrile gloves.	3/3/M
		Decontaminate sampling tools and PPE after use.	
		Wash hands and face after sampling events.	
	Physical Hazard: Heat Stress	Determine appropriate work schedule; take regular breaks	3/3/M
		Have adequate water and electrolyte drinks available	
		Designate shaded break areas	
		Be aware of symptoms of heat-related illness	
Handling Flammable Liquid During Refueling	Physical Hazard: Fire	Store gasoline in approved flammable liquid containers.	2/4/M
		Fuel vehicles in areas free of combustible debris/vegetation.	
		Do not fuel in the back of pick-up trucks with bed liners.	
		Turn engines off prior to refueling.	
		Bond and ground containers during transfer of flammable liquids.	
		Have portable fire extinguishers present at all time and inspect monthly.	

REQUIRED EQUIPMENT, INSPECTION AND TRAINING:

Equipment	Inspection Requirements	Training Requirements (including Competent Person and Qualified Personnel, if applicable)
• Level D PPE • Hardhat • Hearing Protection • Safety Glasses • Leather Gloves • Face Shield when using brush trimmers • Power tools/hand tools • Emergency equipment including first aid kit, eye wash, fire extinguishers	• Inspect PPE prior to each use • Inspect vehicle daily • Calibrate environmental monitoring equipment daily prior to use. • Use appropriate PPE • Inspect emergency equipment/supplies daily (first aid kit, eye wash, fire extinguisher)	• Use and limitations of PPE • Valid driver's license • Lifting • AHA review • First aid/CPR—at least 2 people on site • Hazardous waste sites require 40 hour HAZWOPER training, annual updates. • SSHO will require HAZWOPER Supervisor's Training and 30-hour OSHA Construction Safety Course.

ACTIVITY HAZARD ANALYSIS

Activity/Work Task:	**Chain Saw Usage**	Overall Risk Assessment Code (RAC) (use highest code from all subtasks):					**M**	
Project Location:	Former York Naval Ordnance Plant	Risk Assessment Code (RAC) Matrix						
Project Number:	6292101	Severity	Probability					
Date Prepared:	02 February 2015		1 Frequent	2 Likely	3 Occasional	4 Seldom	5 Unlikely	
		1 Catastrophic	E	E	H	H	M	
Prepared By:	S. Yankay	2 Critical	E	H	H	M	L	
		3 Marginal	H	M	M	L	L	
Reviewed By:	Pete Garger, CIH	4 Negligible	M	L	L	L	L	

Step 1: Review each "hazard" and determine RAC.

Probability = the likelihood to cause an incident, near miss, or accident. Identified as frequent, likely, occasional, seldom, or unlikely.

Severity = the outcome/degree if an incident, near miss, or accident did occur. Identified as catastrophic, critical, marginal, or negligible.

Step 2: Identify the RAC as E, H, M, or L for each hazard on AHA. Select the highest RAC and note at the top of the form.

RAC Chart

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

TASK BREAKDOWN, HAZARDS AND CONTROLS: CHAIN SAW USAGE

Work Task Steps	**Hazards**	**Controls**	**RAC Severity/Probability/RAC**
Preparing 2 cycle oil and gasoline mixture	Physical Hazard: Splash hazards/eye injuries	Proper personnel protective equipment (PPE) will be required, including leather gloves and safety glasses.	3/3/M
	Physical Hazard: Skin exposure to oil/gas mixture	Use a safety gas container for storing and transporting gasoline/oil mix.	2/3/M
		Mix oil and fuel in a well ventilated area.	
		Proper PPE will be required, including leather gloves and safety glasses.	
	Chemical/Physical Hazard: Fires/Explosions	Ensure type ABC, fully charged fire extinguisher on-site.	3/3/M
		Do not fuel chain saw while running, while hot, or near an open flame. Saws will not be started within 10 feet (3 meters) of fuel container.	
		Stop work if hazardous conditions are identified.	
	Chemical/Physical Hazard: Spills	Make sure that there are adequate spill supplies present when handling oils and fuels.	2/3/M
	Physical Hazard: Burns from hot engine	Make yourself aware of engine areas of the saw that will get hot during usage. Allow chainsaw to cool before fueling to prevent fires and burns. Use a funnel and take care not to over fill the tank.	2/2/M

Work Task Steps	Hazards	Controls	RAC Severity/Probability/RAC
	Physical Hazard: Slips, Trips, and Falls	Remove all trip hazards by keeping materials/objects organized and out of walkways.	3/3/L
		Stay aware of footing and do not run.	
		Wear appropriate PPE including non-slip boots if working on wet or slick surfaces.	
Filling bar and chain reservoir	Physical Hazard: Splash hazards/eye injuries	Proper PPE will be required, including leather gloves and safety glasses.	3/4/L
	Physical Hazard: Skin exposure to oil/gas mixture	Use a safety gas container for storing and transporting gasoline/oil mix.	3/3/M
		Mix oil and fuel in a well ventilated area.	
		Proper PPE will be required, including nitrile gloves and safety glasses.	
	Chemical/Physical Hazard: Spills	Make sure that there are adequate spill supplies present when handling oils and fuels.	3/3/M
Cutting with Chainsaw	Physical Hazard: Cuts and lacerations	Understand the operation of the chainsaw and the chain brake prior to using it. If you are not comfortable using this tool, inform your management representative and do not use it.	2/2/M
		Wear appropriate PPE (hard hat, steel-toe boots, leather gloves, protective leg chaps, hearing protection) when working with or in close proximity to chain saws.	
		Start chainsaw on the ground. Never attempt to start or restart while holding the chainsaw suspended with one hand on the handle and trigger and the other one pulling the cord.	
		Saw in a downward motion. Never saw in an upward motion. Make sure that no part of your body, or anyone else's, is in the path or potential path of the saw.	
		Do not remove or disable guards or chain brake. This includes the tip guard if saw is equipped with one. Do not operate saws that are missing guards or other parts originally installed at the time of manufacture.	
		Avoid making overhead cuts.	
		Make sure that bar and chain lubricant is flowing (procedure is explained in operations manual) and keep this reservoir full. Periodically check to make sure the bar and chain lubricant ports are not getting plugged.	
		Keep cutting chain sharp. Note: as the chain becomes dull, the wood chips will become finer.	
	Physical Hazard: Struck by falling trees/limbs	Take care not to cut close to the ground or allow saw cutting chain to run in the soil.	2/2/M
		Do not use chainsaw when others are in close proximity to you. Stop saw if you notice others entering your immediate working area. Do not allow or ask others to hold wood for you while you cut.	

Work Task Steps	Hazards	Controls	RAC Severity/Probability/RAC
Cutting with chainsaw *(continued)*	Physical Hazard: Struck by falling trees/limbs *(continued)*	If you are working with someone using a chainsaw, do not walk up on them without first getting their attention and they have stopped the saw.	2/2/M
		Only qualified individuals will perform work with a chainsaw and will review the methodology to be used at that time with the SSHO.	
		Keep all crew members out of the area where trees are to be pushed over until the tree has fallen.	
		In addition to safety glasses, wear the supplied chainsaw cutting hard hat with face screen and ear muffs. Always wear the face screen in the down position and ear muffs over the ears when operating the chainsaw. Ear plugs may also be used but are not required as additional hearing protection.	
	Physical Hazard: Slips, Trips, and Falls	Remove all trip hazards by keeping materials/objects organized and out of walkways.	3/3/M
		Stay aware of footing and do not run.	
		Wear appropriate PPE including non-slip steel toe boots if working on wet or slick surfaces.	
	Physical Hazard: Heat/Cold Stress	Take breaks as needed.	3/3/M
		Be aware of weather conditions and dress appropriately.	
		Consume adequate food/beverages.	
		If possible, adjust work schedule to avoid heat/cold stresses. Monitor radio or internet for up-to-date severe weather forecasts.	
		Discontinue work during thunderstorms and severe weather events.	3/3/M
	Biological Hazards: Insects, Snakes, Wildlife, Vegetation	Inspect work areas when arriving at a sampling site to identify hazard(s).	
		Stay alert and safe distance away from biological hazards.	
		Workers with allergies should carry antidote kits, if necessary.	
		Use insect repellant as necessary.	
		Wear appropriate PPE including work gloves, long sleeves and pants.	
		Workers will wear light colored clothing or light tyvek when working in areas where ticks or poison ivy is present. Workers will perform visual inspection of their clothing and exposed areas at the end of the workday. The SSHO will be notified in the event that a tick has attached itself to skin. If a poison ivy exposure occurs the worker will was the affected area with soapy water within a half hour period. If symptoms occur (within 24-48 hrs) notify the SSHO.	

Work Task Steps	Hazards	Controls	RAC Severity/Probability/RAC
Tightening, adjusting, and replacing cutting chain	Physical Hazard: Burns/fires	Understand how to tighten, adjust and replace chain before attempting to do so. This information is in the operations manual for the tool, which should be reviewed prior to its use.	
		Do not attempt to perform maintenance on the saw while it is running.	
		Note the sharp edges on the cutting chain and always handle chains with work gloves. Replace any guards that had to be removed during maintenance prior to restarting saw.	
		As stated above, note and do not touch the areas of the saw that will become hot during use.	
		If gas remains in the saw when maintenance is to be performed, allow the tool to cool.	
		Take care not to set and leave a hot chainsaw in dry brush/grass.	
		Ensure type ABC, fully charged fire extinguisher on-site.	

REQUIRED EQUIPMENT, INSPECTION AND TRAINING:

Equipment	Inspection Requirements	Training Requirements (including Competent Person and Qualified Personnel, if applicable)
• PPE • Chain saw • Emergency equipment including first aid kit, eye wash, fire extinguishers, spill kit, radio/cell phone	• Inspect PPE prior to each use • Use appropriate PPE • Inspect chain saw • Inspect emergency equipment/supplies daily (first aid kit, eye wash, fire extinguisher, spill kit)	• Use and limitations of PPE • AHA review • First aid/CPR—at least 2 person on site • Hazardous waste sites require 40 hour HAZWOPER training, annual updates for any intrusive activities. • SSHO will require HAZWOPER 40 hour Worker Training

ACTIVITY HAZARD ANALYSIS

Activity/Work Task:	**Munitions and Explosives of Concern (MEC) Avoidance and Reconnaissance Activities**	Overall Risk Assessment Code (RAC) (use highest code from all subtasks):	**M**

		RAC Matrix					
Project Location:	Former York Naval Ordinance Plant						
Project Number:	6292101		Probability				
Date Prepared:	02 February 2015	Severity	1 Frequent	2 Likely	3 Occasional	4 Seldom	5 Unlikely
		1 Catastrophic	E	E	H	H	M
Prepared By:	S. Yankay	2 Critical	E	H	H	M	L
		3 Marginal	H	M	M	L	L
Reviewed By:	Pete Garger, CIH	4 Negligible	M	L	L	L	L
Competent Person:	UXOQCS/UXOSO						

Step 1: Review each "hazard" and determine RAC.

Probability = the likelihood to cause an incident, near miss, or accident. Identified as frequent, likely, occasional, seldom, or unlikely.

Severity = the outcome/degree if an incident, near miss, or accident did occur. Identified as catastrophic, critical, marginal, or negligible.

Step 2: Identify the RAC as E, H, M, or L for each hazard on AHA. Select the highest RAC and note at the top of the form.

RAC Chart

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

TASK BREAKDOWN, HAZARDS AND CONTROLS:

Work Task Steps	Hazards	Controls	RAC Severity/Probability /RAC
Instrument-aided Visual Inspection (MEC Avoidance)	Direct contact with MEC (detonation, heat, fragmentation, and overpressure)	Identify areas known or suspected of containing unexploded ordinance (UXO).	2/4/M
		UXO-qualified personnel will escort non-UXO qualified staff.	
		Non-UXO qualified staff will receive site-specific UXO awareness training.	
		Clear footpaths four feet wide and mark centerline with highly visible flags or survey tape.	
		Clear vehicle access routes 25-feet wide and include an area for turning around and egress.	
		Identified surface anomalies will be marked with red survey markers and avoided	
		Identified subsurface anomalies will be marked with yellow survey markers and avoided	
		Report all potential MEC to UXO-qualified staff.	
		Evacuate to a minimum of 200 feet from potential MEC.	
		Do not use cell phones or radio within 50 feet of potential MEC.	

Work Task Steps	Hazards	Controls	RAC Severity/Probability /RAC
Instrument-aided Visual Inspection (MEC Avoidance) *(continued)*	Direct contact with MEC (detonation, heat, fragmentation, and overpressure) *(continued)*	Do not disturb the ground in potential MEC areas without consulting UXO-qualified staff.	
		Do not move UXO; evacuate area and notify UXO Safety Program Manager.	
Reconnaissance	Physical Hazard: Slips, Trips, Falls	Keep work area free of excess material and debris.	3/3/M
		Remove all trip hazards by keeping materials/objects organized and out of walkways.	
		Be aware of uneven surfaces while walking around sampling locations.	
		Wear appropriate Level D PPE (work gloves, boots, etc.) including non-slip rubber boots if working on wet or slick surfaces.	
		Stay aware of footing and do not run.	
	Physical Hazard: Cold Stress	Wear appropriate clothing to protect skin from wind and cold temperatures.	3/3/M
		Designate warm rest areas.	
		Be aware of symptoms of cold-related illness.	
	Physical Hazard: Heat Stress	Determine appropriate work schedule; take regular breaks	3/3/M
		Have adequate water and electrolyte drinks available	
		Designate shaded break areas	
		Be aware of symptoms of heat-related illness	
	Physical Hazard: Visibility	Wear high-visibility apparel (fluorescent yellow-green, fluorescent orange-red or fluorescent red). Select color to provide highest contrast to the work environment.	4/4/L
	Physical Hazards: Weather	Monitor weather conditions online or on the radio using a weather station that is part of the National Oceanic and Atmospheric Administration weather radio network or similar notification system. If unfavorable weather conditions arise, the SSHO will evaluate the safety hazards and activities will be halted (by the SSHO). Upon the work stoppage, personnel will retreat to project vehicles. The SSHO will continue to monitor weather conditions and determine if project personnel should leave the site or wait for favorable weather to continue field activities.	3/3/M
	Biological Hazards: Poisonous plants	Inspect work areas when arriving at a sampling site to identify hazard(s).	3/3/M
		Stay alert and safe distance away from biological hazards.	
		Wear appropriate PPE including work gloves, work boots, long sleeves and pants. Remove gloves prior to touching exposed areas of the body.	4/4/L
		Workers with allergies should carry antidote kits (epi-pens), if necessary.	

Work Task Steps	Hazards	Controls	RAC Severity/Probability /RAC
Reconnaissance *(continued)*	Biological Hazards: Poisonous plants *(continued)*	Wash hands, face, and other exposed areas at the beginning of each break and at the end of the workday. If dermal contact occurs, wash the affected area with soap and water immediately.	4/4/L
		Wash hands and face prior to eating, drinking, or smoking	

REQUIRED EQUIPMENT, INSPECTION AND TRAINING:

Equipment	Inspection Requirements	Training Requirements (including Competent Person and Qualified Personnel, if applicable)
• Support vehicle • Level D PPE (boots, gloves, etc.) • Emergency equipment including fire extinguishers and first aid kit • For instrument-aided visual inspection - Schonstedt GA-52Cx or the GA-72Cd • Flagging-red and yellow	• Inspect PPE, tools, and equipment prior to each use • Inspect vehicle daily • Inspect emergency equipment/supplies (first aid kit, eye wash, and fire extinguisher)	• Use and limitations of PPE • Valid driver's license • AHA review • Hazardous waste sites require 40 hour HAZWOPER training, annual updates. • Site Manager will require HAZWOPER Supervisor's Training • UXO Techs: Qualifications and training per DoD Explosive Safety Board TP-18 • Non-UXO qualified personnel: project-specific training conducted by UXO Tech to ensure that all on-site personnel fully understand the potential munitions onsite and MEC avoidance procedures

ACTIVITY HAZARD ANALYSIS

Activity/Work Task:	**Reconnaissance and Geophysics Survey**	Overall Risk Assessment Code (RAC) (use highest code from all subtasks):	**M**
Project Location:	Former York Naval Ordinance Plant		
Project Number:	6292101		
Date Prepared:	02 February 2015		
Prepared By:	S. Yankay		
Reviewed By:	Pete Garger, CIH		
Competent Person:	TBD		

Risk Assessment Code (RAC) Matrix

Severity	Probability: 1 Frequent	2 Likely	3 Occasional	4 Seldom	5 Unlikely
1 Catastrophic	E	E	H	H	M
2 Critical	E	H	H	M	L
3 Marginal	H	M	M	L	L
4 Negligible	M	L	L	L	L

Step 1: Review each "hazard" and determine RAC.

Probability = the likelihood to cause an incident, near miss, or accident. Identified as frequent, likely, occasional, seldom, or unlikely.

Severity = the outcome/degree if an incident, near miss, or accident did occur. Identified as catastrophic, critical, marginal, or negligible.

Step 2: Identify the RAC as E, H, M, or L for each hazard on AHA. Select the highest RAC and note at the top of the form.

RAC Chart

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

TASK BREAKDOWN, HAZARDS AND CONTROLS: MONTHLY INSPECTION AND MAINTENANCE

Work Task Steps	**Hazards**	**Controls**	**RAC Severity/ Probability /RAC**
Reconnaissance and Geophysics Survey	Physical Hazard: Slips, Trips, Falls	Keep work area free of excess material and debris.	3/3/M
		Remove all trip hazards by keeping materials/objects organized and out of walkways.	
		Be aware of uneven surfaces while walking around sampling locations.	
		Wear appropriate PPE including non-slip rubber boots if working on wet or slick surfaces.	
		Stay aware of footing and do not run.	
	Biological Hazards: Insects, Snakes, Wildlife, Vegetation	Inspect work areas when arriving at a sampling site to identify hazard(s).	3/3/M
		Use insect repellant as necessary.	
		Stay alert and safe distance away from biological hazards.	
		Wear appropriate PPE including work gloves, long sleeves and pants, and snake chaps if probability of encountering snakes, ticks, poison ivy or oak.	
		Workers with allergies should carry antidote kits, if necessary.	

REQUIRED EQUIPMENT, INSPECTION AND TRAINING:

Equipment	Inspection Requirements	Training Requirements (including Competent Person and Qualified Personnel, if applicable)
• Support vehicle • Ground penetrating radar or magnetometer • PPE • Emergency equipment including fire extinguishers	• Inspect PPE prior to each use • Inspect vehicle daily • Use appropriate PPE • Inspect emergency equipment/supplies	• Use and limitations of PPE • Valid driver's license • AHA review • Mower operator (and any other large equipment operator) will be trained in equipment use and maintenance • Hazardous waste sites require 40 hour HAZWOPER training, annual updates for any intrusive activities. • SSHO will require HAZWOPER Supervisor's Training and 30-hour OSHA Construction Safety Course.

ACTIVITY HAZARD ANALYSIS

Activity/Work Task:	**Demobilization**	Overall Risk Assessment Code (RAC) (use highest code from all subtasks):				**M**	
Project Location:	Former York Naval Ordnance Plant	Risk Assessment Code (RAC) Matrix					
Project Number:	6292101		Probability				
Date Prepared:	02 February 2015	Severity	1 Frequent	2 Likely	3 Occasional	4 Seldom	5 Unlikely
		1 Catastrophic	E	E	H	H	M
Prepared By:	S. Yankay	2 Critical	E	H	H	M	L
		3 Marginal	H	M	M	L	L
Reviewed By:	Pete Garger, CIH	4 Negligible	M	L	L	L	L

Step 1: Review each "hazard" and determine RAC.

Probability = the likelihood to cause an incident, near miss, or accident. Identified as frequent, likely, occasional, seldom, or unlikely.

Severity = the outcome/degree if an incident, near miss, or accident did occur. Identified as catastrophic, critical, marginal, or negligible.

Step 2: Identify the RAC as E, H, M, or L for each hazard on AHA. Select the highest RAC and note at the top of the form.

RAC Chart
E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

TASK BREAKDOWN, HAZARDS AND CONTROLS: DIRECT PUSH AND WELL INSTALLATION

Work Task Steps	**Hazards**	**Controls**	**RAC Severity/ Probability /RAC**
General Demobilization Activities	Biological Hazards: Insects, Snakes, Wildlife, Vegetation	Repellents and proper clothing should be used for protection against insects including ticks and mosquitoes.	4/3/L
		Protective clothing should be used in areas where poison oak and poison ivy are present.	
		Protective clothing, including long pants and sturdy boots, should be used for protection against snakes and spiders.	
	Physical Hazard: Cold Stress	Cold weather clothing and shelter should be provided as needed based on site conditions.	3/3/M
		Temperature monitoring should be conducted when temperatures fall below 45^{o} F.	
	Physical Hazard: Heat Stress	Drinking water should be made available to all workers and encourage workers to drink small amounts of water frequently.	3/3/M
		Work/rest regimens will be adjusted during hot weather.	
	Physical Hazard: Extreme Weather	When there are warnings or indications of severe weather, monitor conditions and take precautions to protect personnel.	2/4/M
	Physical Hazard: Slips, Trips and Falls	Make sure you have good solid footing and that walking/working surfaces are as clean and dry as possible.	3/3/M
		Inspect areas daily and record findings on daily inspection reports.	

Work Task Steps	Hazards	Controls	RAC Severity/ Probability /RAC
General Demobilization Activities *(continued)*	Physical Hazard: Manual Lifting	Follow proper lifting techniques.	3/3/M
		Use caution and do not twist the back when carrying a load.	
		Do not attempt to lift bulky items or items assessed at over 50lbs. without assistance.	
		Use mechanical devices to move loads when possible.	
		Wear leather gloves for materials handling.	
	Physical Hazard: Hand Tools	Inspect tools prior to use.	3/3/M
		Use tools for their intended use only.	
		Don't use damaged tools.	
		Push, don't pull wrenches.	
	Physical Hazard: Powered Machine Tools	Power tools will be used, inspected and maintained according to manufacturer's recommendations.	3/3/M
		Power tools designed to accommodate guards will be equipped with such guards.	
		The electrical power control will be provided on each power tool to make it possible for the operator to cut off the power without leaving the point of operation.	
		All electrical power tools should be connected in an in-line GFCI.	
Demobilize Crew and Equipment	Physical Hazard: Driving/Vehicle Movement (including trucks, heavy equipment)	Obey traffic rules.	3/3/M
		15 mph is the maximum speed allowed in the work area.	
		Use caution when entering roadways.	
		Do not operate vehicles in unsafe conditions (e.g., on steep slopes, in deep mud).	
		Do not use cell phones when operating vehicles.	
		Secure all loads, including equipment within the cab, containerize small equipment and secure container.	
		Wear seat belts, including those provided in cabs of heavy equipment.	
		Use caution and wear orange vests if working near active roads or around heavy equipment.	
		Leave enough time to get to your destination without hurrying.	
		Be aware of heavy equipment and do not park or conduct work in the blind spot of the equipment operator; "blind spots" of some equipment can be very large.	
		Verify back-up alarms are functional for all heavy equipment. Pick-ups or SUVs with obstructed rear-view use a back-up alarm or a spotter when backing-up.	

Work Task Steps	Hazards	Controls	RAC Severity/ Probability /RAC
Demobilize Crew and Equipment *(continued)*	Physical Hazard: Driving/Vehicle Movement (including trucks, heavy equipment) *(continued)*	Rollover protective structures (ROPS) are required on all heavy equipment, with the exception of trucks used for over–the-road hauling, rubber tired lawn tractors and garden tractors operating on flat terrain (10^o slope maximum)	3/3/M
		Inspect equipment and maintain according to the manufacturer's recommendations.	

REQUIRED EQUIPMENT, INSPECTION AND TRAINING:

Equipment	Inspection Requirements	Training Requirements (including Competent Person and Qualified Personnel, if applicable)
• Level D PPE • Hardhat (as required) • Hearing protection (as required) • Safety glasses (as required) • Leather gloves (as required) • Power tools/hand tools • Emergency equipment including first aid kit, eye wash, fire extinguishers	• Inspect PPE prior to each use • Inspect vehicle daily • Use appropriate PPE • Underground hazards require clearance • Inspect emergency equipment/supplies daily (first aid kit, eye wash, fire extinguisher)	• Use and limitations of PPE • Valid driver's license • Equipment operators will be trained in equipment use and maintenance • Lifting • AHA review • First aid/CPR—at least 2 people on site • Hazardous waste sites require 40 hour HAZWOPER training, annual updates for any intrusive activities. • SSHO will require HAZWOPER Supervisor's Training and 30-hour OSHA Construction Safety Course.

ACTIVITY HAZARD ANALYSIS

Activity/Work Task:	**MPPEH Inspection and Disposition**	Overall Risk Assessment Code (RAC) (use highest code from all subtasks):				**H(2)**	
Project Location:	Former York Naval Ordnance Plant	Risk Assessment Code (RAC) Matrix					
Project Number:	6292101	Severity	Probability				
Date Prepared:	20 February 2015		Frequent A	Likely B	Occasional C	Seldom D	Unlikely E
		Catastrophic I	E (1)	E (1)	H (2)	H (2)	M (3)
Prepared By:	S. Yankay	Critical II	E (1)	H (2)	H (2)	M (3)	L (4)
		Marginal III	H (2)	M (3)	M (3)	L (4)	L (5)
Reviewed By:	P. Garger, CIH	Negligible IV	M (3)	L (4)	L (4)	L (5)	L (5)

Step 1: Review each "hazard" and determine RAC.

Probability = the likelihood to cause an incident, near miss, or accident. Identified as frequent, likely, occasional, seldom, or unlikely.

Severity = the outcome/degree if an incident, near miss, or accident did occur. Identified as catastrophic, critical, marginal, or negligible.

Step 2: Identify the RAC as E, H, M, or L for each hazard on AHA. Select the highest RAC and note at the top of the form.

RAC Chart

E = Extremely High Risk (1)
H = High Risk (2)
M = Moderate Risk (3)
L = Low Risk (4 or 5)

TASK BREAKDOWN, HAZARDS AND CONTROLS: MONTHLY INSPECTION AND MAINTENANCE

Work Task Steps	**Hazards**	**Controls**	**RAC Severity/ Probability /RAC**
MPPEH Inspection and Disposition	Physical Hazard: MEC	Specific requirements for MEC disposal are detailed in the WP .	II/C/H(2)
		Assess MEC items to determine if they can be safely moved.	
		If the item cannot be safely moved, it will be blown in place.	
		Items that are not fused and are acceptable to be moved will be marked for collection and storage in accordance with the ESP.	
		Demolition operations must be conducted in accordance with the Demolition SOP.	
	Physical Hazard: Hand Tools	Inspect tools prior to use.	III/C/M(3)
		Use tools for their intended use only.	
		Don’t use damaged tools.	
		Push, don’t pull wrenches.	
MPPEH	Physical Hazard: Manual	Follow proper lifting techniques.	III/C/M(3)

Work Task Steps	**Hazards**	**Controls**	**RAC Severity/ Probability /RAC**
Inspection and Disposition *(continued)*	Lifting	Use caution and do not twist the back when carrying a load.	
		Do not attempt to lift bulky items or items assessed at over 50lbs. without assistance.	
		Use mechanical devices to move loads when possible.	
		Wear leather gloves for materials handling.	
	Biological Hazards: Insects, Snakes, Wildlife, Vegetation	UXOSO/SSHO will walk site and identify potential hazardous areas and these will be identified in the daily tailgate safety briefing.	IV/C/L(4)
		Use repellants and proper clothing for for protection against insects including ticks and mosquitoes.	
		Stay alert and safe distance away from biological hazards.	
		Wear appropriate PPE including work gloves, long sleeves and pants, and snake chaps if high probability of encountering snakes, ticks, poison ivy or oak.	
		Workers with allergies should carry antidote kits, if necessary.	
		Exercise caution when moving obstacles, items that could be home to snakes, spiders, or other animals or insects.	
	Physical Hazard: Noise	Wear hearing protection.	III/C/M(3)
	Chemical Hazards	Review safety data sheets.	III/E/L(5)
		Follow manufacturer's instruction for use, handling and storage.	
		Use recommended protective equipment.	
		Label all containers.	
	Physical Hazard: Cold Stress	Wear cold weather clothing and provide shelter as needed based on site conditions.	III/C/M(3)
		Conduct temperature monitoring when temperatures fall below 45^{o} F.	
	Physical Hazard: Heat Stress	Make drinking water available to all workers and encourage workers to drink small amounts of water frequently.	III/C/M(3)
		Adjust work/rest regimens during hot weather.	
		Determine appropriate work schedule; take regular breaks.	
		Have adequate water and electrolyte drinks available.	
		Designate shaded break areas.	
		Be aware of symptoms of heat-related illness.	
MPPEH	Physical Hazard: Weather	Monitor radio for up-to-date severe weather forecasts.	IV/D/L(5)

Work Task Steps	Hazards	Controls	RAC Severity/ Probability /RAC
Inspection and Disposition *(continued)*		Discontinue work during thunderstorms, ice, and severe weather events.	

REQUIRED EQUIPMENT, INSPECTION AND TRAINING:

Equipment	Inspection Requirements	Training Requirements (including Competent Person and Qualified Personnel, if applicable)
• Support vehicle • Magnetometer • PPE • Emergency equipment including fire extinguishers • Engineering Controls (i.e., sandbags, shovel, etc.) • Explosives	• Inspect PPE prior to each use • Inspect vehicle daily • Inspect/test magnetometer • Inspect emergency equipment/supplies	• Use and limitations of PPE • Valid driver's license • AHA review • Hazardous waste sites require 40 hour HAZWOPER training, annual updates for any intrusive activities. • UXOSO/SSHO will require HAZWOPER Supervisor's Training and 30-hour OSHA Construction Safety Course. • First aid/CPR—at least 2 people on site • UXO Techs: Qualifications and training per DDESB TP-18 • All non-UXO qualified staff will receive site-specific UXO awareness training.

Attachment C

Harley-Davidson Drug and Alcohol Policy

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HARLEY-DAVIDSON MOTOR COMPANY
ALCOHOL & DRUG POLICY

SECTION 1: PURPOSE

The use of alcohol, drugs or other illegal or controlled substances negatively affects the productive, personal, and family lives of employees and the stability of companies. Employees who use, possess, distribute, manufacture or are under the influence of alcohol and/or drugs at work or on Company property present a hazard to themselves and other employees, reduce productivity, may hurt themselves and other employees, and hurt morale. The Company and the Union are committed to addressing the problems of the use of alcohol and/or drugs in order to ensure the safety of the working environment, employees and the public. For these reasons, it is the purpose of this Policy to establish and maintain a work environment free from the effects of alcohol and/or drug use.

SECTION 2: DEFINITIONS

A. Drugs

"Drugs" are defined as any substance which an individual may not sell, use, possess or distribute under applicable state or federal law. Such as:

Amphetamines	Barbiturates
Benzodiazepines	Marijuana
Cocaine	Methadone
Methaqualone	Opiates
Phencyclidine	Propoxyphene

Drugs also include: 1) any prescription drug being used by any person other than the person for whom the drug was prescribed by a licensed medical practitioner; 2) any prescription drug not legally obtained; or 3) any prescription drug being used in a manner, quantity or purpose other than prescribed.

B. Alcohol

"Alcohol" is defined as the intoxicating agent in fermented and distilled liquors, including but not limited to beer, wine and spirits, which if consumed, can cause intoxication.

C. Possess

"Possess" is defined as to have on one's person, personal effects or in one's personal vehicle while on Company property. Generally, "possess" would not include unopened containers of alcohol in a personal vehicle.

D. Company Property

"Company property" is defined as any office, plant, shop, parking lot or vehicle owned or operated by the Company. "Company property" also includes any facility or location at which the Company is conducting or participating in an off-site event.

SECTION 3: USE, POSSESSION, SALE OR DISTRIBUTION

All employees are expected to report to work in a physical and mental condition that will enable them to perform their jobs in a safe and efficient manner. As such, the following is expressly prohibited under this Policy:

- Possession, use, purchase, sale, manufacture, or distribution of alcohol or drugs (as defined in Section 2 of this Policy) on Company property or while on Company business.
- Reporting to work under the influence or with the presence of alcohol or drugs.
- Operating a Company vehicle, operating equipment, or representing Harley-Davidson at a Company-sponsored event while under the influence of alcohol or drugs.

It is recognized that there may be times when it is acceptable, with prior approval, to engage in moderate social drinking of alcohol during work sponsored functions. However, the spirit and intent of this policy is to eliminate situations where an employee's mental and physical abilities are impaired such that an unsafe or unproductive condition exists. The Company in no way encourages or condones operating equipment or vehicles while in an impaired state. See Corporate Alcohol & Substance Abuse Policy on RIDE.

Further, employees are required to notify Health Services prior to the commencement of their shift if they are under the influence of alcohol or drugs or if they are taking any prescription medication (even if lawfully prescribed and taken as prescribed) which could impair their ability to safely perform their job.

SECTION 4: ALCOHOL & DRUG TESTING

A. Basis for Testing

Testing for alcohol and/or drugs shall only be done if a Company representative has "probable suspicion" that an employee is under the influence of alcohol and/or drugs or as otherwise provided for in this Policy.

"Probable Suspicion" must be based on specific personal observations that a Company representative can describe concerning the appearance, behavior, conduct, speech, or breath odor of the employee, etc. Circumstances or observations that lead to a "probable suspicion" determination should be witnessed by two (2) Company representatives, if practicable. These circumstances/observations shall be documented in writing at the time the employee is sent for testing. A copy of such documentation shall be promptly provided to the shop steward or other designated Union representative.

In addition, "probable suspicion" shall be established any time an employee is: 1) involved in a workplace accident which involves significant damage to property or bodily injury which requires treatment by a health care provider; or 2) a driver of a motorized vehicle (e.g. motorcycle, tow motor, Taylor Dunn, tugger, forklift or electric, gas or propane-powered cart) involved in a workplace accident.

Further, employees shall be required to submit to a drug test prior to their return to work from a leave of absence and/or recall from layoff where the leave and/or layoff is more than four (4) consecutive months in duration.

B. <u>Procedures</u>

When the Company determines it has "probable suspicion" that an employee is under the influence of alcohol and/or drugs, the Company may require the employee to go to a medical facility or report to an on-site third-party medical provider to provide urine samples for laboratory testing and/or be subject to a breath-alcohol test or blood-alcohol test.

At the time that the employee is told to report for probable suspicion testing, the Company representative shall explain to the employee the consequences of a positive test result and that the consequences of refusal to agree to the testing shall have the same effect as a positive test result. A Union representative shall be present when the employee is told of the "probable suspicion."

The Company will provide the employee and his/her Union representative transportation to and from the medical facility, if applicable.

The employee shall be placed on unpaid leave after the employee has provided a sample for testing. The employee shall remain on unpaid leave until the test results are received. If the test results are negative, all references and documentation related to the testing will be removed, including all records in the employee's personnel file, and the employee shall be made whole for lost wages or benefits.

C. <u>Testing and Chain-Of-Custody Procedures</u>

Once the employee arrives at the medical location or on-site third party medical provider, the employee shall select one sample collection kit at random from a supply of split sample test kits. As an added precaution, these kits shall be shrink-wrapped or the specimen bottles shall be individually sealed as a safeguard against prior contamination.

In the urine collection procedure, urine shall be obtained directly in two (2) tamper-resistant urine bottles contained in the specimen collection kit. The Company may request the testing personnel administering a urine drug test to take steps such as checking the color and temperature of the urine specimens to detect tampering or substitution, provided that the employee's right of privacy is protected.

The urine containers shall be sealed, labeled and initialed by the employee without the containers leaving the employee's presence. The specimens must be immediately placed in a transportation container, which shall be sealed and again initialed by the employee, and sent to the designated testing laboratory. Should sample tampering be suspected, a second sample, under observation, will be required.

The person responsible for collecting the urine specimen from the employee shall initiate a chain-of-custody form. All handling and transportation of the urine specimen shall be through chain-of-custody procedures as specified in the Mandatory Guidelines for Federal Workplace Drug Testing Programs (hereinafter referred to as the "HHS Guidelines"), published by the U.S. Department of Health and Human Services and Department of Transportation's ("DOT") procedural protocols and safeguards set forth in Part 40 of Title 49 of the Federal Code of Regulations.

D. Laboratory Analysis

The primary and secondary laboratories to which the samples are sent for analysis shall be selected by the Company from among those laboratories certified by the U.S. Department of Health and Human Services or the National Institute for Drug Abuse (NIDA). The Company agrees to notify the Union in advance of those certified laboratories that have been selected or any change in laboratory.

The laboratories shall be instructed to handle and test the urine specimens, and to report the results to the Company's designated Medical Review Officer according to the test methods, cutoff levels and procedures prescribed in the HHS Guidelines and DOT procedural protocols and safeguards, with the following provision for the split sample procedure:

Split Sample Procedure:

When the primary laboratory receives a urine test kit, one sealed urine specimen bottle shall be removed immediately for testing. The shipping container with the remaining sealed bottle shall be immediately placed in secure refrigerated storage.

If the first urine specimen is reported by the primary laboratory as positive, the employee may, within twenty-four (24) hours of being notified of the positive report, request that the second urine specimen be forwarded to the secondary testing laboratory for Gas Chromatography/Mass Spectrometry (GC/MS) testing.

An employee who requests the secondary laboratory test is required to pay for such test and shall at that time execute a special check off authorization to ensure payment for the testing, or have the option to pay for such test before it is performed.

If the employee chooses the optional secondary laboratory test on the "split sample," a mandatory referral can only take place if the secondary laboratory confirms a positive result, based on the GC/MS cutoff levels listed in the HHS Guidelines and DOT procedural protocols and safeguards. If the secondary laboratory test is negative, the Company shall reimburse the employee for all costs associated with the second test.

The results of the second test shall be reported to the Company's designated Medical Review Officer. A complete report of any tests shall be made available, upon request, to the employee.

E. Consequences of a Positive Test or Refusal to Submit to a Test

The threshold limits for test results being considered positive for drugs shall be those established by HHS Guidelines that are in effect at the time the test is administered. The threshold limits for test results being considered positive for alcohol shall be those established by DOT Guidelines that are in effect at the time the test is administered.

Upon a report of any positive drug or alcohol test, the Company has two (2) options.

OPTION 1: The first option is applicable if there are no aggravating factors associated with the employee's positive drug or alcohol test (e.g. the employee has not violated other Company policies or rules). Under this option, the employee will be immediately suspended for a minimum of sixty (60) calendar days and will be a mandatory referral to the Employee Assistance Program ("EAP") and shall be required to comply with the recommendations of the EAP and to enter a rehabilitation program if referred. This option shall only be provided to an employee once during his/her employment with the Company. Additionally, the employee will be required to provide a written consent to the treatment facility(ies) to disclose information about treatment and progress to a Company representative attesting to his/her compliance. An employee who refuses to participate in the EAP shall be subject to immediate discharge.

Reinstatement will be subject to a probationary period of twenty-four (24) months of active employment during which time the employee may be subject to testing at any time without the necessity of establishing "probable suspicion." In addition, the employee must be in full compliance with the prescribed treatment, as outlined by the EAP counselor and must remain in compliance through the probationary period, failure to comply with the recommendations of the EAP counselor and/or failure to comply fully with the terms and conditions of the program and/or any positive test result during the probationary period will subject the employee to discharge.

OPTION 2: The second option is applicable where there are aggravating factors associated with the employee's positive drug or alcohol test. Under this option, the employee will be immediately discharged.

An employee's refusal to submit to drug and/or alcohol testing, including failure to cooperate with personnel performing the test, attempts to alter any sample or failure to provide a sufficient amount of urine or breath for testing without a medical reason, shall result in immediate discharge.

SECTION 5: EMPLOYEE INFORMATION & EMPLOYEE ASSISTANCE PROGRAM

The Company shall provide information about this policy and EAP for all employees as described below. Such information shall include:

- A description of the Company's Employee Assistance Program, and how employees may confidentially make use of the program.
- An explanation of medical insurance coverage for alcohol and/or drug treatment.
- Dangers of workplace alcohol and/or drug use.
- The reason why the Company has an Alcohol and Drug Policy.
- Description of circumstances and observations that creates a "probable suspicion" situation.
- Testing for drugs and alcohol.
- Procedures for post accident/injury testing.
- The procedures for establishing "probable suspicion", collecting urine samples and maintaining the chain-of-custody.
- The split sample option.
- The consequences of refusal to submit to a test.
- The consequences of a positive test.
- The consequences of non-compliance with EAP recommendations and/or any rehabilitation program.

The Company will notify the Union in advance regarding any changes to its Employee Assistance Program which includes counseling, evaluation, treatment, and rehabilitation.

SECTION 6: COMPANY & UNION

The Company and Union agree that differences arising between the Company, the employees, or the Union as to the interpretation, application or violation of this Policy shall be subject to the grievance and arbitration provisions of the parties' current labor agreement. The parties will have open discussions about using technological advancements designed to achieve more accurate test results.

The Company and Union agree that this Policy does not change nor minimize Harley-Davidson's responsibilities to comply with all Department of Transportation (DOT) regulations which may require more stringent guidelines for specific jobs covered by state and federal laws. See Corporate Alcohol & Substance Abuse Policy – Transportation Addendum. Nor does this policy have any effect upon the Company's drug testing policy for pre-employment physicals.

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Appendix B

Test America Denver Quality Assurance Project Plan

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

BUREAU OF LABORATORIES

LABORATORY ACCREDITATION PROGRAM

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Certifies That

68-00664

TestAmerica Denver

4955 Yarrow Street, Arvada, CO 80002

Having duly met the requirement of
The act of June 29, 2002 (P.L. 596, No. 90)
dealing with Environmental Laboratories Accreditation
(27 Pa. C.S. §§4104-4113) and the
National Environmental Laboratory Accreditation Program Standard

is hereby approved as an

Accredited Laboratory

As more fully described in the attached Scope of Accreditation

Expiration Date: **07/31/2015**

Certificate Number: **009**

Aaren Alger

Aaren S. Alger, Chief
Laboratory Accreditation Program
Bureau of Laboratories

Continued accreditation status depends on successful ongoing participation in the program
Certificate not transferable Surrender upon revocation
To be conspicuously displayed at the Laboratory
Not valid unless accompanied by a valid Scope of Accreditation
Shall not be used to imply endorsement by the Commonwealth of Pennsylvania
Customers are urged to verify the laboratory's current accreditation status
PA DEP is a NELAP recognized accreditation body

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 009-001 expiration date July 31, 2015. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 68-00664 EPA Lab Code: CO00026 TNI Code: (303) 736-0100

TestAmerica Denver
4955 Yarrow Street
Arvada, CO 80002

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1010		Ignitability	NELAP	OR	7/16/2014
EPA 160.4		Residue, volatile	NELAP	OR	7/16/2014
EPA 1664	B	Non-polar material	NELAP	OR	7/16/2014
EPA 1664	A	Oil and grease	NELAP	OR	7/16/2014
EPA 1664	B	Oil and grease	NELAP	OR	7/16/2014
EPA 1664	A	Total petroleum hydrocarbons (TPH)	NELAP	OR	7/16/2014
EPA 180.1		Turbidity	NELAP	OR	7/16/2014
EPA 200.7	4.4	Aluminum	NELAP	OR	7/16/2014
EPA 200.7	4.4	Antimony	NELAP	OR	7/16/2014
EPA 200.7	4.4	Arsenic	NELAP	OR	7/16/2014
EPA 200.7	4.4	Barium	NELAP	OR	7/16/2014
EPA 200.7	4.4	Beryllium	NELAP	OR	7/16/2014
EPA 200.7	4.4	Boron	NELAP	OR	7/16/2014
EPA 200.7	4.4	Cadmium	NELAP	OR	7/16/2014
EPA 200.7	4.4	Calcium	NELAP	OR	7/16/2014
EPA 200.7	4.4	Chromium	NELAP	OR	7/16/2014
EPA 200.7	4.4	Cobalt	NELAP	OR	7/16/2014
EPA 200.7	4.4	Copper	NELAP	OR	7/16/2014
EPA 200.7	4.4	Iron	NELAP	OR	7/16/2014
EPA 200.7	4.4	Lead	NELAP	OR	7/16/2014
EPA 200.7	4.4	Magnesium	NELAP	OR	7/16/2014
EPA 200.7	4.4	Manganese	NELAP	OR	7/16/2014
EPA 200.7	4.4	Molybdenum	NELAP	OR	7/16/2014
EPA 200.7	4.4	Nickel	NELAP	OR	7/16/2014
EPA 200.7	4.4	Potassium	NELAP	OR	7/16/2014
EPA 200.7	4.4	Selenium	NELAP	OR	7/16/2014
EPA 200.7	4.4	Silicon	NELAP	OR	7/16/2014
EPA 200.7	4.4	Silver	NELAP	OR	7/16/2014
EPA 200.7	4.4	Sodium	NELAP	OR	7/16/2014
EPA 200.7	4.4	Thallium	NELAP	OR	7/16/2014
EPA 200.7	4.4	Tin	NELAP	OR	7/16/2014
EPA 200.7	4.4	Titanium	NELAP	OR	7/16/2014
EPA 200.7	4.4	Vanadium	NELAP	OR	7/16/2014
EPA 200.7	4.4	Zinc	NELAP	OR	7/16/2014
EPA 200.8	5.4	Antimony	NELAP	OR	7/16/2014
EPA 200.8	5.4	Arsenic	NELAP	OR	7/16/2014
EPA 200.8	5.4	Barium	NELAP	OR	7/16/2014
EPA 200.8	5.4	Beryllium	NELAP	OR	7/16/2014
EPA 200.8	5.4	Cadmium	NELAP	OR	7/16/2014
EPA 200.8	5.4	Chromium	NELAP	OR	7/16/2014

Aaron Alger

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Attached to Certificate of Accreditation 009-001 expiration date July 31, 2015. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 68-00664 EPA Lab Code: CO00026 TNI Code: (303) 736-0100

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 200.8	5.4	Cobalt	NELAP	OR	7/16/2014
EPA 200.8	5.4	Copper	NELAP	OR	7/16/2014
EPA 200.8	5.4	Lead	NELAP	OR	7/16/2014
EPA 200.8	5.4	Manganese	NELAP	OR	7/16/2014
EPA 200.8	5.4	Molybdenum	NELAP	OR	7/16/2014
EPA 200.8	5.4	Nickel	NELAP	OR	7/16/2014
EPA 200.8	5.4	Selenium	NELAP	OR	7/16/2014
EPA 200.8	5.4	Silver	NELAP	OR	7/16/2014
EPA 200.8	5.4	Thallium	NELAP	OR	7/16/2014
EPA 200.8	5.4	Vanadium	NELAP	OR	7/16/2014
EPA 200.8	5.4	Zinc	NELAP	OR	7/16/2014
EPA 245.1	3.0	Mercury	NELAP	OR	7/16/2014
EPA 300.0	2.1	Bromide	NELAP	OR	7/16/2014
EPA 300.0	2.1	Chloride	NELAP	OR	7/16/2014
EPA 300.0	2.1	Fluoride	NELAP	OR	7/16/2014
EPA 300.0	2.1	Nitrate as N	NELAP	OR	7/16/2014
EPA 300.0	2.1	Orthophosphate as P	NELAP	OR	7/16/2014
EPA 300.0	2.1	Sulfate	NELAP	OR	7/16/2014
EPA 300.0	2.1	Total nitrate-nitrite	NELAP	OR	7/16/2014
EPA 3005	A	Preconcentration under acid	NELAP	OR	7/16/2014
EPA 3010	A	Hot plate acid digestion (HNO3 + HCl)	NELAP	OR	7/16/2014
EPA 3020	A	Hot plate acid digestion (HNO3 only)	NELAP	OR	7/16/2014
EPA 335.4		Total cyanide	NELAP	OR	7/16/2014
EPA 350.1		Ammonia as N	NELAP	OR	7/16/2014
EPA 351.2		Kjeldahl nitrogen, total (TKN)	NELAP	OR	7/16/2014
EPA 3510	C	Separatory funnel liquid-liquid extraction	NELAP	OR	7/16/2014
EPA 3520	C	Continuous liquid-liquid extraction	NELAP	OR	7/16/2014
EPA 353.2		Nitrate as N	NELAP	OR	7/16/2014
EPA 353.2		Total nitrate-nitrite	NELAP	OR	7/16/2014
EPA 3535		Solid-phase extraction (SPE)	NELAP	OR	7/16/2014
EPA 3620	B	Florisil cleanup	NELAP	OR	7/16/2014
EPA 365.1		Orthophosphate as P	NELAP	OR	7/16/2014
EPA 365.1		Phosphorus, total	NELAP	OR	7/16/2014
EPA 3660	B	Sulfur cleanup	NELAP	OR	7/16/2014
EPA 3665	A	Sulfuric acid/permanganate clean-up	NELAP	OR	7/16/2014
EPA 410.4		Chemical oxygen demand (COD)	NELAP	OR	7/16/2014
EPA 420.1		Total phenolics	NELAP	OR	7/16/2014
EPA 420.4		Total phenolics	NELAP	OR	7/16/2014
EPA 5030	B	Aqueous-phase purge-and-trap	NELAP	OR	7/16/2014
EPA 6010		Aluminum	NELAP	OR	7/16/2014
EPA 6010		Antimony	NELAP	OR	7/16/2014
EPA 6010		Arsenic	NELAP	OR	7/16/2014
EPA 6010		Barium	NELAP	OR	7/16/2014
EPA 6010		Beryllium	NELAP	OR	7/16/2014
EPA 6010		Boron	NELAP	OR	7/16/2014
EPA 6010		Cadmium	NELAP	OR	7/16/2014
EPA 6010		Calcium	NELAP	OR	7/16/2014

Aaren Alger

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 009-001 expiration date July 31, 2015. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 68-00664 **EPA Lab Code: CO00026** **TNI Code:** **(303) 736-0100**

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 6010		Chromium	NELAP	OR	7/16/2014
EPA 6010		Cobalt	NELAP	OR	7/16/2014
EPA 6010		Copper	NELAP	OR	7/16/2014
EPA 6010		Iron	NELAP	OR	7/16/2014
EPA 6010		Lead	NELAP	OR	7/16/2014
EPA 6010		Lithium	NELAP	OR	7/16/2014
EPA 6010		Magnesium	NELAP	OR	7/16/2014
EPA 6010		Manganese	NELAP	OR	7/16/2014
EPA 6010	B	Metals by ICP/AES	NELAP	OR	7/16/2014
EPA 6010		Molybdenum	NELAP	OR	7/16/2014
EPA 6010		Nickel	NELAP	OR	7/16/2014
EPA 6010		Phosphorus, total	NELAP	OR	7/16/2014
EPA 6010		Potassium	NELAP	OR	7/16/2014
EPA 6010		Selenium	NELAP	OR	7/16/2014
EPA 6010		Silica, as SiO2	NELAP	OR	7/16/2014
EPA 6010		Silver	NELAP	OR	7/16/2014
EPA 6010		Sodium	NELAP	OR	7/16/2014
EPA 6010		Strontium	NELAP	OR	7/16/2014
EPA 6010		Thallium	NELAP	OR	7/16/2014
EPA 6010		Tin	NELAP	OR	7/16/2014
EPA 6010		Titanium	NELAP	OR	7/16/2014
EPA 6010		Vanadium	NELAP	OR	7/16/2014
EPA 6010		Zinc	NELAP	OR	7/16/2014
EPA 602		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 602		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 602		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 602		Benzene	NELAP	OR	7/16/2014
EPA 602		Chlorobenzene	NELAP	OR	7/16/2014
EPA 602		Ethylbenzene	NELAP	OR	7/16/2014
EPA 602		Methyl tert-butyl ether (MTBE)	NELAP	OR	7/16/2014
EPA 602		Toluene	NELAP	OR	7/16/2014
EPA 602		Xylenes, total	NELAP	OR	7/16/2014
EPA 6020		Antimony	NELAP	OR	7/16/2014
EPA 6020		Arsenic	NELAP	OR	7/16/2014
EPA 6020		Barium	NELAP	OR	7/16/2014
EPA 6020		Beryllium	NELAP	OR	7/16/2014
EPA 6020		Cadmium	NELAP	OR	7/16/2014
EPA 6020		Chromium	NELAP	OR	7/16/2014
EPA 6020		Cobalt	NELAP	OR	7/16/2014
EPA 6020		Copper	NELAP	OR	7/16/2014
EPA 6020		Lead	NELAP	OR	7/16/2014
EPA 6020		Manganese	NELAP	OR	7/16/2014
EPA 6020	A	Metals by ICP/MS	NELAP	OR	7/16/2014
EPA 6020		Nickel	NELAP	OR	7/16/2014
EPA 6020		Silver	NELAP	OR	7/16/2014
EPA 6020		Thallium	NELAP	OR	7/16/2014
EPA 6020		Zinc	NELAP	OR	7/16/2014

Aaron Alger

Laboratory Scope of Accreditation

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DEP Laboratory ID: 68-00664 EPA Lab Code: CO00026 TNI Code: (303) 736-0100

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 608		4,4'-DDD	NELAP	OR	7/16/2014
EPA 608		4,4'-DDE	NELAP	OR	7/16/2014
EPA 608		4,4'-DDT	NELAP	OR	7/16/2014
EPA 608		Aldrin (HHDN)	NELAP	OR	7/16/2014
EPA 608		Aroclor-1016 (PCB-1016)	NELAP	OR	7/16/2014
EPA 608		Aroclor-1221 (PCB-1221)	NELAP	OR	7/16/2014
EPA 608		Aroclor-1232 (PCB-1232)	NELAP	OR	7/16/2014
EPA 608		Aroclor-1242 (PCB-1242)	NELAP	OR	7/16/2014
EPA 608		Aroclor-1248 (PCB-1248)	NELAP	OR	7/16/2014
EPA 608		Aroclor-1254 (PCB-1254)	NELAP	OR	7/16/2014
EPA 608		Aroclor-1260 (PCB-1260)	NELAP	OR	7/16/2014
EPA 608		Chlordane (tech.)	NELAP	OR	7/16/2014
EPA 608		Dieldrin	NELAP	OR	7/16/2014
EPA 608		Endosulfan I	NELAP	OR	7/16/2014
EPA 608		Endosulfan II	NELAP	OR	7/16/2014
EPA 608		Endosulfan sulfate	NELAP	OR	7/16/2014
EPA 608		Endrin	NELAP	OR	7/16/2014
EPA 608		Endrin aldehyde	NELAP	OR	7/16/2014
EPA 608		Heptachlor	NELAP	OR	7/16/2014
EPA 608		Heptachlor epoxide	NELAP	OR	7/16/2014
EPA 608		Toxaphene (Chlorinated camphene)	NELAP	OR	7/16/2014
EPA 608		alpha-BHC (alpha-Hexachlorocyclohexane)	NELAP	OR	7/16/2014
EPA 608		beta-BHC (beta-Hexachlorocyclohexane)	NELAP	OR	7/16/2014
EPA 608		delta-BHC (delta-Hexachlorocyclohexane)	NELAP	OR	7/16/2014
EPA 608		gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	NELAP	OR	7/16/2014
EPA 610		Acenaphthene	NELAP	OR	7/16/2014
EPA 610		Acenaphthylene	NELAP	OR	7/16/2014
EPA 610		Anthracene	NELAP	OR	7/16/2014
EPA 610		Benzo[a]anthracene	NELAP	OR	7/16/2014
EPA 610		Benzo[a]pyrene	NELAP	OR	7/16/2014
EPA 610		Benzo[b]fluoranthene	NELAP	OR	7/16/2014
EPA 610		Benzo[ghi]perylene	NELAP	OR	7/16/2014
EPA 610		Benzo[k]fluoranthene	NELAP	OR	7/16/2014
EPA 610		Chrysene (Benzo[a]phenanthrene)	NELAP	OR	7/16/2014
EPA 610		Dibenzo[a,h]anthracene	NELAP	OR	7/16/2014
EPA 610		Fluoranthene	NELAP	OR	7/16/2014
EPA 610		Fluorene	NELAP	OR	7/16/2014
EPA 610		Indeno(1,2,3-cd)pyrene	NELAP	OR	7/16/2014
EPA 610		Naphthalene	NELAP	OR	7/16/2014
EPA 610		Phenanthrene	NELAP	OR	7/16/2014
EPA 610		Pyrene	NELAP	OR	7/16/2014
EPA 614		Azinphos-methyl (Guthion)	NELAP	OR	7/16/2014
EPA 614		Demeton-O	NELAP	OR	7/16/2014
EPA 614		Demeton-S	NELAP	OR	7/16/2014
EPA 614		Diazinon (Spectracide)	NELAP	OR	7/16/2014
EPA 614		Disulfoton	NELAP	OR	7/16/2014

Aaron Alger

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pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 009-001 expiration date July 31, 2015. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 68-00664 **EPA Lab Code: CO00026** **TNI Code:** **(303) 736-0100**

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 614		Malathion	NELAP	OR	7/16/2014
EPA 614		Methyl parathion (Parathion, methyl)	NELAP	OR	7/16/2014
EPA 614		Parathion, ethyl (Ethyl parathion, Parathion)	NELAP	OR	7/16/2014
EPA 624		1,1,1-Trichloroethane	NELAP	OR	7/16/2014
EPA 624		1,1,2,2-Tetrachloroethane	NELAP	OR	7/16/2014
EPA 624		1,1,2-Trichloroethane	NELAP	OR	7/16/2014
EPA 624		1,1-Dichloroethane	NELAP	OR	7/16/2014
EPA 624		1,1-Dichloroethene (1,1-Dichloroethylene)	NELAP	OR	7/16/2014
EPA 624		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 624		1,2-Dichloroethane	NELAP	OR	7/16/2014
EPA 624		1,2-Dichloropropane	NELAP	OR	7/16/2014
EPA 624		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 624		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 624		2-Chloroethyl vinyl ether	NELAP	OR	7/16/2014
EPA 624		Acrolein (Propenal)	NELAP	OR	7/16/2014
EPA 624		Acrylonitrile	NELAP	OR	7/16/2014
EPA 624		Benzene	NELAP	OR	7/16/2014
EPA 624		Bromodichloromethane	NELAP	OR	7/16/2014
EPA 624		Bromoform	NELAP	OR	7/16/2014
EPA 624		Bromomethane (Methyl bromide)	NELAP	OR	7/16/2014
EPA 624		Carbon tetrachloride	NELAP	OR	7/16/2014
EPA 624		Chlorobenzene	NELAP	OR	7/16/2014
EPA 624		Chloroethane	NELAP	OR	7/16/2014
EPA 624		Chloroform	NELAP	OR	7/16/2014
EPA 624		Dibromochloromethane	NELAP	OR	7/16/2014
EPA 624		Ethylbenzene	NELAP	OR	7/16/2014
EPA 624		Methylene chloride (Dichloromethane)	NELAP	OR	7/16/2014
EPA 624		Tetrachloroethene (PCE, Perchloroethylene)	NELAP	OR	7/16/2014
EPA 624		Toluene	NELAP	OR	7/16/2014
EPA 624		Trichloroethene (TCE, Trichloroethylene)	NELAP	OR	7/16/2014
EPA 624		Trichlorofluoromethane (Freon 11)	NELAP	OR	7/16/2014
EPA 624		Vinyl chloride (Chloroethene)	NELAP	OR	7/16/2014
EPA 624		Xylenes, total	NELAP	OR	7/16/2014
EPA 624		cis-1,3-Dichloropropene	NELAP	OR	7/16/2014
EPA 624		trans-1,2-Dichloroethene	NELAP	OR	7/16/2014
EPA 624		trans-1,3-Dichloropropene	NELAP	OR	7/16/2014
EPA 625		1,2,4-Trichlorobenzene	NELAP	OR	7/16/2014
EPA 625		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 625		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 625		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 625		2,4,5-Trichlorophenol	NELAP	OR	7/16/2014
EPA 625		2,4,6-Trichlorophenol	NELAP	OR	7/16/2014
EPA 625		2,4-Dichlorophenol	NELAP	OR	7/16/2014
EPA 625		2,4-Dimethylphenol	NELAP	OR	7/16/2014
EPA 625		2,4-Dinitrophenol	NELAP	OR	7/16/2014
EPA 625		2,4-Dinitrotoluene (2,4-DNT)	NELAP	OR	7/16/2014
EPA 625		2,6-Dinitrotoluene (2,6-DNT)	NELAP	OR	7/16/2014

Aaron Alger

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Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 009-001 expiration date July 31, 2015. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 68-00664 EPA Lab Code: CO00026 TNI Code: (303) 736-0100

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 625		2-Chloronaphthalene	NELAP	OR	7/16/2014
EPA 625		2-Chlorophenol	NELAP	OR	7/16/2014
EPA 625		2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	NELAP	OR	7/16/2014
EPA 625		2-Nitrophenol	NELAP	OR	7/16/2014
EPA 625		3,3'-Dichlorobenzidine	NELAP	OR	7/16/2014
EPA 625		4-Bromophenyl phenyl ether	NELAP	OR	7/16/2014
EPA 625		4-Chloro-3-methylphenol	NELAP	OR	7/16/2014
EPA 625		4-Chlorophenyl phenyl ether	NELAP	OR	7/16/2014
EPA 625		4-Nitrophenol	NELAP	OR	7/16/2014
EPA 625		Acenaphthene	NELAP	OR	7/16/2014
EPA 625		Acenaphthylene	NELAP	OR	7/16/2014
EPA 625		Anthracene	NELAP	OR	7/16/2014
EPA 625		Benzidine	NELAP	OR	7/16/2014
EPA 625		Benzo[a]anthracene	NELAP	OR	7/16/2014
EPA 625		Benzo[a]pyrene	NELAP	OR	7/16/2014
EPA 625		Benzo[b]fluoranthene	NELAP	OR	7/16/2014
EPA 625		Benzo[ghi]perylene	NELAP	OR	7/16/2014
EPA 625		Benzo[k]fluoranthene	NELAP	OR	7/16/2014
EPA 625		Butyl benzyl phthalate (Benzyl butyl phthalate)	NELAP	OR	7/16/2014
EPA 625		Carbazole	NELAP	OR	7/16/2014
EPA 625		Chrysene (Benzo[a]phenanthrene)	NELAP	OR	7/16/2014
EPA 625		Di-n-butyl phthalate	NELAP	OR	7/16/2014
EPA 625		Di-n-octyl phthalate	NELAP	OR	7/16/2014
EPA 625		Dibenzo[a,h]anthracene	NELAP	OR	7/16/2014
EPA 625		Diethyl phthalate	NELAP	OR	7/16/2014
EPA 625		Dimethyl phthalate	NELAP	OR	7/16/2014
EPA 625		Fluoranthene	NELAP	OR	7/16/2014
EPA 625		Fluorene	NELAP	OR	7/16/2014
EPA 625		Hexachlorobenzene	NELAP	OR	7/16/2014
EPA 625		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	OR	7/16/2014
EPA 625		Hexachlorocyclopentadiene	NELAP	OR	7/16/2014
EPA 625		Hexachloroethane	NELAP	OR	7/16/2014
EPA 625		Indeno(1,2,3-cd)pyrene	NELAP	OR	7/16/2014
EPA 625		Isophorone	NELAP	OR	7/16/2014
EPA 625		N-Nitrosodi-n-propylamine	NELAP	OR	7/16/2014
EPA 625		N-Nitrosodimethylamine	NELAP	OR	7/16/2014
EPA 625		N-Nitrosodiphenylamine	NELAP	OR	7/16/2014
EPA 625		Naphthalene	NELAP	OR	7/16/2014
EPA 625		Nitrobenzene	NELAP	OR	7/16/2014
EPA 625		Pentachlorophenol (PCP)	NELAP	OR	7/16/2014
EPA 625		Phenanthrene	NELAP	OR	7/16/2014
EPA 625		Phenol	NELAP	OR	7/16/2014
EPA 625		Pyrene	NELAP	OR	7/16/2014
EPA 625		bis(2-Chloroethoxy)methane	NELAP	OR	7/16/2014
EPA 625		bis(2-Chloroethyl) ether	NELAP	OR	7/16/2014

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Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 009-001 expiration date July 31, 2015. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 68-00664 **EPA Lab Code: CO00026** **TNI Code:** **(303) 736-0100**

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 625		bis(2-Chloroisopropyl) ether	NELAP	OR	7/16/2014
EPA 625		bis(2-Ethylhexyl) phthalate (DEHP)	NELAP	OR	7/16/2014
EPA 7196	A	Chromium VI	NELAP	OR	7/16/2014
EPA 7470	A	Mercury	NELAP	OR	7/16/2014
EPA 8011		1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	NELAP	OR	7/16/2014
EPA 8011		1,2-Dibromoethane (EDB, Ethylene dibromide)	NELAP	OR	7/16/2014
EPA 8011		Microextractables by GC-ECD	NELAP	OR	7/16/2014
EPA 8015		Diesel-range organics (DRO)	NELAP	OR	7/16/2014
EPA 8015		Ethanol	NELAP	OR	7/16/2014
EPA 8015		Gasoline-range organics (GRO)	NELAP	OR	7/16/2014
EPA 8015		Isobutyl alcohol (2-Methyl-1-propanol)	NELAP	OR	7/16/2014
EPA 8015		Methanol	NELAP	OR	7/16/2014
EPA 8015	B	Nonhalogenated organics by GC/FID	NELAP	OR	7/16/2014
EPA 8015		n-Butyl alcohol (n-Butanol, 1-Butanol)	NELAP	OR	7/16/2014
EPA 8021		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8021		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8021		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8021		Benzene	NELAP	OR	7/16/2014
EPA 8021		Chlorobenzene	NELAP	OR	7/16/2014
EPA 8021		Ethylbenzene	NELAP	OR	7/16/2014
EPA 8021		Methyl tert-butyl ether (MTBE)	NELAP	OR	7/16/2014
EPA 8021		Naphthalene	NELAP	OR	7/16/2014
EPA 8021		Toluene	NELAP	OR	7/16/2014
EPA 8021	B	VOCs by GC/PID/ELCD	NELAP	OR	7/16/2014
EPA 8021		Xylenes, total	NELAP	OR	7/16/2014
EPA 8081		4,4'-DDD	NELAP	OR	7/16/2014
EPA 8081		4,4'-DDE	NELAP	OR	7/16/2014
EPA 8081		4,4'-DDT	NELAP	OR	7/16/2014
EPA 8081		Aldrin (HHDN)	NELAP	OR	7/16/2014
EPA 8081		Chlordane (tech.)	NELAP	OR	7/16/2014
EPA 8081		Chlorobenzilate	NELAP	OR	7/16/2014
EPA 8081		Diallate (cis or trans)	NELAP	OR	7/16/2014
EPA 8081		Dicofol (Kelthane)	NELAP	OR	7/16/2014
EPA 8081		Dieldrin	NELAP	OR	7/16/2014
EPA 8081		Endosulfan I	NELAP	OR	7/16/2014
EPA 8081		Endosulfan II	NELAP	OR	7/16/2014
EPA 8081		Endosulfan sulfate	NELAP	OR	7/16/2014
EPA 8081		Endrin	NELAP	OR	7/16/2014
EPA 8081		Endrin aldehyde	NELAP	OR	7/16/2014
EPA 8081		Endrin ketone	NELAP	OR	7/16/2014
EPA 8081		Heptachlor	NELAP	OR	7/16/2014
EPA 8081		Heptachlor epoxide	NELAP	OR	7/16/2014
EPA 8081		Isodrin	NELAP	OR	7/16/2014
EPA 8081		Kepone	NELAP	OR	7/16/2014
EPA 8081		Methoxychlor	NELAP	OR	7/16/2014

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Laboratory Scope of Accreditation

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DEP Laboratory ID: 68-00664 EPA Lab Code: CO00026 TNI Code: (303) 736-0100

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8081		Mirex	NELAP	OR	7/16/2014
EPA 8081	A	Organochlorine pesticides by GC/ECD	NELAP	OR	7/16/2014
EPA 8081		alpha-BHC (alpha-Hexachlorocyclohexane)	NELAP	OR	7/16/2014
EPA 8081		alpha-Chlordane	NELAP	OR	7/16/2014
EPA 8081		beta-BHC (beta-Hexachlorocyclohexane)	NELAP	OR	7/16/2014
EPA 8081		delta-BHC (delta-Hexachlorocyclohexane)	NELAP	OR	7/16/2014
EPA 8081		gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	NELAP	OR	7/16/2014
EPA 8081		gamma-Chlordane	NELAP	OR	7/16/2014
EPA 8082		Aroclor-1016 (PCB-1016)	NELAP	OR	7/16/2014
EPA 8082		Aroclor-1221 (PCB-1221)	NELAP	OR	7/16/2014
EPA 8082		Aroclor-1232 (PCB-1232)	NELAP	OR	7/16/2014
EPA 8082		Aroclor-1242 (PCB-1242)	NELAP	OR	7/16/2014
EPA 8082		Aroclor-1248 (PCB-1248)	NELAP	OR	7/16/2014
EPA 8082		Aroclor-1254 (PCB-1254)	NELAP	OR	7/16/2014
EPA 8082		Aroclor-1260 (PCB-1260)	NELAP	OR	7/16/2014
EPA 8082	A	PCBs by GC/ECD	NELAP	OR	7/16/2014
EPA 8141		Atrazine	NELAP	OR	7/16/2014
EPA 8141		Azinphos-ethyl (Ethyl guthion)	NELAP	OR	7/16/2014
EPA 8141		Azinphos-methyl (Guthion)	NELAP	OR	7/16/2014
EPA 8141		Bolstar (Sulprofos)	NELAP	OR	7/16/2014
EPA 8141		Carbophenothion (Trithion)	NELAP	OR	7/16/2014
EPA 8141		Chlorpyrifos	NELAP	OR	7/16/2014
EPA 8141		Coumaphos	NELAP	OR	7/16/2014
EPA 8141		Demeton-O	NELAP	OR	7/16/2014
EPA 8141		Demeton-S	NELAP	OR	7/16/2014
EPA 8141		Diazinon (Spectracide)	NELAP	OR	7/16/2014
EPA 8141		Dichlorovos (DDVP, Dichlorvos)	NELAP	OR	7/16/2014
EPA 8141		Dimethoate	NELAP	OR	7/16/2014
EPA 8141		Disulfoton	NELAP	OR	7/16/2014
EPA 8141		EPN (Santox)	NELAP	OR	7/16/2014
EPA 8141		Ethoprop (Prophos)	NELAP	OR	7/16/2014
EPA 8141		Famphur	NELAP	OR	7/16/2014
EPA 8141		Fensulfothion	NELAP	OR	7/16/2014
EPA 8141		Fenthion	NELAP	OR	7/16/2014
EPA 8141		Malathion	NELAP	OR	7/16/2014
EPA 8141		Merphos	NELAP	OR	7/16/2014
EPA 8141		Methyl parathion (Parathion, methyl)	NELAP	OR	7/16/2014
EPA 8141		Mevinphos	NELAP	OR	7/16/2014
EPA 8141		Naled	NELAP	OR	7/16/2014
EPA 8141	A	Organophosphorus compounds by GC/NPD	NELAP	OR	7/16/2014
EPA 8141		Parathion, ethyl (Ethyl parathion, Parathion)	NELAP	OR	7/16/2014
EPA 8141		Phorate (Thimet)	NELAP	OR	7/16/2014
EPA 8141		Phosmet (Imidan)	NELAP	OR	7/16/2014
EPA 8141		Ronnel	NELAP	OR	7/16/2014
EPA 8141		Simazine	NELAP	OR	7/16/2014
EPA 8141		Stirophos (Tetrachlorovinphos)	NELAP	OR	7/16/2014

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The Pennsylvania Department of Environmental Protection Laboratory Accreditation Program is a NELAP recognized Accreditation Body. Customers are urged to verify the laboratory's current accreditation standing.

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8141		Sulfotepp (Tetraethyl dithiopyrophosphate)	NELAP	OR	7/16/2014
EPA 8141		Thionazine (Thionazin, Zinophos)	NELAP	OR	7/16/2014
EPA 8141		Tokuthion (Prothiophos)	NELAP	OR	7/16/2014
EPA 8141		Trichloronate	NELAP	OR	7/16/2014
EPA 8151		2,4,5-T	NELAP	OR	7/16/2014
EPA 8151		2,4,5-TP (Silvex)	NELAP	OR	7/16/2014
EPA 8151		2,4-D	NELAP	OR	7/16/2014
EPA 8151		2,4-DB (Butoxon)	NELAP	OR	7/16/2014
EPA 8151	A	Chlorinated herbicides by GC/ECD	NELAP	OR	7/16/2014
EPA 8151		Dalapon (2,2-Dichloropropionic acid)	NELAP	OR	7/16/2014
EPA 8151		Dicamba	NELAP	OR	7/16/2014
EPA 8151		Dichloroprop (Dichlorprop)	NELAP	OR	7/16/2014
EPA 8151		Dinoseb (2-sec-Butyl-4,6-dinitrophenol, DNBP)	NELAP	OR	7/16/2014
EPA 8151		MCPA	NELAP	OR	7/16/2014
EPA 8151		MCPP (Mecoprop)	NELAP	OR	7/16/2014
EPA 8151		Picloram (4-Amino-3,5,6-trichloro-2-pyridinecarboxylic acid)	NELAP	OR	7/16/2014
EPA 8260		1,1,1,2-Tetrachloroethane	NELAP	OR	7/16/2014
EPA 8260		1,1,1-Trichloroethane	NELAP	OR	7/16/2014
EPA 8260		1,1,2,2-Tetrachloroethane	NELAP	OR	7/16/2014
EPA 8260		1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	NELAP	OR	7/16/2014
EPA 8260		1,1,2-Trichloroethane	NELAP	OR	7/16/2014
EPA 8260		1,1-Dichloroethane	NELAP	OR	7/16/2014
EPA 8260		1,1-Dichloroethene (1,1-Dichloroethylene)	NELAP	OR	7/16/2014
EPA 8260		1,1-Dichloropropene	NELAP	OR	7/16/2014
EPA 8260		1,2,3-Trichlorobenzene	NELAP	OR	7/16/2014
EPA 8260		1,2,3-Trichloropropane (1,2,3-TCP)	NELAP	OR	7/16/2014
EPA 8260		1,2,4-Trichlorobenzene	NELAP	OR	7/16/2014
EPA 8260		1,2,4-Trimethylbenzene	NELAP	OR	7/16/2014
EPA 8260		1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	NELAP	OR	7/16/2014
EPA 8260		1,2-Dibromoethane (EDB, Ethylene dibromide)	NELAP	OR	7/16/2014
EPA 8260		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8260		1,2-Dichloroethane	NELAP	OR	7/16/2014
EPA 8260		1,2-Dichloropropane	NELAP	OR	7/16/2014
EPA 8260		1,3,5-Trimethylbenzene	NELAP	OR	7/16/2014
EPA 8260		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8260		1,3-Dichloropropane	NELAP	OR	7/16/2014
EPA 8260		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8260		1,4-Dioxane (1,4-Diethyleneoxide)	NELAP	OR	7/16/2014
EPA 8260		1-Chlorohexane	NELAP	OR	7/16/2014
EPA 8260		2,2-Dichloropropane	NELAP	OR	7/16/2014
EPA 8260		2-Butanone (Methyl ethyl ketone, MEK)	NELAP	OR	7/16/2014
EPA 8260		2-Chloroethyl vinyl ether	NELAP	OR	7/16/2014
EPA 8260		2-Chlorotoluene	NELAP	OR	7/16/2014

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Laboratory Scope of Accreditation

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DEP Laboratory ID: 68-00664 EPA Lab Code: CO00026 TNI Code: (303) 736-0100

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8260		2-Hexanone	NELAP	OR	7/16/2014
EPA 8260		2-Nitropropane	NELAP	OR	7/16/2014
EPA 8260		2-Pentanone	NELAP	OR	7/16/2014
EPA 8260		4-Chlorotoluene	NELAP	OR	7/16/2014
EPA 8260		4-Methyl-2-pentanone (MIBK)	NELAP	OR	7/16/2014
EPA 8260		Acetone	NELAP	OR	7/16/2014
EPA 8260		Acetonitrile	NELAP	OR	7/16/2014
EPA 8260		Acrolein (Propenal)	NELAP	OR	7/16/2014
EPA 8260		Acrylonitrile	NELAP	OR	7/16/2014
EPA 8260		Allyl chloride (3-Chloropropene)	NELAP	OR	7/16/2014
EPA 8260		Benzene	NELAP	OR	7/16/2014
EPA 8260		Bromobenzene	NELAP	OR	7/16/2014
EPA 8260		Bromochloromethane	NELAP	OR	7/16/2014
EPA 8260		Bromodichloromethane	NELAP	OR	7/16/2014
EPA 8260		Bromoform	NELAP	OR	7/16/2014
EPA 8260		Bromomethane (Methyl bromide)	NELAP	OR	7/16/2014
EPA 8260		Carbon disulfide	NELAP	OR	7/16/2014
EPA 8260		Carbon tetrachloride	NELAP	OR	7/16/2014
EPA 8260		Chlorobenzene	NELAP	OR	7/16/2014
EPA 8260		Chloroethane	NELAP	OR	7/16/2014
EPA 8260		Chloroform	NELAP	OR	7/16/2014
EPA 8260		Chloromethane (Methyl chloride)	NELAP	OR	7/16/2014
EPA 8260		Chloroprene (2-Chloro-1,3-butadiene)	NELAP	OR	7/16/2014
EPA 8260		Cyclohexane	NELAP	OR	7/16/2014
EPA 8260		Dibromochloromethane	NELAP	OR	7/16/2014
EPA 8260		Dibromomethane	NELAP	OR	7/16/2014
EPA 8260		Dichlorodifluoromethane (Freon 12)	NELAP	OR	7/16/2014
EPA 8260		Diethyl ether (Ethyl ether)	NELAP	OR	7/16/2014
EPA 8260		Diisopropyl ether (DIPE)	NELAP	OR	7/16/2014
EPA 8260		Ethanol	NELAP	OR	7/16/2014
EPA 8260		Ethyl acetate	NELAP	OR	7/16/2014
EPA 8260		Ethyl methacrylate	NELAP	OR	7/16/2014
EPA 8260		Ethylbenzene	NELAP	OR	7/16/2014
EPA 8260		Ethylene oxide	NELAP	OR	7/16/2014
EPA 8260		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	OR	7/16/2014
EPA 8260		Iodomethane (Methyl iodide)	NELAP	OR	7/16/2014
EPA 8260		Isobutyl alcohol (2-Methyl-1-propanol)	NELAP	OR	7/16/2014
EPA 8260		Isopropyl alcohol (2-Propanol)	NELAP	OR	7/16/2014
EPA 8260		Isopropylbenzene (Cumene)	NELAP	OR	7/16/2014
EPA 8260		Methacrylonitrile	NELAP	OR	7/16/2014
EPA 8260		Methyl tert-butyl ether (MTBE)	NELAP	OR	7/16/2014
EPA 8260		Methylene chloride (Dichloromethane)	NELAP	OR	7/16/2014
EPA 8260		Methylmethacrylate	NELAP	OR	7/16/2014
EPA 8260		Naphthalene	NELAP	OR	7/16/2014
EPA 8260		Pentachloroethane	NELAP	OR	7/16/2014
EPA 8260		Propionitrile (Ethyl cyanide)	NELAP	OR	7/16/2014

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Laboratory Scope of Accreditation

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DEP Laboratory ID: 68-00664 **EPA Lab Code: CO00026** **TNI Code:** **(303) 736-0100**

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8260		Styrene	NELAP	OR	7/16/2014
EPA 8260		Tetrachloroethene (PCE, Perchloroethylene)	NELAP	OR	7/16/2014
EPA 8260		Toluene	NELAP	OR	7/16/2014
EPA 8260		Trichloroethene (TCE, Trichloroethylene)	NELAP	OR	7/16/2014
EPA 8260		Trichlorofluoromethane (Freon 11)	NELAP	OR	7/16/2014
EPA 8260	B	VOCs by GC/MS	NELAP	OR	7/16/2014
EPA 8260		Vinyl acetate	NELAP	OR	7/16/2014
EPA 8260		Vinyl chloride (Chloroethene)	NELAP	OR	7/16/2014
EPA 8260		Xylenes, total	NELAP	OR	7/16/2014
EPA 8260		cis-1,2-Dichloroethene	NELAP	OR	7/16/2014
EPA 8260		cis-1,3-Dichloropropene	NELAP	OR	7/16/2014
EPA 8260		cis-1,4-Dichloro-2-butene	NELAP	OR	7/16/2014
EPA 8260		n-Butyl alcohol (n-Butanol, 1-Butanol)	NELAP	OR	7/16/2014
EPA 8260		n-Butylbenzene	NELAP	OR	7/16/2014
EPA 8260		n-Propylbenzene	NELAP	OR	7/16/2014
EPA 8260		sec-Butylbenzene	NELAP	OR	7/16/2014
EPA 8260		tert-Butyl alcohol (2-Methyl-2-propanol)	NELAP	OR	7/16/2014
EPA 8260		tert-Butylbenzene	NELAP	OR	7/16/2014
EPA 8260		trans-1,2-Dichloroethene	NELAP	OR	7/16/2014
EPA 8260		trans-1,3-Dichloropropene	NELAP	OR	7/16/2014
EPA 8260		trans-1,4-Dichloro-2-butene	NELAP	OR	7/16/2014
EPA 8270		1,2,4,5-Tetrachlorobenzene	NELAP	OR	7/16/2014
EPA 8270		1,2,4-Trichlorobenzene	NELAP	OR	7/16/2014
EPA 8270		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8270		1,2-Diphenylhydrazine	NELAP	OR	7/16/2014
EPA 8270		1,3,5-Trinitrobenzene (1,3,5-TNB)	NELAP	OR	7/16/2014
EPA 8270		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8270		1,3-Dinitrobenzene (1,3-DNB)	NELAP	OR	7/16/2014
EPA 8270		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8270		1,4-Dinitrobenzene (1,4-DNB)	NELAP	OR	7/16/2014
EPA 8270		1,4-Naphthoquinone	NELAP	OR	7/16/2014
EPA 8270		1,4-Phenylenediamine	NELAP	OR	7/16/2014
EPA 8270		1-Chloronaphthalene	NELAP	OR	7/16/2014
EPA 8270		1-Naphthylamine (alpha-Naphthylamine)	NELAP	OR	7/16/2014
EPA 8270		2,3,4,6-Tetrachlorophenol	NELAP	OR	7/16/2014
EPA 8270		2,4,5-Trichlorophenol	NELAP	OR	7/16/2014
EPA 8270		2,4,6-Trichlorophenol	NELAP	OR	7/16/2014
EPA 8270		2,4-Dichlorophenol	NELAP	OR	7/16/2014
EPA 8270		2,4-Dimethylphenol	NELAP	OR	7/16/2014
EPA 8270		2,4-Dinitrophenol	NELAP	OR	7/16/2014
EPA 8270		2,4-Dinitrotoluene (2,4-DNT)	NELAP	OR	7/16/2014
EPA 8270		2,6-Dichlorophenol	NELAP	OR	7/16/2014
EPA 8270		2,6-Dinitrotoluene (2,6-DNT)	NELAP	OR	7/16/2014
EPA 8270		2-Acetylaminofluorene	NELAP	OR	7/16/2014
EPA 8270		2-Chloronaphthalene	NELAP	OR	7/16/2014
EPA 8270		2-Chlorophenol	NELAP	OR	7/16/2014

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Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8270		2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	NELAP	OR	7/16/2014
EPA 8270		2-Methylnaphthalene	NELAP	OR	7/16/2014
EPA 8270		2-Methylphenol (o-Cresol)	NELAP	OR	7/16/2014
EPA 8270		2-Naphthylamine (beta-Naphthylamine)	NELAP	OR	7/16/2014
EPA 8270		2-Nitroaniline	NELAP	OR	7/16/2014
EPA 8270		2-Nitrophenol	NELAP	OR	7/16/2014
EPA 8270		2-Picoline (2-Methylpyridine)	NELAP	OR	7/16/2014
EPA 8270		3+4-Methylphenol (m+p-Cresol)	NELAP	OR	7/16/2014
EPA 8270		3,3'-Dichlorobenzidine	NELAP	OR	7/16/2014
EPA 8270		3,3'-Dimethylbenzidine	NELAP	OR	7/16/2014
EPA 8270		3-Methylcholanthrene	NELAP	OR	7/16/2014
EPA 8270		3-Nitroaniline	NELAP	OR	7/16/2014
EPA 8270		4,4'-Methylenebis(2-chloroaniline)	NELAP	OR	7/16/2014
EPA 8270		4-Aminobiphenyl	NELAP	OR	7/16/2014
EPA 8270		4-Bromophenyl phenyl ether	NELAP	OR	7/16/2014
EPA 8270		4-Chloro-3-methylphenol	NELAP	OR	7/16/2014
EPA 8270		4-Chloroaniline	NELAP	OR	7/16/2014
EPA 8270		4-Chlorophenyl phenyl ether	NELAP	OR	7/16/2014
EPA 8270		4-Dimethylaminoazobenzene (Dimethylaminoazobenzene)	NELAP	OR	7/16/2014
EPA 8270		4-Nitroaniline	NELAP	OR	7/16/2014
EPA 8270		4-Nitrophenol	NELAP	OR	7/16/2014
EPA 8270		4-Nitroquinoline-1-oxide	NELAP	OR	7/16/2014
EPA 8270		5-Nitro-o-toluidine	NELAP	OR	7/16/2014
EPA 8270		7,12-Dimethylbenz(a)anthracene	NELAP	OR	7/16/2014
EPA 8270		Acenaphthene	NELAP	OR	7/16/2014
EPA 8270		Acenaphthylene	NELAP	OR	7/16/2014
EPA 8270		Acetophenone	NELAP	OR	7/16/2014
EPA 8270		Aniline	NELAP	OR	7/16/2014
EPA 8270		Anthracene	NELAP	OR	7/16/2014
EPA 8270		Aramite	NELAP	OR	7/16/2014
EPA 8270		Benzidine	NELAP	OR	7/16/2014
EPA 8270		Benzo[a]anthracene	NELAP	OR	7/16/2014
EPA 8270		Benzo[a]pyrene	NELAP	OR	7/16/2014
EPA 8270		Benzo[b]fluoranthene	NELAP	OR	7/16/2014
EPA 8270		Benzo[ghi]perylene	NELAP	OR	7/16/2014
EPA 8270		Benzo[k]fluoranthene	NELAP	OR	7/16/2014
EPA 8270		Benzoic acid	NELAP	OR	7/16/2014
EPA 8270		Benzyl alcohol	NELAP	OR	7/16/2014
EPA 8270		Benzyl butyl phthalate (Butyl benzyl phthalate)	NELAP	OR	7/16/2014
EPA 8270		Carbazole	NELAP	OR	7/16/2014
EPA 8270		Chrysene (Benzo[a]phenanthrene)	NELAP	OR	7/16/2014
EPA 8270		Di-n-butyl phthalate	NELAP	OR	7/16/2014
EPA 8270		Di-n-octyl phthalate	NELAP	OR	7/16/2014
EPA 8270		Dibenzo[a,h]anthracene	NELAP	OR	7/16/2014
EPA 8270		Dibenzofuran	NELAP	OR	7/16/2014

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Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 009-001 expiration date July 31, 2015. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 68-00664 **EPA Lab Code: CO00026** **TNI Code:** **(303) 736-0100**

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8270		Diethyl phthalate	NELAP	OR	7/16/2014
EPA 8270		Dimethoate	NELAP	OR	7/16/2014
EPA 8270		Dimethyl phthalate	NELAP	OR	7/16/2014
EPA 8270		Dinoseb (2-sec-Butyl-4,6-dinitrophenol, DNBP)	NELAP	OR	7/16/2014
EPA 8270		Diphenylamine	NELAP	OR	7/16/2014
EPA 8270		Disulfoton	NELAP	OR	7/16/2014
EPA 8270		Ethyl methanesulfonate	NELAP	OR	7/16/2014
EPA 8270		Famphur	NELAP	OR	7/16/2014
EPA 8270		Fluoranthene	NELAP	OR	7/16/2014
EPA 8270		Fluorene	NELAP	OR	7/16/2014
EPA 8270		Hexachlorobenzene	NELAP	OR	7/16/2014
EPA 8270		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	OR	7/16/2014
EPA 8270		Hexachlorocyclopentadiene	NELAP	OR	7/16/2014
EPA 8270		Hexachloroethane	NELAP	OR	7/16/2014
EPA 8270		Hexachloropropene	NELAP	OR	7/16/2014
EPA 8270		Indeno(1,2,3-cd)pyrene	NELAP	OR	7/16/2014
EPA 8270		Isodrin	NELAP	OR	7/16/2014
EPA 8270		Isophorone	NELAP	OR	7/16/2014
EPA 8270		Isosafrole	NELAP	OR	7/16/2014
EPA 8270		Methapyrilene	NELAP	OR	7/16/2014
EPA 8270		Methyl methanesulfonate	NELAP	OR	7/16/2014
EPA 8270		Methyl parathion (Parathion, methyl)	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosodi-n-butylamine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosodi-n-propylamine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosodiethylamine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosodimethylamine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosodiphenylamine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosomethylethylamine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosomorpholine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosopiperidine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosopyrrolidine	NELAP	OR	7/16/2014
EPA 8270		Naphthalene	NELAP	OR	7/16/2014
EPA 8270		Nitrobenzene	NELAP	OR	7/16/2014
EPA 8270		O,O,O-Triethyl phosphorothioate	NELAP	OR	7/16/2014
EPA 8270		Parathion, ethyl (Ethyl parathion, Parathion)	NELAP	OR	7/16/2014
EPA 8270		Pentachlorobenzene	NELAP	OR	7/16/2014
EPA 8270		Pentachloronitrobenzene (PCNB)	NELAP	OR	7/16/2014
EPA 8270		Pentachlorophenol (PCP)	NELAP	OR	7/16/2014
EPA 8270		Phenacetin	NELAP	OR	7/16/2014
EPA 8270		Phenanthrene	NELAP	OR	7/16/2014
EPA 8270		Phenol	NELAP	OR	7/16/2014
EPA 8270		Phorate (Thimet)	NELAP	OR	7/16/2014
EPA 8270		Phthalic anhydride	NELAP	OR	7/16/2014
EPA 8270		Pronamide (Kerb)	NELAP	OR	7/16/2014
EPA 8270		Pyrene	NELAP	OR	7/16/2014

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Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8270		Pyridine	NELAP	OR	7/16/2014
EPA 8270	C	SOCs by GC/MS	NELAP	OR	7/16/2014
EPA 8270		Safrole	NELAP	OR	7/16/2014
EPA 8270		Sulfotepp (Tetraethyl dithiopyrophosphate)	NELAP	OR	7/16/2014
EPA 8270		Thionazine (Thionazin, Zinophos)	NELAP	OR	7/16/2014
EPA 8270		a,a-Dimethylphenethylamine (Phentermine)	NELAP	OR	7/16/2014
EPA 8270		bis(2-Chloroethoxy)methane	NELAP	OR	7/16/2014
EPA 8270		bis(2-Chloroethyl) ether	NELAP	OR	7/16/2014
EPA 8270		bis(2-Chloroisopropyl) ether	NELAP	OR	7/16/2014
EPA 8270		bis(2-Ethylhexyl) phthalate (DEHP)	NELAP	OR	7/16/2014
EPA 8270		o-Toluidine (2-Toluidine, 2-Methylaniline)	NELAP	OR	7/16/2014
EPA 8270		tris-(2,3-Dibromopropyl) phosphate (tris-BP)	NELAP	OR	7/16/2014
EPA 8310		Acenaphthene	NELAP	OR	7/16/2014
EPA 8310		Acenaphthylene	NELAP	OR	7/16/2014
EPA 8310		Anthracene	NELAP	OR	7/16/2014
EPA 8310		Benzo[a]anthracene	NELAP	OR	7/16/2014
EPA 8310		Benzo[a]pyrene	NELAP	OR	7/16/2014
EPA 8310		Benzo[b]fluoranthene	NELAP	OR	7/16/2014
EPA 8310		Benzo[ghi]perylene	NELAP	OR	7/16/2014
EPA 8310		Benzo[k]fluoranthene	NELAP	OR	7/16/2014
EPA 8310		Chrysene (Benzo[a]phenanthrene)	NELAP	OR	7/16/2014
EPA 8310		Dibenzo[a,h]anthracene	NELAP	OR	7/16/2014
EPA 8310		Fluoranthene	NELAP	OR	7/16/2014
EPA 8310		Fluorene	NELAP	OR	7/16/2014
EPA 8310		Indeno(1,2,3-cd)pyrene	NELAP	OR	7/16/2014
EPA 8310		Naphthalene	NELAP	OR	7/16/2014
EPA 8310		PAHs by HPLC/UV/Fluorescence	NELAP	OR	7/16/2014
EPA 8310		Phenanthrene	NELAP	OR	7/16/2014
EPA 8310		Pyrene	NELAP	OR	7/16/2014
EPA 8321		2,4,5-T	NELAP	OR	7/16/2014
EPA 8321		2,4-D	NELAP	OR	7/16/2014
EPA 8321		2,4-DB (Butoxon)	NELAP	OR	7/16/2014
EPA 8321		Dalapon (2,2-Dichloropropionic acid)	NELAP	OR	7/16/2014
EPA 8321		Dicamba	NELAP	OR	7/16/2014
EPA 8321		Dichloroprop (Dichlorprop)	NELAP	OR	7/16/2014
EPA 8321		Dinoseb (2-sec-Butyl-4,6-dinitrophenol, DNBP)	NELAP	OR	7/16/2014
EPA 8321		Linuron (Lorox)	NELAP	OR	7/16/2014
EPA 8321		MCPA	NELAP	OR	7/16/2014
EPA 8321		MCPP (Mecoprop)	NELAP	OR	7/16/2014
EPA 8321		Neburon	NELAP	OR	7/16/2014
EPA 8321	A	Non-volatile compounds by HPLC-MS or HPLC-UV	NELAP	OR	7/16/2014
EPA 8321		Oxamyl (Vydate)	NELAP	OR	7/16/2014
EPA 8321		Pentachlorophenol (PCP)	NELAP	OR	7/16/2014
EPA 8321		Propoxur (Baygon)	NELAP	OR	7/16/2014
EPA 8321		Siduron	NELAP	OR	7/16/2014

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Laboratory Scope of Accreditation

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DEP Laboratory ID: 68-00664 EPA Lab Code: CO00026 TNI Code: (303) 736-0100

Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8330		1,3,5-Trinitrobenzene (1,3,5-TNB)	NELAP	OR	7/16/2014
EPA 8330		1,3-Dinitrobenzene (1,3-DNB)	NELAP	OR	7/16/2014
EPA 8330		2,4,6-Trinitrotoluene (2,4,6-TNT)	NELAP	OR	7/16/2014
EPA 8330		2,4-Dinitrotoluene (2,4-DNT)	NELAP	OR	7/16/2014
EPA 8330		2,6-Dinitrotoluene (2,6-DNT)	NELAP	OR	7/16/2014
EPA 8330		2-Amino-4,6-dinitrotoluene (2-Am-DNT)	NELAP	OR	7/16/2014
EPA 8330		2-Nitrotoluene	NELAP	OR	7/16/2014
EPA 8330		3-Nitrotoluene	NELAP	OR	7/16/2014
EPA 8330		4-Amino-2,6-dinitrotoluene (4-Am-DNT)	NELAP	OR	7/16/2014
EPA 8330		4-Nitrotoluene	NELAP	OR	7/16/2014
EPA 8330		Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	NELAP	OR	7/16/2014
EPA 8330		Nitroaromatics and nitramines by HPLC/UV	NELAP	OR	7/16/2014
EPA 8330		Nitrobenzene	NELAP	OR	7/16/2014
EPA 8330		Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	NELAP	OR	7/16/2014
EPA 9012		Total cyanide	NELAP	OR	7/16/2014
EPA 9020	B	Total organic halides (TOX)	NELAP	OR	7/16/2014
EPA 9030	B	Sulfide	NELAP	OR	7/16/2014
EPA 9034		Total sulfides	NELAP	OR	7/16/2014
EPA 9040	C	pH	NELAP	OR	7/16/2014
EPA 9050		Conductivity	NELAP	OR	7/16/2014
EPA 9056	A	Anions by IC	NELAP	OR	7/16/2014
EPA 9056		Bromide	NELAP	OR	7/16/2014
EPA 9056		Chloride	NELAP	OR	7/16/2014
EPA 9056		Fluoride	NELAP	OR	7/16/2014
EPA 9056		Nitrate as N	NELAP	OR	7/16/2014
EPA 9056		Nitrite as N	NELAP	OR	7/16/2014
EPA 9056		Orthophosphate as P	NELAP	OR	7/16/2014
EPA 9056		Sulfate	NELAP	OR	7/16/2014
EPA 9060		Total organic carbon (TOC)	NELAP	OR	7/16/2014
EPA 9060	A	Total organic carbon (TOC)	NELAP	OR	7/16/2014
EPA 9066		Total phenolics	NELAP	OR	7/16/2014
SM 2120 B		Color	NELAP	OR	7/16/2014
SM 2310 B		Acidity as CaCO3	NELAP	OR	7/16/2014
SM 2320 B		Alkalinity as CaCO3	NELAP	OR	7/16/2014
SM 2340 C		Total hardness as CaCO3	NELAP	OR	7/16/2014
SM 2510 B		Conductivity	NELAP	OR	7/16/2014
SM 2540 B		Residue, total	NELAP	OR	7/16/2014
SM 2540 C		Residue, filterable (TDS)	NELAP	OR	7/16/2014
SM 2540 D		Residue, nonfilterable (TSS)	NELAP	OR	7/16/2014
SM 2540 F		Residue, settleable	NELAP	OR	7/16/2014
SM 3500-Cr B	20-22	Chromium VI	NELAP	OR	7/16/2014
SM 3500-Cr D	18/19	Chromium VI	NELAP	OR	7/16/2014
SM 4500-CN- C/E		Total cyanide	NELAP	OR	7/16/2014
SM 4500-CN- G		Amenable cyanide	NELAP	OR	7/16/2014
SM 4500-H+ B		pH	NELAP	OR	7/16/2014

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Matrix: Non-Potable Water

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
SM 4500-NO2- B		Nitrite as N	NELAP	OR	7/16/2014
SM 4500-S D		Sulfide	NELAP	OR	7/16/2014
SM 4500-S F		Sulfide	NELAP	OR	7/16/2014
SM 4500-SO3 B		Sulfite, SO3	NELAP	OR	7/16/2014
SM 5210 B		Biochemical oxygen demand (BOD)	NELAP	OR	7/16/2014
SM 5210 B		Carbonaceous BOD (CBOD)	NELAP	OR	7/16/2014
SM 5310 B		Total organic carbon (TOC)	NELAP	OR	7/16/2014

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 1010	A	Ignitability	NELAP	OR	7/16/2014
EPA 1311		Toxicity characteristic leaching procedure (TCLP)	NELAP	OR	7/16/2014
EPA 1312		Synthetic precipitation leaching procedure (SPLP)	NELAP	OR	7/16/2014
EPA 3050		Acid digestion of solids	NELAP	OR	7/16/2014
EPA 3050	B	Acid digestion of solids	NELAP	OR	7/16/2014
EPA 3052		Microwave digestion of solids (HNO3 + HF)	NELAP	OR	7/16/2014
EPA 3540	C	Soxhlet extraction	NELAP	OR	7/16/2014
EPA 3546		Microwave extraction	NELAP	OR	7/16/2014
EPA 3550	B	Ultrasonic extraction	NELAP	OR	7/16/2014
EPA 3580	A	Waste dilution	NELAP	OR	7/16/2014
EPA 3620	B	Florisil cleanup	NELAP	OR	7/16/2014
EPA 3660	B	Sulfur cleanup	NELAP	OR	7/16/2014
EPA 3665	A	Sulfuric acid/permanganate clean-up	NELAP	OR	7/16/2014
EPA 5035		Closed-system purge-and-trap (bisulfate option)	NELAP	OR	7/16/2014
EPA 5035		Closed-system purge-and-trap (methanol option)	NELAP	OR	7/16/2014
EPA 5035		Closed-system purge-and-trap (unpreserved)	NELAP	OR	7/16/2014
EPA 6010		Aluminum	NELAP	OR	7/16/2014
EPA 6010		Antimony	NELAP	OR	7/16/2014
EPA 6010		Arsenic	NELAP	OR	7/16/2014
EPA 6010		Barium	NELAP	OR	7/16/2014
EPA 6010		Beryllium	NELAP	OR	7/16/2014
EPA 6010		Boron	NELAP	OR	7/16/2014
EPA 6010		Cadmium	NELAP	OR	7/16/2014
EPA 6010		Calcium	NELAP	OR	7/16/2014
EPA 6010		Chromium	NELAP	OR	7/16/2014
EPA 6010		Cobalt	NELAP	OR	7/16/2014
EPA 6010		Copper	NELAP	OR	7/16/2014
EPA 6010		Iron	NELAP	OR	7/16/2014
EPA 6010		Lead	NELAP	OR	7/16/2014
EPA 6010		Lithium	NELAP	OR	7/16/2014
EPA 6010		Magnesium	NELAP	OR	7/16/2014

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Laboratory Scope of Accreditation

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DEP Laboratory ID: 68-00664 **EPA Lab Code: CO00026** **TNI Code:** **(303) 736-0100**

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 6010		Manganese	NELAP	OR	7/16/2014
EPA 6010	B	Metals by ICP/AES	NELAP	OR	7/16/2014
EPA 6010		Molybdenum	NELAP	OR	7/16/2014
EPA 6010		Nickel	NELAP	OR	7/16/2014
EPA 6010		Phosphorus, total	NELAP	OR	7/16/2014
EPA 6010		Potassium	NELAP	OR	7/16/2014
EPA 6010		Selenium	NELAP	OR	7/16/2014
EPA 6010		Silica, as SiO2	NELAP	OR	7/16/2014
EPA 6010		Silver	NELAP	OR	7/16/2014
EPA 6010		Sodium	NELAP	OR	7/16/2014
EPA 6010		Strontium	NELAP	OR	7/16/2014
EPA 6010		Thallium	NELAP	OR	7/16/2014
EPA 6010		Tin	NELAP	OR	7/16/2014
EPA 6010		Titanium	NELAP	OR	7/16/2014
EPA 6010		Vanadium	NELAP	OR	7/16/2014
EPA 6010		Zinc	NELAP	OR	7/16/2014
EPA 6020		Antimony	NELAP	OR	7/16/2014
EPA 6020		Arsenic	NELAP	OR	7/16/2014
EPA 6020		Barium	NELAP	OR	7/16/2014
EPA 6020		Beryllium	NELAP	OR	7/16/2014
EPA 6020		Cadmium	NELAP	OR	7/16/2014
EPA 6020		Chromium	NELAP	OR	7/16/2014
EPA 6020		Cobalt	NELAP	OR	7/16/2014
EPA 6020		Copper	NELAP	OR	7/16/2014
EPA 6020		Lead	NELAP	OR	7/16/2014
EPA 6020		Manganese	NELAP	OR	7/16/2014
EPA 6020	A	Metals by ICP/MS	NELAP	OR	7/16/2014
EPA 6020		Molybdenum	NELAP	OR	7/16/2014
EPA 6020		Nickel	NELAP	OR	7/16/2014
EPA 6020		Selenium	NELAP	OR	7/16/2014
EPA 6020		Silver	NELAP	OR	7/16/2014
EPA 6020		Thallium	NELAP	OR	7/16/2014
EPA 6020		Vanadium	NELAP	OR	7/16/2014
EPA 6020		Zinc	NELAP	OR	7/16/2014
EPA 7196	A	Chromium VI	NELAP	OR	7/16/2014
EPA 7471	A	Mercury	NELAP	OR	7/16/2014
EPA 8011		1,2-Dibromo-3-chloropropane (DBCP, Dibromochloropropane)	NELAP	OR	7/16/2014
EPA 8011		1,2-Dibromoethane (EDB, Ethylene dibromide)	NELAP	OR	7/16/2014
EPA 8015		Diesel-range organics (DRO)	NELAP	OR	7/16/2014
EPA 8015		Ethanol	NELAP	OR	7/16/2014
EPA 8015		Ethylene glycol	NELAP	OR	7/16/2014
EPA 8015		Gasoline-range organics (GRO)	NELAP	OR	7/16/2014
EPA 8015		Isobutyl alcohol (2-Methyl-1-propanol)	NELAP	OR	7/16/2014
EPA 8015		Isopropyl alcohol (2-Propanol)	NELAP	OR	7/16/2014
EPA 8015		Methanol	NELAP	OR	7/16/2014

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Laboratory Scope of Accreditation

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DEP Laboratory ID: 68-00664 EPA Lab Code: CO00026 TNI Code: (303) 736-0100

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8015	B	Nonhalogenated organics by GC/FID	NELAP	OR	7/16/2014
EPA 8015		n-Butyl alcohol (n-Butanol, 1-Butanol)	NELAP	OR	7/16/2014
EPA 8015		n-Propanol (1-Propanol)	NELAP	OR	7/16/2014
EPA 8021		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8021		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8021		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8021		Benzene	NELAP	OR	7/16/2014
EPA 8021		Chlorobenzene	NELAP	OR	7/16/2014
EPA 8021		Ethylbenzene	NELAP	OR	7/16/2014
EPA 8021		Methyl tert-butyl ether (MTBE)	NELAP	OR	7/16/2014
EPA 8021		Naphthalene	NELAP	OR	7/16/2014
EPA 8021		Toluene	NELAP	OR	7/16/2014
EPA 8021	B	VOCs by GC/PID/ELCD	NELAP	OR	7/16/2014
EPA 8021		Xylenes, total	NELAP	OR	7/16/2014
EPA 8081		4,4'-DDD	NELAP	OR	7/16/2014
EPA 8081		4,4'-DDE	NELAP	OR	7/16/2014
EPA 8081		4,4'-DDT	NELAP	OR	7/16/2014
EPA 8081		Aldrin (HHDN)	NELAP	OR	7/16/2014
EPA 8081		Chlordane (tech.)	NELAP	OR	7/16/2014
EPA 8081		Chlorobenzilate	NELAP	OR	7/16/2014
EPA 8081		Diallate (cis or trans)	NELAP	OR	7/16/2014
EPA 8081		Dicofol (Kelthane)	NELAP	OR	7/16/2014
EPA 8081		Dieldrin	NELAP	OR	7/16/2014
EPA 8081		Endosulfan I	NELAP	OR	7/16/2014
EPA 8081		Endosulfan II	NELAP	OR	7/16/2014
EPA 8081		Endosulfan sulfate	NELAP	OR	7/16/2014
EPA 8081		Endrin	NELAP	OR	7/16/2014
EPA 8081		Endrin aldehyde	NELAP	OR	7/16/2014
EPA 8081		Endrin ketone	NELAP	OR	7/16/2014
EPA 8081		Heptachlor	NELAP	OR	7/16/2014
EPA 8081		Heptachlor epoxide	NELAP	OR	7/16/2014
EPA 8081		Isodrin	NELAP	OR	7/16/2014
EPA 8081		Kepone	NELAP	OR	7/16/2014
EPA 8081		Methoxychlor	NELAP	OR	7/16/2014
EPA 8081		Mirex	NELAP	OR	7/16/2014
EPA 8081	A	Organochlorine pesticides by GC/ECD	NELAP	OR	7/16/2014
EPA 8081		Toxaphene (Chlorinated camphene)	NELAP	OR	7/16/2014
EPA 8081		alpha-BHC (alpha-Hexachlorocyclohexane)	NELAP	OR	7/16/2014
EPA 8081		alpha-Chlordane	NELAP	OR	7/16/2014
EPA 8081		beta-BHC (beta-Hexachlorocyclohexane)	NELAP	OR	7/16/2014
EPA 8081		delta-BHC (delta-Hexachlorocyclohexane)	NELAP	OR	7/16/2014
EPA 8081		gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	NELAP	OR	7/16/2014
EPA 8081		gamma-Chlordane	NELAP	OR	7/16/2014
EPA 8082		Aroclor-1016 (PCB-1016)	NELAP	OR	7/16/2014
EPA 8082		Aroclor-1221 (PCB-1221)	NELAP	OR	7/16/2014
EPA 8082		Aroclor-1232 (PCB-1232)	NELAP	OR	7/16/2014

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Laboratory Scope of Accreditation

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DEP Laboratory ID: 68-00664 **EPA Lab Code: CO00026** **TNI Code:** **(303) 736-0100**

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8082		Aroclor-1242 (PCB-1242)	NELAP	OR	7/16/2014
EPA 8082		Aroclor-1248 (PCB-1248)	NELAP	OR	7/16/2014
EPA 8082		Aroclor-1254 (PCB-1254)	NELAP	OR	7/16/2014
EPA 8082		Aroclor-1260 (PCB-1260)	NELAP	OR	7/16/2014
EPA 8082	A	PCBs by GC/ECD	NELAP	OR	7/16/2014
EPA 8141		Atrazine	NELAP	OR	7/16/2014
EPA 8141		Azinphos-ethyl (Ethyl guthion)	NELAP	OR	7/16/2014
EPA 8141		Azinphos-methyl (Guthion)	NELAP	OR	7/16/2014
EPA 8141		Bolstar (Sulprofos)	NELAP	OR	7/16/2014
EPA 8141		Carbophenothion (Trithion)	NELAP	OR	7/16/2014
EPA 8141		Chlorpyrifos	NELAP	OR	7/16/2014
EPA 8141		Coumaphos	NELAP	OR	7/16/2014
EPA 8141		Demeton-O	NELAP	OR	7/16/2014
EPA 8141		Demeton-S	NELAP	OR	7/16/2014
EPA 8141		Diazinon (Spectracide)	NELAP	OR	7/16/2014
EPA 8141		Dichlorovos (DDVP, Dichlorvos)	NELAP	OR	7/16/2014
EPA 8141		Dimethoate	NELAP	OR	7/16/2014
EPA 8141		Disulfoton	NELAP	OR	7/16/2014
EPA 8141		EPN (Santox)	NELAP	OR	7/16/2014
EPA 8141		Ethoprop (Prophos)	NELAP	OR	7/16/2014
EPA 8141		Famphur	NELAP	OR	7/16/2014
EPA 8141		Fensulfothion	NELAP	OR	7/16/2014
EPA 8141		Fenthion	NELAP	OR	7/16/2014
EPA 8141		Malathion	NELAP	OR	7/16/2014
EPA 8141		Merphos	NELAP	OR	7/16/2014
EPA 8141		Methyl parathion (Parathion, methyl)	NELAP	OR	7/16/2014
EPA 8141		Mevinphos	NELAP	OR	7/16/2014
EPA 8141		Naled	NELAP	OR	7/16/2014
EPA 8141	A	Organophosphorus compounds by GC/NPD	NELAP	OR	7/16/2014
EPA 8141		Parathion, ethyl (Ethyl parathion, Parathion)	NELAP	OR	7/16/2014
EPA 8141		Phorate (Thimet)	NELAP	OR	7/16/2014
EPA 8141		Phosmet (Imidan)	NELAP	OR	7/16/2014
EPA 8141		Ronnel	NELAP	OR	7/16/2014
EPA 8141		Simazine	NELAP	OR	7/16/2014
EPA 8141		Stirophos (Tetrachlorovinphos)	NELAP	OR	7/16/2014
EPA 8141		Sulfotepp (Tetraethyl dithiopyrophosphate)	NELAP	OR	7/16/2014
EPA 8141		Thionazine (Thionazin, Zinophos)	NELAP	OR	7/16/2014
EPA 8141		Tokuthion (Prothiophos)	NELAP	OR	7/16/2014
EPA 8141		Trichloronate	NELAP	OR	7/16/2014
EPA 8151		2,4,5-T	NELAP	OR	7/16/2014
EPA 8151		2,4,5-TP (Silvex)	NELAP	OR	7/16/2014
EPA 8151		2,4-D	NELAP	OR	7/16/2014
EPA 8151		2,4-DB (Butoxon)	NELAP	OR	7/16/2014
EPA 8151	A	Chlorinated herbicides by GC/ECD	NELAP	OR	7/16/2014
EPA 8151		Dalapon (2,2-Dichloropropionic acid)	NELAP	OR	7/16/2014
EPA 8151		Dicamba	NELAP	OR	7/16/2014
EPA 8151		Dichloroprop (Dichlorprop)	NELAP	OR	7/16/2014

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

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DEP Laboratory ID: 68-00664 EPA Lab Code: CO00026 TNI Code: (303) 736-0100

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8151		MCPA	NELAP	OR	7/16/2014
EPA 8151		MCPP (Mecoprop)	NELAP	OR	7/16/2014
EPA 8151		Picloram (4-Amino-3,5,6-trichloro-2-pyridinecarboxylic acid)	NELAP	OR	7/16/2014
EPA 8260		1,1,1,2-Tetrachloroethane	NELAP	OR	7/16/2014
EPA 8260		1,1,1-Trichloroethane	NELAP	OR	7/16/2014
EPA 8260		1,1,2,2-Tetrachloroethane	NELAP	OR	7/16/2014
EPA 8260		1,1,2-Trichloroethane	NELAP	OR	7/16/2014
EPA 8260		1,1-Dichloroethane	NELAP	OR	7/16/2014
EPA 8260		1,1-Dichloroethene (1,1-Dichloroethylene)	NELAP	OR	7/16/2014
EPA 8260		1,1-Dichloropropene	NELAP	OR	7/16/2014
EPA 8260		1,2,3-Trichlorobenzene	NELAP	OR	7/16/2014
EPA 8260		1,2,3-Trichloropropane (1,2,3-TCP)	NELAP	OR	7/16/2014
EPA 8260		1,2,4-Trichlorobenzene	NELAP	OR	7/16/2014
EPA 8260		1,2,4-Trimethylbenzene	NELAP	OR	7/16/2014
EPA 8260		1,2-Dibromoethane (EDB, Ethylene dibromide)	NELAP	OR	7/16/2014
EPA 8260		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8260		1,2-Dichloroethane	NELAP	OR	7/16/2014
EPA 8260		1,2-Dichloropropane	NELAP	OR	7/16/2014
EPA 8260		1,3,5-Trimethylbenzene	NELAP	OR	7/16/2014
EPA 8260		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8260		1,3-Dichloropropane	NELAP	OR	7/16/2014
EPA 8260		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8260		1,4-Dioxane (1,4-Diethyleneoxide)	NELAP	OR	7/16/2014
EPA 8260		1-Chlorohexane	NELAP	OR	7/16/2014
EPA 8260		2,2-Dichloropropane	NELAP	OR	7/16/2014
EPA 8260		2-Butanone (Methyl ethyl ketone, MEK)	NELAP	OR	7/16/2014
EPA 8260		2-Chloroethyl vinyl ether	NELAP	OR	7/16/2014
EPA 8260		2-Chlorotoluene	NELAP	OR	7/16/2014
EPA 8260		2-Hexanone	NELAP	OR	7/16/2014
EPA 8260		2-Nitropropane	NELAP	OR	7/16/2014
EPA 8260		2-Pentanone	NELAP	OR	7/16/2014
EPA 8260		2-Picoline (2-Methylpyridine)	NELAP	OR	7/16/2014
EPA 8260		4-Chlorotoluene	NELAP	OR	7/16/2014
EPA 8260		4-Methyl-2-pentanone (MIBK)	NELAP	OR	7/16/2014
EPA 8260		Acetone	NELAP	OR	7/16/2014
EPA 8260		Acetonitrile	NELAP	OR	7/16/2014
EPA 8260		Acrolein (Propenal)	NELAP	OR	7/16/2014
EPA 8260		Acrylonitrile	NELAP	OR	7/16/2014
EPA 8260		Allyl chloride (3-Chloropropene)	NELAP	OR	7/16/2014
EPA 8260		Benzene	NELAP	OR	7/16/2014
EPA 8260		Bromobenzene	NELAP	OR	7/16/2014
EPA 8260		Bromochloromethane	NELAP	OR	7/16/2014
EPA 8260		Bromodichloromethane	NELAP	OR	7/16/2014
EPA 8260		Bromoform	NELAP	OR	7/16/2014
EPA 8260		Bromomethane (Methyl bromide)	NELAP	OR	7/16/2014

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Laboratory Scope of Accreditation

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DEP Laboratory ID: 68-00664 **EPA Lab Code: CO00026** **TNI Code:** **(303) 736-0100**

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8260		Carbon disulfide	NELAP	OR	7/16/2014
EPA 8260		Carbon tetrachloride	NELAP	OR	7/16/2014
EPA 8260		Chlorobenzene	NELAP	OR	7/16/2014
EPA 8260		Chloroethane	NELAP	OR	7/16/2014
EPA 8260		Chloroform	NELAP	OR	7/16/2014
EPA 8260		Chloromethane (Methyl chloride)	NELAP	OR	7/16/2014
EPA 8260		Chloroprene (2-Chloro-1,3-butadiene)	NELAP	OR	7/16/2014
EPA 8260		Dibromochloromethane	NELAP	OR	7/16/2014
EPA 8260		Dibromomethane	NELAP	OR	7/16/2014
EPA 8260		Dichlorodifluoromethane (Freon 12)	NELAP	OR	7/16/2014
EPA 8260		Diethyl ether (Ethyl ether)	NELAP	OR	7/16/2014
EPA 8260		Ethanol	NELAP	OR	7/16/2014
EPA 8260		Ethyl acetate	NELAP	OR	7/16/2014
EPA 8260		Ethyl methacrylate	NELAP	OR	7/16/2014
EPA 8260		Ethylbenzene	NELAP	OR	7/16/2014
EPA 8260		Ethylene oxide	NELAP	OR	7/16/2014
EPA 8260		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	OR	7/16/2014
EPA 8260		Iodomethane (Methyl iodide)	NELAP	OR	7/16/2014
EPA 8260		Isobutyl alcohol (2-Methyl-1-propanol)	NELAP	OR	7/16/2014
EPA 8260		Isopropyl alcohol (2-Propanol)	NELAP	OR	7/16/2014
EPA 8260		Isopropylbenzene (Cumene)	NELAP	OR	7/16/2014
EPA 8260		Methacrylonitrile	NELAP	OR	7/16/2014
EPA 8260		Methyl tert-butyl ether (MTBE)	NELAP	OR	7/16/2014
EPA 8260		Methylene chloride (Dichloromethane)	NELAP	OR	7/16/2014
EPA 8260		Methylmethacrylate	NELAP	OR	7/16/2014
EPA 8260		Naphthalene	NELAP	OR	7/16/2014
EPA 8260		Pentachloroethane	NELAP	OR	7/16/2014
EPA 8260		Propionitrile (Ethyl cyanide)	NELAP	OR	7/16/2014
EPA 8260		Styrene	NELAP	OR	7/16/2014
EPA 8260		Tetrachloroethene (PCE, Perchloroethylene)	NELAP	OR	7/16/2014
EPA 8260		Toluene	NELAP	OR	7/16/2014
EPA 8260		Trichloroethene (TCE, Trichloroethylene)	NELAP	OR	7/16/2014
EPA 8260		Trichlorofluoromethane (Freon 11)	NELAP	OR	7/16/2014
EPA 8260	B	VOCs by GC/MS	NELAP	OR	7/16/2014
EPA 8260		Vinyl acetate	NELAP	OR	7/16/2014
EPA 8260		Vinyl chloride (Chloroethene)	NELAP	OR	7/16/2014
EPA 8260		Xylenes, total	NELAP	OR	7/16/2014
EPA 8260		cis-1,2-Dichloroethene	NELAP	OR	7/16/2014
EPA 8260		cis-1,3-Dichloropropene	NELAP	OR	7/16/2014
EPA 8260		cis-1,4-Dichloro-2-butene	NELAP	OR	7/16/2014
EPA 8260		n-Butyl alcohol (n-Butanol, 1-Butanol)	NELAP	OR	7/16/2014
EPA 8260		n-Butylbenzene	NELAP	OR	7/16/2014
EPA 8260		n-Propylbenzene	NELAP	OR	7/16/2014
EPA 8260		sec-Butylbenzene	NELAP	OR	7/16/2014
EPA 8260		tert-Butyl alcohol (2-Methyl-2-propanol)	NELAP	OR	7/16/2014
EPA 8260		tert-Butylbenzene	NELAP	OR	7/16/2014

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DEP Laboratory ID: 68-00664 EPA Lab Code: CO00026 TNI Code: (303) 736-0100

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8260		trans-1,2-Dichloroethene	NELAP	OR	7/16/2014
EPA 8260		trans-1,3-Dichloropropene	NELAP	OR	7/16/2014
EPA 8260		trans-1,4-Dichloro-2-butene	NELAP	OR	7/16/2014
EPA 8270		1,2,4,5-Tetrachlorobenzene	NELAP	OR	7/16/2014
EPA 8270		1,2,4-Trichlorobenzene	NELAP	OR	7/16/2014
EPA 8270		1,2-Dichlorobenzene (o-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8270		1,2-Diphenylhydrazine	NELAP	OR	7/16/2014
EPA 8270		1,3,5-Trinitrobenzene (1,3,5-TNB)	NELAP	OR	7/16/2014
EPA 8270		1,3-Dichlorobenzene (m-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8270		1,3-Dinitrobenzene (1,3-DNB)	NELAP	OR	7/16/2014
EPA 8270		1,4-Dichlorobenzene (p-Dichlorobenzene)	NELAP	OR	7/16/2014
EPA 8270		1,4-Dinitrobenzene (1,4-DNB)	NELAP	OR	7/16/2014
EPA 8270		1,4-Naphthoquinone	NELAP	OR	7/16/2014
EPA 8270		1,4-Phenylenediamine	NELAP	OR	7/16/2014
EPA 8270		1-Chloronaphthalene	NELAP	OR	7/16/2014
EPA 8270		1-Naphthylamine (alpha-Naphthylamine)	NELAP	OR	7/16/2014
EPA 8270		2,3,4,6-Tetrachlorophenol	NELAP	OR	7/16/2014
EPA 8270		2,4,5-Trichlorophenol	NELAP	OR	7/16/2014
EPA 8270		2,4,6-Trichlorophenol	NELAP	OR	7/16/2014
EPA 8270		2,4-Dichlorophenol	NELAP	OR	7/16/2014
EPA 8270		2,4-Dimethylphenol	NELAP	OR	7/16/2014
EPA 8270		2,4-Dinitrophenol	NELAP	OR	7/16/2014
EPA 8270		2,4-Dinitrotoluene (2,4-DNT)	NELAP	OR	7/16/2014
EPA 8270		2,6-Dichlorophenol	NELAP	OR	7/16/2014
EPA 8270		2,6-Dinitrotoluene (2,6-DNT)	NELAP	OR	7/16/2014
EPA 8270		2-Acetylaminofluorene	NELAP	OR	7/16/2014
EPA 8270		2-Chloronaphthalene	NELAP	OR	7/16/2014
EPA 8270		2-Chlorophenol	NELAP	OR	7/16/2014
EPA 8270		2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	NELAP	OR	7/16/2014
EPA 8270		2-Methylnaphthalene	NELAP	OR	7/16/2014
EPA 8270		2-Methylphenol (o-Cresol)	NELAP	OR	7/16/2014
EPA 8270		2-Naphthylamine (beta-Naphthylamine)	NELAP	OR	7/16/2014
EPA 8270		2-Nitroaniline	NELAP	OR	7/16/2014
EPA 8270		2-Nitrophenol	NELAP	OR	7/16/2014
EPA 8270		2-Picoline (2-Methylpyridine)	NELAP	OR	7/16/2014
EPA 8270		3+4-Methylphenol (m+p-Cresol)	NELAP	OR	7/16/2014
EPA 8270		3,3'-Dichlorobenzidine	NELAP	OR	7/16/2014
EPA 8270		3,3'-Dimethylbenzidine	NELAP	OR	7/16/2014
EPA 8270		3-Methylcholanthrene	NELAP	OR	7/16/2014
EPA 8270		3-Nitroaniline	NELAP	OR	7/16/2014
EPA 8270		4,4'-Methylenebis(2-chloroaniline)	NELAP	OR	7/16/2014
EPA 8270		4-Aminobiphenyl	NELAP	OR	7/16/2014
EPA 8270		4-Bromophenyl phenyl ether	NELAP	OR	7/16/2014
EPA 8270		4-Chloro-3-methylphenol	NELAP	OR	7/16/2014
EPA 8270		4-Chloroaniline	NELAP	OR	7/16/2014
EPA 8270		4-Chlorophenyl phenyl ether	NELAP	OR	7/16/2014

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DEP Laboratory ID: 68-00664 **EPA Lab Code: CO00026** **TNI Code:** **(303) 736-0100**

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8270		4-Nitroaniline	NELAP	OR	7/16/2014
EPA 8270		4-Nitrophenol	NELAP	OR	7/16/2014
EPA 8270		4-Nitroquinoline-1-oxide	NELAP	OR	7/16/2014
EPA 8270		5-Nitro-o-toluidine	NELAP	OR	7/16/2014
EPA 8270		7,12-Dimethylbenz(a)anthracene	NELAP	OR	7/16/2014
EPA 8270		Acenaphthene	NELAP	OR	7/16/2014
EPA 8270		Acenaphthylene	NELAP	OR	7/16/2014
EPA 8270		Acetophenone	NELAP	OR	7/16/2014
EPA 8270		Aniline	NELAP	OR	7/16/2014
EPA 8270		Anthracene	NELAP	OR	7/16/2014
EPA 8270		Aramite	NELAP	OR	7/16/2014
EPA 8270		Benzidine	NELAP	OR	7/16/2014
EPA 8270		Benzo[a]anthracene	NELAP	OR	7/16/2014
EPA 8270		Benzo[a]pyrene	NELAP	OR	7/16/2014
EPA 8270		Benzo[b]fluoranthene	NELAP	OR	7/16/2014
EPA 8270		Benzo[ghi]perylene	NELAP	OR	7/16/2014
EPA 8270		Benzo[k]fluoranthene	NELAP	OR	7/16/2014
EPA 8270		Benzoic acid	NELAP	OR	7/16/2014
EPA 8270		Benzyl alcohol	NELAP	OR	7/16/2014
EPA 8270		Benzyl butyl phthalate (Butyl benzyl phthalate)	NELAP	OR	7/16/2014
EPA 8270		Carbazole	NELAP	OR	7/16/2014
EPA 8270		Chlorobenzilate	NELAP	OR	7/16/2014
EPA 8270		Chrysene (Benzo[a]phenanthrene)	NELAP	OR	7/16/2014
EPA 8270		Di-n-butyl phthalate	NELAP	OR	7/16/2014
EPA 8270		Di-n-octyl phthalate	NELAP	OR	7/16/2014
EPA 8270		Dibenz[a,h]acridine	NELAP	OR	7/16/2014
EPA 8270		Dibenz[a,j]acridine	NELAP	OR	7/16/2014
EPA 8270		Dibenzo[a,e]pyrene	NELAP	OR	7/16/2014
EPA 8270		Dibenzo[a,h]anthracene	NELAP	OR	7/16/2014
EPA 8270		Dibenzofuran	NELAP	OR	7/16/2014
EPA 8270		Diethyl phthalate	NELAP	OR	7/16/2014
EPA 8270		Dimethoate	NELAP	OR	7/16/2014
EPA 8270		Dimethyl phthalate	NELAP	OR	7/16/2014
EPA 8270		Dinoseb (2-sec-Butyl-4,6-dinitrophenol, DNBP)	NELAP	OR	7/16/2014
EPA 8270		Diphenylamine	NELAP	OR	7/16/2014
EPA 8270		Disulfoton	NELAP	OR	7/16/2014
EPA 8270		Ethyl methanesulfonate	NELAP	OR	7/16/2014
EPA 8270		Famphur	NELAP	OR	7/16/2014
EPA 8270		Fluoranthene	NELAP	OR	7/16/2014
EPA 8270		Fluorene	NELAP	OR	7/16/2014
EPA 8270		Hexachlorobenzene	NELAP	OR	7/16/2014
EPA 8270		Hexachlorobutadiene (1,3-Hexachlorobutadiene)	NELAP	OR	7/16/2014
EPA 8270		Hexachlorocyclopentadiene	NELAP	OR	7/16/2014
EPA 8270		Hexachloroethane	NELAP	OR	7/16/2014
EPA 8270		Hexachloropropene	NELAP	OR	7/16/2014

Aaron Alger

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pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 009-001 expiration date July 31, 2015. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 68-00664 EPA Lab Code: CO00026 TNI Code: (303) 736-0100

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8270		Indeno(1,2,3-cd)pyrene	NELAP	OR	7/16/2014
EPA 8270		Isodrin	NELAP	OR	7/16/2014
EPA 8270		Isophorone	NELAP	OR	7/16/2014
EPA 8270		Isosafrole	NELAP	OR	7/16/2014
EPA 8270		Methapyrilene	NELAP	OR	7/16/2014
EPA 8270		Methyl methanesulfonate	NELAP	OR	7/16/2014
EPA 8270		Methyl parathion (Parathion, methyl)	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosodi-n-butylamine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosodi-n-propylamine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosodiethylamine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosodimethylamine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosodiphenylamine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosomethylethylamine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosomorpholine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosopiperidine	NELAP	OR	7/16/2014
EPA 8270		N-Nitrosopyrrolidine	NELAP	OR	7/16/2014
EPA 8270		Naphthalene	NELAP	OR	7/16/2014
EPA 8270		Nitrobenzene	NELAP	OR	7/16/2014
EPA 8270		O,O,O-Triethyl phosphorothioate	NELAP	OR	7/16/2014
EPA 8270		Parathion, ethyl (Ethyl parathion, Parathion)	NELAP	OR	7/16/2014
EPA 8270		Pentachlorobenzene	NELAP	OR	7/16/2014
EPA 8270		Pentachloronitrobenzene (PCNB)	NELAP	OR	7/16/2014
EPA 8270		Pentachlorophenol (PCP)	NELAP	OR	7/16/2014
EPA 8270		Phenacetin	NELAP	OR	7/16/2014
EPA 8270		Phenanthrene	NELAP	OR	7/16/2014
EPA 8270		Phenol	NELAP	OR	7/16/2014
EPA 8270		Phorate (Thimet)	NELAP	OR	7/16/2014
EPA 8270		Phthalic anhydride	NELAP	OR	7/16/2014
EPA 8270		Pronamide (Kerb)	NELAP	OR	7/16/2014
EPA 8270		Pyrene	NELAP	OR	7/16/2014
EPA 8270		Pyridine	NELAP	OR	7/16/2014
EPA 8270	C	SOCs by GC/MS	NELAP	OR	7/16/2014
EPA 8270		Safrole	NELAP	OR	7/16/2014
EPA 8270		Sulfotepp (Tetraethyl dithiopyrophosphate)	NELAP	OR	7/16/2014
EPA 8270		Thionazine (Thionazin, Zinophos)	NELAP	OR	7/16/2014
EPA 8270		a,a-Dimethylphenethylamine (Phentermine)	NELAP	OR	7/16/2014
EPA 8270		bis(2-Chloroethoxy)methane	NELAP	OR	7/16/2014
EPA 8270		bis(2-Chloroethyl) ether	NELAP	OR	7/16/2014
EPA 8270		bis(2-Chloroisopropyl) ether	NELAP	OR	7/16/2014
EPA 8270		bis(2-Ethylhexyl) phthalate (DEHP)	NELAP	OR	7/16/2014
EPA 8270		o-Toluidine (2-Toluidine, 2-Methylaniline)	NELAP	OR	7/16/2014
EPA 8270		p-(Dimethylamino)azobenzene	NELAP	OR	7/16/2014
EPA 8270		tris-(2,3-Dibromopropyl) phosphate (tris-BP)	NELAP	OR	7/16/2014
EPA 8310		Acenaphthene	NELAP	OR	7/16/2014
EPA 8310		Acenaphthylene	NELAP	OR	7/16/2014
EPA 8310		Anthracene	NELAP	OR	7/16/2014

Aaron Alger

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Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 009-001 expiration date July 31, 2015. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 68-00664 **EPA Lab Code: CO00026** **TNI Code:** **(303) 736-0100**

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8310		Benzo[a]anthracene	NELAP	OR	7/16/2014
EPA 8310		Benzo[a]pyrene	NELAP	OR	7/16/2014
EPA 8310		Benzo[b]fluoranthene	NELAP	OR	7/16/2014
EPA 8310		Benzo[ghi]perylene	NELAP	OR	7/16/2014
EPA 8310		Benzo[k]fluoranthene	NELAP	OR	7/16/2014
EPA 8310		Chrysene (Benzo[a]phenanthrene)	NELAP	OR	7/16/2014
EPA 8310		Dibenzo[a,h]anthracene	NELAP	OR	7/16/2014
EPA 8310		Fluoranthene	NELAP	OR	7/16/2014
EPA 8310		Fluorene	NELAP	OR	7/16/2014
EPA 8310		Indeno(1,2,3-cd)pyrene	NELAP	OR	7/16/2014
EPA 8310		Naphthalene	NELAP	OR	7/16/2014
EPA 8310		PAHs by HPLC/UV/Fluorescence	NELAP	OR	7/16/2014
EPA 8310		Phenanthrene	NELAP	OR	7/16/2014
EPA 8310		Pyrene	NELAP	OR	7/16/2014
EPA 8321		2,4,5-T	NELAP	OR	7/16/2014
EPA 8321		2,4,5-TP (Silvex)	NELAP	OR	7/16/2014
EPA 8321		2,4-D	NELAP	OR	7/16/2014
EPA 8321		2,4-DB (Butoxon)	NELAP	OR	7/16/2014
EPA 8321		Aldicarb (Temik)	NELAP	OR	7/16/2014
EPA 8321		Aminocarb	NELAP	OR	7/16/2014
EPA 8321		Carbaryl (Sevin)	NELAP	OR	7/16/2014
EPA 8321		Carbofuran (Furaden)	NELAP	OR	7/16/2014
EPA 8321		Chlorpropham (Chloropropham)	NELAP	OR	7/16/2014
EPA 8321		Dalapon (2,2-Dichloropropionic acid)	NELAP	OR	7/16/2014
EPA 8321		Dicamba	NELAP	OR	7/16/2014
EPA 8321		Dichloroprop (Dichlorprop)	NELAP	OR	7/16/2014
EPA 8321		Dinoseb (2-sec-Butyl-4,6-dinitrophenol, DNBP)	NELAP	OR	7/16/2014
EPA 8321		Diuron	NELAP	OR	7/16/2014
EPA 8321		Fluometuron	NELAP	OR	7/16/2014
EPA 8321		Linuron (Lorox)	NELAP	OR	7/16/2014
EPA 8321		MCPA	NELAP	OR	7/16/2014
EPA 8321		MCPP (Mecoprop)	NELAP	OR	7/16/2014
EPA 8321		Methiocarb (Mesurol)	NELAP	OR	7/16/2014
EPA 8321		Methomyl (Lannate)	NELAP	OR	7/16/2014
EPA 8321		Mexacarbate (Zectran)	NELAP	OR	7/16/2014
EPA 8321		Monuron	NELAP	OR	7/16/2014
EPA 8321		Neburon	NELAP	OR	7/16/2014
EPA 8321	A	Non-volatile compounds by HPLC-MS or HPLC-UV	NELAP	OR	7/16/2014
EPA 8321		Oxamyl (Vydate)	NELAP	OR	7/16/2014
EPA 8321		Propham	NELAP	OR	7/16/2014
EPA 8321		Propoxur (Baygon)	NELAP	OR	7/16/2014
EPA 8321		Siduron	NELAP	OR	7/16/2014
EPA 8330		1,3,5-Trinitrobenzene (1,3,5-TNB)	NELAP	OR	7/16/2014
EPA 8330		1,3-Dinitrobenzene (1,3-DNB)	NELAP	OR	7/16/2014
EPA 8330		2,4,6-Trinitrotoluene (2,4,6-TNT)	NELAP	OR	7/16/2014

Aaron Alger

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

Laboratory Scope of Accreditation

Attached to Certificate of Accreditation 009-001 expiration date July 31, 2015. This listing of accredited analytes should be used only when associated with a valid certificate of accreditation.

DEP Laboratory ID: 68-00664 EPA Lab Code: CO00026 TNI Code: (303) 736-0100

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Accreditation Type	Primary	Effective Date
EPA 8330		2,4-Dinitrotoluene (2,4-DNT)	NELAP	OR	7/16/2014
EPA 8330		2,6-Dinitrotoluene (2,6-DNT)	NELAP	OR	7/16/2014
EPA 8330		2-Amino-4,6-dinitrotoluene (2-Am-DNT)	NELAP	OR	7/16/2014
EPA 8330		2-Nitrotoluene	NELAP	OR	7/16/2014
EPA 8330		3-Nitrotoluene	NELAP	OR	7/16/2014
EPA 8330		4-Amino-2,6-dinitrotoluene (4-Am-DNT)	NELAP	OR	7/16/2014
EPA 8330		4-Nitrotoluene	NELAP	OR	7/16/2014
EPA 8330		Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	NELAP	OR	7/16/2014
EPA 8330		Nitroaromatics and nitramines by HPLC/UV	NELAP	OR	7/16/2014
EPA 8330		Nitrobenzene	NELAP	OR	7/16/2014
EPA 8330		Nitroglycerin	NELAP	OR	7/16/2014
EPA 8330		Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	NELAP	OR	7/16/2014
EPA 8330		RDX (Hexahydro-1,3,5-trinitro-1,3,5-triazine)	NELAP	OR	7/16/2014
EPA 9012		Total cyanide	NELAP	OR	7/16/2014
EPA 9030	B	Sulfide	NELAP	OR	7/16/2014
EPA 9030	B	Sulfide distillation	NELAP	OR	7/16/2014
EPA 9034		Sulfide	NELAP	OR	7/16/2014
EPA 9045	D	pH	NELAP	OR	7/16/2014
EPA 9056	A	Anions by IC	NELAP	OR	7/16/2014
EPA 9056		Bromide	NELAP	OR	7/16/2014
EPA 9056		Chloride	NELAP	OR	7/16/2014
EPA 9056		Fluoride	NELAP	OR	7/16/2014
EPA 9056		Nitrate as N	NELAP	OR	7/16/2014
EPA 9056		Nitrite as N	NELAP	OR	7/16/2014
EPA 9056		Orthophosphate as P	NELAP	OR	7/16/2014
EPA 9056		Sulfate	NELAP	OR	7/16/2014
EPA 9060		Total organic carbon (TOC)	NELAP	OR	7/16/2014
EPA 9071		Oil and grease	NELAP	OR	7/16/2014
EPA 9095	A	Paint filter liquids test	NELAP	OR	7/16/2014

Aaren Alger

Laboratory Status Summary

DEP Laboratory ID: 68-00664 | EPA Lab Code: CO00026 | (303) 736-0100

TestAmerica Denver
4955 Yarrow Street
Arvada, CO 80002

Matrix: Non-Potable Water

Method	Revision	Analyte	Status	Effective Date
EPA 1311		Toxicity characteristic leaching procedure (TCLP)	Denied	7/16/2014
EPA 1312		Synthetic precipitation leaching procedure (SPLP)	Denied	7/16/2014
EPA 8260		tert-Amyl ethyl ether (TAEE)	Denied	7/16/2014
EPA 8270		Aminoazobenzene	Denied	7/16/2014

Matrix: Solid and Chemical Materials

Method	Revision	Analyte	Status	Effective Date
EPA 3005	A	Preconcentration under acid	Denied	7/16/2014
EPA 3010	A	Hot plate acid digestion (HNO3 + HCl)	Denied	7/16/2014
EPA 3020	A	Hot plate acid digestion (HNO3 only)	Denied	7/16/2014
EPA 7470	A	Mercury	Denied	7/16/2014
EPA 8151		Dinoseb (2-sec-Butyl-4,6-dinitrophenol, DNBP)	Withdrawn	7/16/2014
EPA 9066		Total phenolics	Denied	7/16/2014
SM 9222 D + EPA 625/R-92/013 Appendix F		Fecal coliform (Enumeration)	Denied	7/16/2014

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Laboratories

07/17/2014

William Cicero
TestAmerica Denver
4955 Yarrow Street
Arvada, CO 80002

Re: Certificate of Accreditation
DEP Lab ID No. 68-00664

Dear Laboratory Supervisor:

Enclosed is your new Certificate of Accreditation to operate as a Pennsylvania Accredited Laboratory. This Certificate of Accreditation expires **07/31/2015** unless suspended or revoked earlier. As a laboratory accredited in accordance with the Environmental Laboratory Accreditation Act of June 29, 2002 (P.L 596, No 90) (27 Pa C.S. §§ 4101 – 4113) and The Environmental Laboratory Accreditation Regulations of 25 Pa. Code Chapter 252 you are responsible for continual compliance with the accreditation Act and regulations promulgated thereunder. Failure to comply with all applicable Federal and Departmental laws and regulations may result in suspension or revocation of your laboratory's accreditation.

Your DEP laboratory identification number is **68-00664**. Please use this number on all correspondence with the PA Department of Environmental Protection (Department).

Your laboratory is accredited to perform only the analyses by the methods listed on the Scope of Accreditation that accompanies the Certificate of Accreditation. The Certificate of Accreditation remains the property of the Department and must be displayed in the laboratory.

Please note this certification must be renewed annually. Renewal applications must be submitted to the Department *no later than 60 days prior to the expiration of the certification.* Failure to submit a renewal application within this time period may result in a lapse of the laboratory's accreditation. Should this occur, the laboratory may not conduct any further analyses for which accreditation is required and, if the laboratory is accredited to perform analyses on drinking water, the laboratory must notify the public water suppliers served by the laboratory of the laboratory's failure to renew its certificate of accreditation. Copies of the renewal application may be found on the Department's web site (www.depweb.state.pa.us/labs).

If you have any questions concerning your certificate, you may contact your laboratory's accreditation officer Eric Nkurunziza at 717-346-8201 or ENkurunziz@pa.gov.

Sincerely,

Aaren Alger

Aaren S. Alger, Chief
Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

TESTAMERICA DENVER
4955 Yarrow Street
Arvada, CO 80002
Margaret S. Sleevi Phone: 303-736-0100
www.testamericainc.com

ENVIRONMENTAL

Valid To: October 31, 2015 Certificate Number: 2907.01

In recognition of the successful completion of the A2LA evaluation process, (including an assessment of the laboratory's compliance with ISO IEC 17025:2005, the 2003 NELAC Chapter 5 Standard, the requirements of the DoD Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 4.2 of the DoD Quality Systems Manual for Environmental Laboratories), and for the test methods applicable to the Wyoming Storage Tank Remediation Laboratory Accreditation Program, accreditation is granted to this laboratory to perform recognized EPA methods using the following testing technologies and in the analyte categories identified below:

Testing Technologies

Atomic Absorption/ICP-AES Spectrometry, ICP/MS, Gas Chromatography, Gas Chromatography/Mass Spectrometry, Gravimetry, High Performance Liquid Chromatography, Ion Chromatography, Misc.- Electronic Probes (pH, O_2), Oxygen Demand, Hazardous Waste Characteristics Tests, Spectrophotometry (Visible), Spectrophotometry (Automated), Titrimetry, Total Organic Carbon, Total Organic Halide

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Metals				
Aluminum	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Antimony	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Arsenic	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Barium	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Beryllium	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Boron	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Cadmium	EPA 6010C	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A

5301 Buckeystown Pike, Suite 350 | Frederick, Maryland 21704-8373 | Phone: 301 644 3248 | Fax: 301 662 2974 | www.A2LA.org

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Calcium	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Chromium	EPA 6010C	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Cobalt	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Copper	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Iron	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Lead	EPA 6010C	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Lithium	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Magnesium	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Manganese	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Mercury	----------------------	----------------------	EPA 7470A	EPA 7471A / 7471B
Molybdenum	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Nickel	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Potassium	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Selenium	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Silica	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Silicon	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Silver	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Sodium	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Strontium	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Thallium	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Tin	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Titanium	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Vanadium	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Zinc	----------------------	----------------------	EPA 6010B / 6010C / 6020 / 6020A	EPA 6010B / 6010C / 6020 / 6020A
Nutrients				
Nitrate (as N)	----------------------	By calculation	By calculation / EPA 9056 / 9056A	By calculation / EPA 9056 / 9056A
Nitrate-nitrite (as N)	----------------------	EPA 353.2	EPA 353.2 / 9056 / 9056A	EPA 9056 / 9056A
Nitrite (as N)	----------------------	SM 4500-NO2 B	SM 4500-NO2 B; EPA 9056 / 9056A	EPA 9056 / 9056A
Orthophosphate (as P)	----------------------	----------------------	EPA 9056 / 9056A	EPA 9056 / 9056A
Total phosphorus	----------------------	----------------------	EPA 6010B / 6010C	EPA 6010B / 6010C
Demands				
Total Organic Carbon	----------------------	----------------------	EPA 9060 / 9060A	EPA 9060 / 9060A
Total Organic Halides	----------------------	----------------------	EPA 9020B	----------------------
Wet Chemistry				----------------------
Alkalinity (Total Bicarbonate, Carbonate, and Hydroxide Alkalinty)	----------------------	SM 2320 B_1997	SM 2320 B	SM 2320 B
Ammonia	----------------------	EPA 350.1	EPA 350.1	----------------------
Biological Oxygen Demand	----------------------	SM 5210B	SM 5210B	----------------------
Bromide	----------------------	----------------------	EPA 9056 / 9056A	EPA 9056 / 9056A
Chloride	----------------------	----------------------	EPA 9056 / 9056A	EPA 9056 / 9056A
Chemical Oxygen Demand	----------------------	EPA 410.4	EPA 410.4	
Conductivity	----------------------	----------------------	EPA 9050 / 9050A	EPA 9050 / 9050A
Cyanide	----------------------	----------------------	9012A / 9012B	9012A / 9012B
Ferrous Iron	----------------------	SM 3500 Fe B, D	SM 3500 Fe B, D	----------------------
Fluoride	----------------------	----------------------	EPA 9056 / 9056A	EPA 9056 / 9056A
Hexavalent Chromium	EPA 7196A	----------------------	EPA 7196A	----------------------
pH	----------------------	----------------------	EPA 9040B / 9045C	EPA 9040B / 9045C
Oil and Grease (HEM and SGT-HEM)	----------------------	----------------------	EPA 1664A/ 1664B	9071B
Percent Moisture	----------------------	----------------------	----------------------	ASTM D2216
Perchlorate	----------------------	----------------------	EPA 6860	EPA 6860
Phenols	----------------------	----------------------	EPA 9066	EPA 9066
Solids, Total	----------------------	SM 2540 B	SM 2540 B	SM 2540 B
Solids, Total Suspended	----------------------	SM 2540 D	SM 2540 D	SM 2540 D
Solids, Total Dissolved	----------------------	SM 2540 C	SM 2540 C	SM 2540 C
Sulfate	----------------------	----------------------	EPA 9056 / 9056A	EPA 9056 / 9056A
Sulfide, Total	----------------------	----------------------	EPA 9034	EPA 9034
Sulfide	----------------------	----------------------	EPA 9030B	EPA 9030B
Total Kjeldahl Nitrogen	----------------------	----------------------	EPA 351.2	----------------------

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Purgeable Organics (volatiles)				----------------------
Acetone	----------------------	----------------------	EPA 8260B	EPA 8260B
Acetonitrile	----------------------	----------------------	EPA 8260B	EPA 8260B
Acrolein	----------------------	----------------------	EPA 8260B	EPA 8260B
Acrylonitrile	----------------------	----------------------	EPA 8260B	EPA 8260B
Allyl Chloride	----------------------	----------------------	EPA 8260B	EPA 8260B
tert-Amyl Methyl Ether	EPA 8260B			
Benzene	EPA 8260B / 8021B	----------------------	EPA 8260B / 8021B / AK101/ OK DEQ GRO	EPA 8260B / 8021B / AK101/ OK DEQ GRO
Bromobenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
Bromochloromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Bromodichloromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Bromoform	----------------------	----------------------	EPA 8260B	EPA 8260B
Bromomethane	----------------------	----------------------	EPA 8260B	EPA 8260B
2-Butanone	----------------------	----------------------	EPA 8260B	EPA 8260B
n-Butyl alcohol	----------------------	----------------------	EPA 8260B / 8015B / 8015C	EPA 8260B / 8015B / 8015C
tert-Butyl alcohol	EPA 8260B			
n-Butylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
sec-Butylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
tert-Butylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
Carbon disulfide	----------------------	----------------------	EPA 8260B	EPA 8260B
Carbon tetrachloride	----------------------	----------------------	EPA 8260B	EPA 8260B
Chlorobenzene	----------------------	----------------------	EPA 8260B / 8021B	EPA 8260B / 8021B
2-Chloro-1,3-butadiene	----------------------	----------------------	EPA 8260B	EPA 8260B
Chloroethane	----------------------	----------------------	EPA 8260B	EPA 8260B
2-Chloroethyl vinyl ether	----------------------	----------------------	EPA 8260B	EPA 8260B
Chloroform	----------------------	----------------------	EPA 8260B	EPA 8260B
1-Chlorohexane	----------------------	----------------------	EPA 8260B	EPA 8260B
Chloromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Chloroprene	----------------------	----------------------	EPA 8260B	EPA 8260B
4-Chlorotoluene	----------------------	----------------------	EPA 8260B	EPA 8260B
2-Chlorotoluene	----------------------	----------------------	EPA 8260B	EPA 8260B
Cyclohexane	----------------------	----------------------	EPA 8260B	EPA 8260B
Cyclohexanone	----------------------	----------------------	EPA 8260B	EPA 8260B
Dibromochloromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2-Dibromo-3-chloropropane (DBCP)	----------------------	EPA 504	EPA 504 / 8260B / 8011	EPA 8260B / 8011
Dibromochloromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Dichlorodifluoromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Dibromomethane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2 Dibromoethane (EDB)	EPA 8011	EPA 504	EPA 504 / 8260B / 8011	EPA 8260B / 8011
1,2-Dichlorobenzene	----------------------	----------------------	EPA 8260B / 8021B	EPA 8260B / 8021B
1,3-Dichlorobenzene	----------------------	----------------------	EPA 8260B / 8021B	EPA 8260B / 8021B

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
1,4-Dichlorobenzene	----------------------	----------------------	EPA 8260B / 8021B	EPA 8260B / 8021B
cis-1,4-Dichloro-2-butene	----------------------	----------------------	EPA 8260B	EPA 8260B
trans-1,4-Dichloro-2-butene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,1-Dichloroethane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2-Dichloroethane	EPA 8260B	----------------------	EPA 8260B	EPA 8260B
1,1-Dichloroethene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2-Dichloroethene	----------------------	----------------------	EPA 8260B	EPA 8260B
cis-1,2-Dichloroethene	----------------------	----------------------	EPA 8260B	EPA 8260B
trans-1,2-Dichloroethene	----------------------	----------------------	EPA 8260B	EPA 8260B
Dichlorofluoromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2-Dichloropropane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,3-Dichloropropane	----------------------	----------------------	EPA 8260B	EPA 8260B
2,2-Dichloropropane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,1-Dichloropropene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,3-Dichloropropene	----------------------	----------------------	EPA 8260B	EPA 8260B
cis-1,3-Dichloropropene	----------------------	----------------------	EPA 8260B	EPA 8260B
trans-1,3-Dichloropropene	----------------------	----------------------	EPA 8260B	EPA 8260B
Diethyl ether	----------------------	----------------------	EPA 8260B	EPA 8260B
Di-isopropylether	EPA 8260B	----------------------	EPA 8260B	EPA 8260B
1,4-Dioxane	----------------------	----------------------	EPA 8260B / 8260B SIM	EPA 8260B / 8260B SIM
Ethanol	----------------------	----------------------	EPA 8260B / 8015B / 8015C	EPA 8260B / 8015B / 8015C
Ethyl Acetate	----------------------	----------------------	EPA 8260B	EPA 8260B
Ethyl Benzene	EPA 8260B/8021B	----------------------	EPA 8260B / 8021B / AK101/ OK DEQ GRO	EPA 8260B / 8021B/ AK101/ OK DEQ GRO
Ethyl Methacrylate	----------------------	----------------------	EPA 8260B	EPA 8260B
Ethyl tert-Butyl Ether	EPA 8260B			
Ethylene Glycol	----------------------	----------------------	EPA 8015C	EPA 8015C
Gas Range Organics (GRO)	EPA 8015C	----------------------	EPA 8015B / 8015C / AK101 / 8015D	EPA 8015B / 8015C / AK101 / 8015D
Hexane	----------------------	----------------------	EPA 8260B	EPA 8260B
2-Hexanone	----------------------	----------------------	EPA 8260B	EPA 8260B
Hexachlorobutadiene	----------------------	----------------------	EPA 8260B	EPA 8260B
Isobutyl Alcohol (2-Methyl-1-propanol)	----------------------	----------------------	EPA 8260B / 8015B / 8015C	EPA 8260B / 8015B / 8015C
Isopropyl Alcohol	----------------------	----------------------	EPA 8260B	EPA 8260B
Isopropylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,4-Isopropyltoluene	----------------------	----------------------	EPA 8260B	EPA 8260B
Iodomethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Methacrylonitrile	----------------------	----------------------	EPA 8260B	EPA 8260B
Methanol	----------------------	----------------------	EPA 8015B / 8015C	EPA 8015B / 8015C
Methyl Acetate	----------------------	----------------------	EPA 8260B	EPA 8260B
Methyl Cyclohexane	----------------------	----------------------	EPA 8260B	EPA 8260B
Methylene Chloride	----------------------	----------------------	EPA 8260B	EPA 8260B
Methyl Ethyl Ketone (MEK)	----------------------	----------------------	EPA 8260B	EPA 8260B
Methyl Isobutyl Ketone	----------------------	----------------------	EPA 8260B	EPA 8260B
Methyl Methacrylate	----------------------	----------------------	EPA 8260B	EPA 8260B

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Methyl tert-Butyl Ether (MtBE)	EPA 8260B / 8021B	----------------------	EPA 8260B / 8021B / OK DEQ GRO	EPA 8260B / 8021B/ OK DEQ GRO
4-Methyl-2-Pentanone	----------------------	----------------------	EPA 8260B	EPA 8260B
Naphthalene	EPA 8260B / 8021B	----------------------	EPA 8260B/ OK DEQ GRO	EPA 8260B / OK DEQ GRO
2-Nitropropane	----------------------	----------------------	EPA 8260B	EPA 8260B
2,2' Oxybisethanol	----------------------	----------------------	EPA 8015C	EPA 8015C
2-Pentanone	----------------------	----------------------	EPA 8260B	EPA 8260B
Propionitrile	----------------------	----------------------	EPA 8260B	EPA 8260B
n-Propylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
Propylene Glycol	----------------------	----------------------	EPA 8015C	EPA 8015C
Styrene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,1,1,2-Tetrachloroethane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,1,2,2-Tetrachloroethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Tetrachloroethene	----------------------	----------------------	EPA 8260B	EPA 8260B
Tetrahydrofuran	----------------------	----------------------	EPA 8260B	EPA 8260B
Toluene	EPA 8260B / 8021B	----------------------	EPA 8260B / 8021B / AK101 / OK DEQ GRO	EPA 8260B / 8021B / AK101 / OK DEQ GRO
Total Petroleum Hydrocarbons (TPH)	----------------------	EPA 1664A EPA 1664B	EPA 1664A EPA 1664B	----------------------
1,2,3-Trichlorobenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,1,1-Trichloroethane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,1,2-Trichloroethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Trichloroethene	----------------------	----------------------	EPA 8260B	EPA 8260B
Trichlorofluoromethane	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2,3-Trichlorobenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2,4-Trichlorobenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2,3-Trichloropropane	----------------------	EPA 504.1	EPA 504.1 / 8260B / 8011	EPA 8260B / 8011
1,1,2-Trichloro-1,2,2-trifluoroethane	----------------------	----------------------	EPA 8260B	EPA 8260B
Triethylene Glycol	----------------------	----------------------	EPA 8015C	EPA 8015C
1,2,3-Trimethylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,2,4-Trimethylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
1,3,5-Trimethylbenzene	----------------------	----------------------	EPA 8260B	EPA 8260B
Vinyl Acetate	----------------------	----------------------	EPA 8260B	EPA 8260B
Vinyl Chloride	----------------------	----------------------	EPA 8260B	EPA 8260B
Xylenes, total	EPA 8260B / 8021B	----------------------	EPA 8260B / 8021B / AK101 / OK DEQ GRO	EPA 8260B / 8021B / AK101 / OK DEQ GRO
1,2-Xylene	EPA 8260B / 8021B	----------------------	EPA 8260B / 8021B / AK101 / OK DEQ GRO	EPA 8260B / 8021B / AK101 / OK DEQ GRO
M+P-Xylene	EPA 8260B / 8021B	----------------------	EPA 8260B / 8021B / AK101 / OK DEQ GRO	EPA 8260B / 8021B / AK101 / OK DEQ GRO
Methane	----------------------	----------------------	RSK-175	----------------------
Ethane	----------------------	----------------------	RSK-175	----------------------
Ethylene (Ethene)	----------------------	----------------------	RSK-175	----------------------
Acetylene	----------------------	----------------------	RSK-175	----------------------

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Acetylene Ethane	----------------------	----------------------	RSK-175	----------------------
Extractable Organics (semivolatiles)				
Acenaphthene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Acenaphthylene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Acetophenone	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Acetylaminofluorene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Alachlor	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Aminobiphenyl	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Aniline	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Anthracene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Aramite	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Atrazine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Azobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzaldehyde	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzidine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzoic acid	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Benzo (a) Anthracene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Benzo (b) Fluoranthene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Benzo (k) Fluoranthene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Benzo (ghi) Perylene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Benzo (a) Pyrene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Benzyl Alcohol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Bis (2-chloroethoxy) methane	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Bis (2-chloroethyl) Ether	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Bis (2-chloroisopropyl) Ether (2,2'Oxybis(1-chloropropane)	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Bis (2-ethylhexyl) Phthalate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Bromophenyl Phenyl Ether	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Butyl Benzyl Phthalate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-sec-Butyl-4,6-Dinitrophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Carbazole	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Chloroanilene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Chlorobenzilate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Chloro-3-Methylphenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1-Chloronaphthalene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Chloronaphthalene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Chlorophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Chlorophenyl Phenyl Ether	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Chrysene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Cresols	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Diallate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Dibenzo (a,h) Anthracene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Dibenzofuran	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,2-Dichlorobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,3-Dichlorobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,4-Dichlorobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
3,3’-Dichlorobenzidine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4-Dichlorophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,6-Dichlorophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Diethyl phthalate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Dimethoate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
3,3-Dimethylbenzidine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
p-Dimethylaminoazobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
7,12-Dimethylbenz(a)anthracene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Alpha-,alpha-Dimethylphenethylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4-Dimethylphenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Dimethyl Phthalate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Di-n-Butyl Phthalate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Di-n-Octyl Phthalate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,3-Dinitrobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,4-Dinitrobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4-Dinitrophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4-Dinitrotoluene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,6-Dinitrotoluene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,4-Dioxane	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Diphenylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,2-Diphenylhydrazine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Disulfoton	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Diesel Range Organics (DRO)	EPA 8015C	----------------------	EPA 8015B / 8015C, AK102, TX 1005 / 8015D / OK DEQ DRO	EPA 8015B / 8015C, AK102, TX 1005 / 8015D / OK DEQ DRO
Ethyl Methanesulfonate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Famphur	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Fluoroanthene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Fluorene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Gasoline Range Organics	----------------------	----------------------	TX 1005 / OK DEQ GRO	TX 1005 / OK DEQ GRO
Hexachlorobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Hexachlorobutadiene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Hexachlorocyclopentadiene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Hexachloroethane	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Hexachloropropene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Indeno (1,2,3-cd) Pyrene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Isodrin	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Isophorone	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Isosafrole	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Methapyrilene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
3-Methylcholanthrene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Methyl-4,6-Dinitrophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Methyl Methane Sulfonate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Methylcholanthrene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1-Methylnaphthalene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
2-Methylnaphthalene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
2-Methylphenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
3+4-Methylphenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Naphthalene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
1,4-Naphthoquinone	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1-Naphthylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Naphthylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Nitroaniline	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
3-Nitroaniline	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Nitroaniline	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Nitrobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Nitrophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
4-Nitrophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Nitroquinoline-1-Oxide	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
N-Nitrosodiethylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosodimethylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosodi-n-Butylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosodi-n-Propylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosodiphenylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosomethylethylamine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosomorpholine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosopiperidine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
N-Nitrosopyrrolidine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
5-Nitro-o-Toluidine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,2-oxybis(1-chloropropane)	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Parathion, Methyl	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Parathion, Ethyl	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pentachlorobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pentachloroethane	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pentachloronitobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pentachlorophenol	----------------------	----------------------	EPA 8270C / 8270D / 8321A / 8321B	EPA 8270C / 8270D / 8321A / 8321B
Phenacetin	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Phenanthrene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Phenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Phorate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2-Picoline	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pronamide	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Pyrene	----------------------	----------------------	EPA 8270C / 8270D / 8270SIM	EPA 8270C / 8270D / 8270SIM
Pyridine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Safrole	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Sulfotepp	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,2,4,5-Tetrachlorobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,3,4,6-Tetrachlorophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Thionazin	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
o-Toluidine	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,2,4-Trichlorobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4,5-Trichlorophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
2,4,6-Trichlorophenol	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
o,o,o-Triethyl Phosphorothioate	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
1,3,5-Trinitrobenzene	----------------------	----------------------	EPA 8270C / 8270D	EPA 8270C / 8270D
Motor Oil (Residual Range Organics)	----------------------	----------------------	EPA 8015B / 8015C, AK103 / OK DEQ RRO	EPA 8015B / 8015C, AK103 / OK DEQ RRO
Pesticides/Herbicides/PCBs				
Aldrin	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Atrazine	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Azinophos ethyl	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Azinophos methyl	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
alpha-BHC	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
beta-BHC	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
delta-BHC	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
gamma-BHC	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Bolstar	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
alpha-Chlordane	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
gamma-Chlordane	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Chlordane (technical)	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Chloropyrifos	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Coumaphos	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
2,4-D	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A /8321A
Dalapon	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
2,4-DB	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
4,4'-DDD	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
4,4'-DDE	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
4,4'-DDT	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Demeton-O	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Demeton-S	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Demeton, total	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Diazinon	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Dicamba	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
Dichlorovos	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Dichloroprop	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
Dieldrin	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Dimethoate	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Dinoseb	----------------------	----------------------	EPA 8151A / 8321A	EPA 8321A
Disulfoton	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Endosulfan I	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Endosulfan II	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Endonsulfan sulfate	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Endrin	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Endrin aldehyde	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Endrin ketone	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
EPN	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Ethoprop	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Ethyl Parathion	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Famphur	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Fensulfothion	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Fenthion	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Heptachlor	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Heptachlor Epoxide	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Hexachlorobenzene	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Malathion	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
MCPA	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
MCPP	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
Merphos	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Methoxychlor	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Methyl parathion	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Mevinphos	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Naled	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
PCB-1016 (Arochlor)	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1221	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1232	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1242	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1248	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1254	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1260	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1262	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
PCB-1268	----------------------	----------------------	EPA 8082 / 8082A	EPA 8082 / 8082A
Phorate	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Phosmet	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Propazine	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Ronnel	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Simazine	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Stirophos	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Sulfotepp	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
2,4,5-T	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
Thionazin	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Tokuthion	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
2,4,5-TP	----------------------	----------------------	EPA 8151A / 8321A	EPA 8151A / 8321A
Toxaphene	----------------------	----------------------	EPA 8081A / 8081B	EPA 8081A / 8081B
Trichloronate	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
o,o,o-Triethylphos Phorothioate	----------------------	----------------------	EPA 8141A / 8141B	EPA 8141A / 8141B
Explosives				
1,3,5-Trinitrobenzene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
1,3-Dinitrobenzene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
2,4,6-Trinitrotoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
3,5-Dinitroaniline	----------------------	----------------------	EPA 8330B	EPA 8330B
2,4-Dinitrotoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
2,6-Dinitroltoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
2-Amino-4,6-Dinitrotoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
2-Nitrotoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
3-Nitrotoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
4-Amino-2,6-Dinitrotoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
4-Nitrotoluene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Nitrobenzene	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
Nitroglycerin	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
Octahydro-1,3,5,7-Tetrabitro-1,3,5,7-Tetrazocine (HMX)	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
Pentaerythritoltetranitrate (PETN)	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
Picric acid	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
RDX (Hexahydro-1,3,5-Trinitro-1,3,5-Triazine)	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
Tetryl (Methyl 2,4,6-Trinitrophenylnitramine	----------------------	----------------------	EPA 8330A / 8330B / 8321A / 8321B	EPA 8330A / 8330B / 8321A / 8321B
Perfluorinated Hydrocarbons (PFCs) and Perfluorinated Sulfonates (PFSs)				
Perfluorobutanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluoropentanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorohexanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluoroheptanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorooctanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorononanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorodecanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluoroundecanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorododecanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorotridecanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorotetradecanoic Acid	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorobutane Sulfonate	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorohexane Sulfonate	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorooctane Sulfonate	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorodecane Sulfonate	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Perfluorooctane Sulfonamide	----------------------	SOP DV-LC-0012	SOP DV-LC-0012	SOP DV-LC-0012
Hazardous Waste Characteristics				
Conductivity	----------------------	----------------------	EPA 9050A	EPA 9050A
Corrosivity	----------------------	----------------------	EPA 9040B	9045C
Ignitibility	----------------------	EPA 1010/EPA 1010A	EPA 1010 / 1010A	EPA 1010 / 1010A
Paint Filter Liquids Test	----------------------	----------------------	EPA 9095A	EPA 9095A
Synthetic Precipitation Leaching Procedure (SPLP)	----------------------	----------------------	EPA 1312	EPA 1312

Parameter/Analyte	WY Storage Tank Program	Non-Potable Water	Solid Hazardous Waste (Water)	Solid Hazardous Waste (Solid)
Toxicity Characteristic Leaching Procedure	----------------------	----------------------	EPA 1311	EPA 1311
Organic Prep Methods				
Separatory Funnel Liquid-Liquid Extraction	----------------------	----------------------	EPA 3510C	-----------------------
Continuous Liquid-Liquid Extraction	----------------------	----------------------	EPA 3520C	-----------------------
Soxhlet Extraction	----------------------	----------------------	-----------------------	EPA 3540C
Microwave Extraction	----------------------	----------------------	-----------------------	EPA 3546
Ultrasonic Extraction	----------------------	----------------------	-----------------------	EPA 3550B
Ultrasonic Extraction	----------------------	----------------------	-----------------------	EPA 3550C
Waste Dilution	----------------------	----------------------	EPA 3580A	EPA 3580A
Solid Phase Extraction Volatiles Purge and trap Volatiles Purge and Trap for Soils	----------------------	----------------------	EPA 3535A EPA 5030B	EPA 5030B EPA 5035
Organic Cleanup Procedures				
Florisil Cleanup	----------------------	----------------------	EPA 3620B	EPA 3620B
Florisil Cleanup	----------------------	----------------------	EPA 3620C	EPA 3620C
Sulfur Cleanup	----------------------	----------------------	EPA 3660B	EPA 3660B
Sulfuric Acid/Permanganate Cleanup	----------------------	----------------------	EPA 3665A	EPA 3665A
Metals Digestion				
Acid Digestion Total Recoverable or Dissolved Metals	----------------------	----------------------	EPA 3005A	----------------------
Acid Digestion for Total Metals	----------------------	----------------------	EPA 3010A	----------------------
Acid Digestion for Total Metals	----------------------	----------------------	EPA 3020A	----------------------
Acid Digestion of Sediments, Sludges and Soils	----------------------	----------------------	----------------------	EPA 3050B

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In recognition of the successful completion of the A2LA evaluation process that includes an assessment of the laboratory's compliance with ISO/IEC 17025:2005, the 2003 NELAC Chapter 5 Standard, and the requirements of the Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) as detailed in version 4.2 of the DoD Quality System Manual for Environmental Laboratories (QSM); accreditation is granted to this laboratory to perform recognized EPA methods as defined on the associated A2LA Environmental Scope of Accreditation. This accreditation demonstrates technical competence for this defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

Presented this 5th day of November 2013.

President & CEO
For the Accreditation Council
Certificate Number 2907.01
Valid to October 31, 2015

For the tests to which this accreditation applies, please refer to the laboratory's Environmental Scope of Accreditation.

Appendix C

Standard Operating Procedures (SOPs)

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Standard Operating Procedure No. 003
for
Subsurface/Utility Clearance

Prepared by

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Revision 0
December 2014

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CONTENTS

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1. SCOPE AND APPLICATION

1.1 PURPOSE

The purpose of this Standard Operating Procedure is to prevent injury to workers and damage to subsurface structures (including tanks, pipe lines, water lines, gas lines, electrical service, etc.) during ground disturbance activities (including drilling, augering, sampling, use of direct-push technologies, excavation, trenching, concrete coring or removal, fence post installation, grading, or other similar operations).

1.2 LIMITATIONS

The procedures set forth in this document are the suggested procedures but may not be applicable to particular sites based on the site-specific considerations. The Project Manager is responsible for making a site-specific evaluation of each site to determine whether the Subsurface/Clearance Procedures should be utilized or require modification. If safety or other site-specific considerations require a modified or different procedure, the Project Manager should review the modified procedure with the Business Unit Director, Profit Center Manager, or Senior Technical Reviewer.

1.3 SCOPE

This procedure provides minimum guidance for subsurface clearance activities, which must be followed prior to and during ground disturbance activities at EA project sites. Even after completing the subsurface clearance activities required in this procedure, all ground disturbance activities should proceed with due caution.

Deviations from this procedure may be provided on an exception basis for specific situations, such as underground storage tank systems removals, verified aboveground/overhead services/lines, undeveloped land/idle facilities, shallow groundwater conditions, soil stability, or well construction quality assurance/quality control concerns, etc.

EA or its subcontractors are responsible for, and shall ensure that, all ground disturbance activities are completed safely, without incident, and in accordance with applicable federal, state, and local regulations.

This procedure shall not override any site-specific or consultant/contractor procedures that are more stringent or provide a greater degree of safety or protection of health or the environment.

2. PROCEDURES

The EA Project Manager or his designee must complete the Subsurface Clearance Procedure Checklist (Appendix A) in conjunction with the following procedures. The checklist must be completed before initiating any ground disturbance activities. The completed checklist must be submitted to the appropriate team individuals, subcontractors, and/or the client and included in the project files.

2.1 SAFETY

A Health and Safety Plan must be available onsite and followed by all contractors and subcontractors.

All work areas shall be defined and secured with safety cones, safety tape, construction fence, other barriers, or signs as appropriate.

Site work permits must be obtained as required by site procedures. Based on site conditions or classification, the use of intrinsically-safe equipment may be required.

To ensure the safety of all onsite personnel and subsurface structure integrity, consideration should be given to de-energizing and locking out selected site utilities or temporarily shutting down a portion of or the entire facility.

2.2 PREPARATION TASKS

Objective—To gather all relevant information about potential subsurface structures prior to the actual site visit.

2.2.1 Obtain Permits and Site Access

The consultant/contractor is responsible for following all applicable laws, guidance, and approved codes of practice; obtaining all necessary permits and utility clearances; and securing site access permission.

2.2.2 Historic Site Information

Obtain most recent as-built drawings and/or site plans (including underground storage tank, product, and vent lines) as available.

NOTE: As-built drawings may not accurately depict the locations and depths of improvements and subsurface structures and should, therefore, not be **solely** relied upon.

EA should obtain any other site information such as easements, right-of-ways, historical plot plans, fire insurance plans, tank (dip) charts, previous site investigations, soil surveys, boring logs, and aerial photographs, etc. as relevant to the planned ground disturbance activities.

Where applicable, EA should also contact contract personnel who may have historic site knowledge.

2.2.3 Mark-Outs

Objective—To identify location of subsurface structures on surface.

EA must ensure that a thorough mark-out at the site is completed to locate electrical, gas, telephone, water, sewer, low voltage electric lines, product delivery pipelines, fiber optic, and all other subsurface utilities/services.

- Where available, public utility companies must be contacted to identify underground utilities. (This can be accomplished through the One-Call system in most instances.)

- In addition, where available and warranted by site conditions, a private utility/pipeline mark-out company should be contracted to perform an electronic subsurface survey to identify the presence of suspected hazardous or critical underground utilities and subsurface structures. In some cases, this is necessary to confirm public utility mark-outs in the vicinity of planned ground disturbance activities.

EA will review all available site plan subsurface information with the private mark-out company to assist in locating utilities and other subsurface structures.

NOTE: Mark-outs may not accurately depict the exact locations of improvements and subsurface structures and should, therefore, not be **solely** relied upon.

Where possible, EA personnel are encouraged to be onsite at the time of subsurface mark-outs. This is to ensure accuracy and understanding of subsurface structures identified and provides an opportunity to exchange information with mark-out company personnel regarding planned work activities.

Subsurface structures should be marked throughout the entire work area(s) with adequate materials (e.g., site conditions may require paint and tape/flags). Ground disturbance activities must be started within 30 days of mark-out, unless local ordinances specify a shorter time period. If activities are not started within required time period or markings have faded, mark-outs must be redone.

EA personnel will record time and date of mark-out request and list all companies contacted by the service and confirmation number. This should be available for review onsite and checked off after visual confirmation of markings.

2.2.4 Initial Site Visit

Objective—To compare the site plan to actual conditions based on information gathered in Procedures 2 and 3 above, obtain additional site information needed, and prepare a vicinity map.

EA will document all findings and update the site plan with this information. On third party sites, close coordination with the site owner's representatives for mark-outs, review of as-builts, and other information reviews should be conducted prior to work. Project Managers are encouraged to provide updated as-built information to the client.

In some regions, it may be more effective and efficient to conduct the site visit at the same time the contractor and drill rig are mobilized to the site. The inspection should include the following activities and may include others as determined by the consultant/contractor and the Project Manager.

2.2.5 Utilities

EA shall perform a detailed site walk-through for the purpose of identifying all aboveground indicators of subsurface utilities/services that may be leading to or from buildings within the planned work area. The inspection shall include, but not be limited to, the following:

- Utility mark-outs
- Aboveground utilities
- Area lights/signs
- Phones
- Drains
- Junction boxes
- Natural gas meters or connections
- Other utilities including: fire hydrants, on/below grade electrical transformers, splice cages, sewer lines, pipeline markers, cable markers, valve box covers, clean-outs/traps, sprinkler systems, steam lines (including insulated tanks that may indicate steam lines), and cathodic protection on lines/tanks
- Observe paving scars (i.e., fresh asphalt/concrete patches, scored asphalt/concrete).

NOTE: In many cases, the onsite location of low-voltage electrical lines and individual property water and sewer line branches may be approximated by using the following technique:

- Locate the entry/connection location at the facility building
- Attempt to identify utility connections for the mains (water sewer, etc.) by locating clean-outs, valve manways, etc. The location path of the utility is likely with the area between the main connection and facility building connection. Subsurface electrical line locations from the facility building to signs, lamps, etc. can be estimated with the same process.

2.2.6 Other Subsurface Systems

Some other subsurface systems to be cognizant of during subsurface activities include product delivery systems (i.e., at gas stations) and existing remediation systems.

2.2.7 Selection of Ground Disturbance Locations

EA will utilize the information collected to this point in combination with regulatory requirements and project objectives to select ground disturbance locations. Ground disturbance locations should also consider the location of overhead obstructions (e.g., power lines). Work at active gasoline retail locations must consider several special considerations that should be outlined in the site-specific safety and health plan.

2.2.8 Review of Selected Locations with the Client

EA will review the selected ground disturbance locations with the client. EA will not proceed with the subsurface activities until the plan has been discussed with the client. During execution of the project, subsurface activities are required outside of the area previously approved by the client. EA will submit these changes to the client for approval prior to execution.

2.2.9 Ground Disturbance Activity Sequence

EA will plan ground disturbance activities starting at the point farthest from the location of suspected underground improvements. This is done to determine the natural subsurface conditions and to allow EA site personnel to recognize fill conditions.

Experience has shown that the following warning signs may indicate the presence of a subsurface structure:

- Warning tape (typically indicative of underground services).
- Pea gravel/sand/non-indigenous material (typically indicative of tanks or lines).
- Red concrete (typically indicative of electrical duct banks).

- The abrupt absence of soil recovery in a hand auger. This could indicate pea gravel or sand that has spilled out of the auger. This may not be indicative in areas where native soil conditions typically result in poor hand auger recoveries.

- Any unexpected departure from the native soil or backfill conditions as established by prior onsite digging.

If any of these conditions is encountered by EA site personnel, digging should stop and the client should be contacted.

3. SUBSURFACE CLEARANCE METHODS

The method used to delineate the subsurface should be compatible with the inherent associated risk given the type of facility/property, soil stratigraphy, and the location of the ground disturbance activity, such that required delineation is obtained. It should be noted that in areas where there is paving, sufficient paving should be removed to allow clear visibility of the subsurface conditions during clearance activities. The following is a list of potential clearance methods that may be used on a job site:

- Vacuum digging
- Probing
- Hand digging
- Hand augering
- Post-hole digging.

EA personnel will evaluate the potential for electrical shock or fire/explosion for each subsurface disturbance project and will evaluate as necessary the use of non-conductive or non-sparking tools (i.e., fiberglass hand shovels, and thick electrically insulating rubber grips on hand augers or probes). The potential need for the use of non-conductive materials, electrical safety insulated gloves, and footwear will also be evaluated on a case-by-case basis.

3.1 SUBSURFACE CLEARANCE PROCEDURES FOR DRILLING, DIRECT-PUSH TECHNOLGY, AUGERING, FENCE POST INSTALLATION, OR OTHER BOREHOLE INSTALLATION ACTIVITIES

The area to be delineated will exceed the diameter of the largest tool to be advanced and sufficiently allow for visual inspection of any obstructions encountered.

3.2 SUBSURFACE CLEARANCE PROCEDURES FOR TRENCHING/ EXCAVATION ACTIVITIES

Appropriate subsurface clearance methods should be conducted along the length and width of the excavation at a frequency sufficient to ensure adequate precautions have been applied to the entire work area. The frequency and density of investigations will be based on site knowledge, potential hazards, and risks of the work area to surrounding locations (e.g., proximity to a residential area or school).

Whenever subsurface structures are exposed, EA will cease work and mark the area (e.g., flags, stakes, cross bracing) to ensure the integrity of these exposed structures is maintained during subsequent trenching/excavation/backfilling.

Uniform color codes for marking of underground facilities are provided in Appendix B.

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Appendix A

Subsurface Clearance Procedure Checklist

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Subsurface Clearance Procedure Checklist

Site Identification: ____________________

Project Consultant/Contractor: ____________________

Section 1: Safety, Preparation Tasks, and Mark-Outs

Activity	**Yes**	**No**	**N/A**	**Comments including Justification if Response Is No or Not Applicable**
Health and Safety Plan is available and all contractors and subcontractors are familiar with it.				
All applicable local, state, and federal permits have been obtained.				
Site access/permission has been secured.				
Most recent as-built drawings and/or site plans (including underground storage tank, product, and vent lines) obtained.				
Reviewed site information to identify subsurface structures relevant to planned site activities (easements, rights-of-way, historical plot plans, fire insurance plans, tank dip charts, previous site investigations, soil surveys, boring logs, aerial photographs, etc.).				
Utility mark-outs have been performed by public utility company(s). Mark-outs clear/visible.				
Subsurface structure mark-outs performed by private mark-out company. Mark-outs clear/visible.				
Additional Activities: Were dig locations reviewed with site representative?				

Section 2: Initial Site Visit and Selecting Ground Disturbance Locations

Activity	**Yes**	**No**	**N/A**	**Comments including Justification if Response Is No or Not Applicable**
Location of all aboveground indicators of subsurface utilities/services that may be leading to or from buildings within the planned work area has been identified.				
Location of utility mark-outs by all utility companies previously contacted has been identified within required time period.				
Location of all subsurface structure mark-outs by private mark-out company has been identified within required time period.				
Location of area lights/signs and associated subsurface lines identified.				
Location of all phones and associated subsurface lines identified.				
Location of all drains and associated interconnecting lines identified.				
Location of all electrical junction boxes and associated interconnecting lines identified				
Location of all natural gas meters or connections and all interconnecting lines identified				

Completed by: ____________________
Name

Signature: ____________________ ____________
Company Date

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Appendix B

Uniform Color Codes for Excavation

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APWA UNIFORM COLOR CODE

WHITE - Proposed Excavation

PINK - Temporary Survey Markings

RED - Electric Power Lines, Cables, Conduit and Lighting Cables

YELLOW - Gas, Oil, Steam, Petroleum or Gaseous Materials

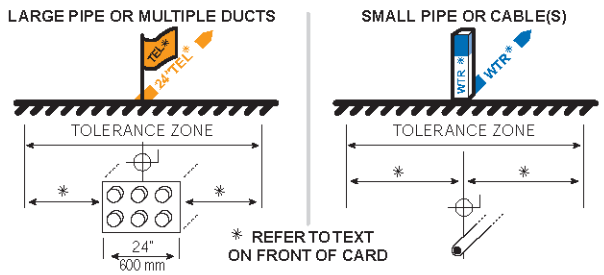
ORANGE - Communication, Alarm or Signal Lines, Cables or Conduit

BLUE - Potable Water

PURPLE - Reclaimed Water, Irrigation and Slurry Lines

GREEN - Sewers and Drain Lines

TYPICAL MARKING



Customize with your center's phone and address information

GUIDELINES FOR UNIFORM TEMPORARY MARKING OF UNDERGROUND FACILITIES

This marking guide provides for universal use and understanding of the temporary marking of subsurface facilities to prevent accidents and damage or service interruption by contractors, excavators, utility companies, municipalities or any others working on or near underground facilities.

ONE-CALL SYSTEMS
The One-Call damage prevention system shall be contacted prior to excavation.

PROPOSED EXCAVATION
Use white marks to show the location, route or boundary of proposed excavation. Surface marks on roadways do not exceed 1.5" by 18" (40 mm by 450 mm). The facility color and facility owner identity may be added to white flags or stakes.

USE OF TEMPORARY MARKING
Use color-coded surface marks (i.e., paint or chalk) to indicate the location or route of active and out-of-service buried lines. To increase visibility, color coded vertical markers (i.e., stakes or flags) should supplement surface marks. Marks and markers indicate the name, initials or logo of the company that owns or operates the line, and width of the facility if it is greater than 2" (50 mm). Marks placed by other than line owner/operator or its agent indicate the identity of the designating firm. Multiple lines in joint trench are marked in tandem. If the surface over the buried line is to be removed, supplementary offset markings are used. Offset markings are on a uniform alignment and clearly indicate the actual facility is a specific distance away.

TOLERANCE ZONE
Any excavation within the tolerance zone is performed with non-powered hand tools or non-invasive method until the marked facility is exposed. The width of the tolerance zone may be specified in law or code. If not, a tolerance zone including the width of the facility plus 18" (450 mm) measured horizontally from each side of the facility is recommended.

ADOPT UNIFORM COLOR CODE
The American Public Works Association encourages public agencies, utilities, contractors, other associations, manufacturers and all others involved in excavation to adopt the APWA Uniform Color Code, using ANSI standard Z535.1 Safety Colors for temporary marking and facility identification.

Rev. 4/99

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Standard Operating Procedure No. 011
for
Vegetation Removal

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle, Suite 400
Hunt Valley, Maryland 21031

Revision 0
February 2015

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CONTENTS

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1. PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide EA Engineering, Science and Technology, Inc., PBC (EA) employees and subcontractors with the minimum procedures and safety and health requirements applicable to perform vegetation removal operations on sites contaminated with munitions and explosives of concern (MEC).

2. SCOPE

This SOP applies to all EA site personnel, including contractor and subcontractor personnel, involved in the conduct of vegetation removal operations on a site potentially contaminated with MEC. This policy is not a stand-alone document; rather, it is to be used together with the applicable project-specific Work Plan; Site-Specific Health and Safety Plan Addendum; Quality Assurance Project Plan (QAPP); applicable federal, state, and local regulations; and contract restrictions and guidance. Consult the documents listed in Section 10.0 of this SOP for additional compliance issues.

3. MAINTENANCE

The Project Manager (PM), in collaboration with the Senior Unexploded Ordnance Supervisor (SUXOS) is responsible for the maintenance of this procedure. Approval authority rests with the Project Quality Control Manager (PQCM).

4. PERSONNEL REQUIREMENTS/RESPONSABILITIES

4.1 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.

4.2 RESPONSIBLE PERSONNEL

Only those personnel that meet the requirements set forth by the Client and EA will be utilized at the project site to facilitate safe and efficient vegetation removal operations.

5. TRAINING

All training on equipment will be either formal or on-the-job (OJT) training. This training will be documented by site personnel and subject to review for accuracy and completeness.

6. PERSONAL PROTECTIVE EQUIPMENT

Level D personal protective equipment (PPE) is required for all personnel engaged in vegetation removal operations. Clothing includes, but is not limited to:

- Coveralls or work clothing as prescribed
- Work gloves, leather or canvas as appropriate
- Safety Glasses
- Hard Hats (if necessary)
- Composite toed safety boots
- Hearing protection, noise attenuators, or ear plugs
- Dust mask, as required by wind conditions and/or the presence of airborne particulate matter
- Other personal protective equipment (PPE) as needed. (e.g., face shield, chainsaw chaps, etc.).

7. TEAM COMPOSITION

The Vegetation Removal Team will consist of three qualified personnel, as a minimum. These personnel may include any or all of the following:

- Unexploded ordnance (UXO) Technician III
- UXO Technician II or I
- Laborers.

7.1 UXO TECHNICIAN III

The UXO Technician III is UXO qualified and directs the operation and other team personnel within the context of removal requirements. In addition, the UXO Technician III must be familiar with the equipment being utilized.

7.2 OPERATOR

The operator(s) will be qualified and trained on the equipment being utilized (e.g., chainsaw, weed eater, hand tools etc.) and operate the equipment in a safe and efficient manner. The operator performs daily inspections and maintenance functions as recommended in the operator's manual. The operator will perform other duties as needed or directed.

8. SAFETY

Safety is paramount and all personnel will observe those safety precautions/warnings that apply or may apply to vegetation removal operations. The precautions listed below are general in nature and personnel will need to review applicable publications for more specific safety precautions/warnings. Distances listed are the minimum required.

- Teams will be separated by 75 feet (Team Separation Distance):
  - Former York Naval Ordnance Plant – 75 feet.
- Maintain safe separation distance from UXO personnel engaged in intrusive work.
- Distances may be increased by the U.S. Army Corps of Engineers (USACE) Ordnance Explosive (OE) Safety Specialist as determined by site history, UXO items encountered, terrain features, and other factors that may apply.
- Use equipment safety features.
- Safety precautions/warnings found in the operator's manual/manufacture's publications will be observed.
- Maintain 6 inches of ground clearance during removal operations.
- Communications will be maintained between the SUXOS and operator(s) at all times.
- Maintain site control.
- Observe UXO safety precautions for items encountered or suspected.
- Ensure PPE is appropriate, serviceable, and worn/used in a proper manner.

9. OPERATIONAL PROCEDURES

Personnel will not enter within 10 ft of an operating piece of equipment. If at any time personnel enter closer than 10 ft, the operator will immediately stop, return the engine to idle speed, and cease operations. Prior to operations commencing, a communications check with all team personnel will be conducted. Hand signals will be devised and used as a means of communication. All team personnel must know these hand signals prior to operations commencing. The hand signals will be documented on the tailgate safety-briefing sheet each morning of operations and at each change of team personnel.

The UXO Technician III will be responsible for the direction and manner in which the vegetation is to be removed. Only low lying brush and trees less than 4 inch diameter will be removed. Prior to removal operations commencing, a visual search/survey is conducted to determine the hazards that may be encountered, which may include munitions and explosives of concern (MEC), terrain slope, vegetation, wildlife, environmental concerns, and PPE requirements. The UXO Technician III will perform a visual search for MEC, ordnance scrap, surface debris, and any other obstruction/object that may pose a hazard to team personnel. Hazardous items, impassable terrain, or vegetation that may affect operations will be marked and team personnel notified.

Team personnel are to ensure that a 6-inch ground clearance is maintained during removal operations. Those areas marked as hazards are to be avoided. The manner in which operations are accomplished will follow safe work practices and procedures. Areas of concern will be addressed to the SUXOS and/or UXO Quality Control Specialist (UXOQCS)/UXO Safety Officer (UXOSO) as needed. All MEC items encountered are marked and avoided. Notification of these items will be made to the appropriate personnel.

10. SUMMARY

EA personnel will conduct vegetation removal operations in a safe, efficient, and productive manner and will use this SOP and references, which include changes and revisions.

11. REFERENCES

- EA Corporate Safety and Health Program (CSHP)
- SSHP
- Occupational Safety and Health Administration (OSHA) Regulations
- USACE, Engineer Manual 385-1-1
- USACE Engineer Manual 385-1-97
- Operator’s Manual(s) and Manufacturer’s Publications.

Standard Operating Procedure No. 012
for
Munitions Debris Inspection

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
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Hunt Valley, Maryland 21031

Revision 0
February 2015

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CONTENTS

Page

1. PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide the munitions potentially possessing explosive hazards procedures at EA Engineering, Science, and Technology, Inc., PBC (EA). This SOP is not meant to be all inclusive, nor is it applicable in all situations. This policy is not a standalone document; rather, it is to be used in conjunction with the applicable project-specific Work Plan (WP); Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP); applicable federal, state, and local regulations; contract restrictions; and guidance.

2. SCOPE

This SOP applies to all site personnel, including subcontractor personnel, involved in the conduct of operations on munitions response sites requiring munitions debris/scrap inspection and certification activities. This SOP is not intended to contain all of the requirements needed to ensure compliance. Consult the documents listed in the reference sections of the WP and APP/SSHP.

3. MAINTENANCE

The Project Manager (PM), in collaboration with the Site Supervisor is responsible for the maintenance of this procedure. Approval authority rests with the Program Quality Control Manager (PQCM).

4. MPPEH INSPECTION AND CERTIFICATION

EA MEC Projects will comply with the following procedures for collection, inspection, and certification and final disposal of Material Potentially Presenting an Explosive Hazard (MPPEH), Munitions Debris (MD), Range Related Debris (RRD) and Non-Munitions Related Debris (NMRD).

MPPEH must be controlled and managed (e.g., sorted, segregated, stored, secured from the time of recovery through the release from DoD control to prevent its unauthorized use, transfer or release, and to protect personnel and property from uncontrolled exposures to potential explosive hazards. This must be accomplished by ensuring the chain-of-custody remains intact during the entire process from discovery to final disposition. See Attachment 1—Figure 1: MPPEH Process that depicts the flow of the MPPEH process from recovery to release from DoD control.

4.1 ROLES AND RESPONSIBILITIES

The following outlined section, addresses the roles and responsibilities for each position normally involved in military munitions response (MMR) projects in regard to the planning, recovery, inspection process, handling, and storage of MPPEH, MD, RRD and NMRD on MMR projects.

4.1.1 Project Manager

- Ensure that current and thorough MPPEH Management procedures are contained in the project plans.

- Ensure that the MPPEH Management, inspection and certification procedures are being followed in accordance with the Site-Specific work plan and SOP.

- Coordinate final disposition of all Materials Documented as Safe (MDAS) with the EA approved recyclable facility.

4.1.2 Site Supervisor and Senior Unexploded Ordnance Supervisor

- Responsible for ensuring work and QC plans specify the procedures and responsibilities for processing MPPEH for final disposition as MD, RRD and NMRD.

- Ensure a requisition and turn-in document, DD Form 1348-1A is completed for all MD and RRD to be transferred for final disposition to an approved EA recycle facility.

- Perform a daily inspection (with the UXOQCS) of all MPPEH collected (100%) and released by the UXOTIII to ensure no items with explosive hazards, engine fluids, illuminating dials and other visible liquid hazards, toxic or radiological waste (HTRW) materials are identified as MD, RRD or NMRD.

- Maintain one of two keys to the lockable container.

- Certify all MD and RRD is free of explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials.

- Be responsible for ensuring that the daily inspected debris is secured in a closed, lockable container.

- Maintain the MDAS Container Log (Attachment 2, Form 005) for all lockable containers of certified MD.

4.1.3 UXO SAFETY OFFICER

- Ensures all procedures for processing MPPEH are being performed safely and consistent with applicable regulations the site specific work plan and associated guidance/planning documents.

4.1.4 UXO Quality Control Specialist

- Conduct daily audits of the procedures used by UXO personnel to assess whether the processes and procedures as stated in the Site Specific Work plan and this SOP for MPPEH are being followed.

- Perform a daily inspection (with the SUXOS) of all MPPEH collected (100%) and released by the UXOTIII to ensure no items with explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials are identified as munitions debris or range-related debris or NMRD.

- Ensure that the daily inspected MD and RRD is placed in a closed lockable container. All NMRD is to be placed in a second closed lockable container.

- Maintain one of two keys for each lockable container.

4.1.5 UXO Technician III

- Performs a 100% daily re-inspection of all recovered items prior to departing the work area to determine if items are free of explosives hazards or other dangerous fillers and engine fluids, illuminating dials and other visible liquid HTRW materials.

- Ensures that segregation is appropriate for all items not requiring demilitarization or venting from those items that do require demilitarization or venting.

- Segregates all MD, NMRD, and RRD prior to the SUXOS and UXOQCS inspection at the MPPEH collection point.

- If at any time an item is questionable, cannot be 100% identified, or its condition undetermined, it will remain at the location discovered prior to being transported to the MPPEH collection point, pending evaluation and disposition by the SUXOS, UXOQCS, and UXOS.

4.1.6 UXO Technician II

- Weigh each item and perform a 100% inspection of each item as it is discovered and determine the following:

  — Whether the item is an UXO, MD, RRD or NMRD.

  — Whether the item contains explosives hazards or other dangerous fillers.

  — If the item is suspected to be unacceptable to move and requires detonation.

- Whether the item requires demilitarization or venting to expose dangerous fillers.
- Whether the item requires draining of engine fluids, illuminating dials and other visible liquid HTRW materials.

- Segregate all items not requiring demilitarization or venting from those items that do require demilitarization or venting.
- The SUXOS and UXOSO will be notified immediately if items are found to contain other dangerous fillers. Items will not be moved pending assessment by the SUXOS and UXOSO.

4.1.7 UXO Technician I

UXO Technician I (UXOTI) can tentatively identify a located item as MPPEH, followed by a required confirmation by a UXOTII or UXOTIII.

4.1.8 Unexploded Ordnance Sweep Personnel

Unexploded Ordnance Sweep Personnel (UXOSP) will only mark suspected items and will not be allowed to perform any assessment of suspect items to determine its status.

4.2 MUNITIONS DEBRIS CERTIFICATION AND VERIFICATION

The SUXOS will certify (prior to off-site release) that all munitions debris and range-related debris is free of explosive hazards and will verify the MPPEH inspection process has been followed.

DD Form 1348-1A (Attachment 2, Form 001) will be used as certification/verification documentation. All DD 1348-A forms must clearly show the type or printed names of the SUXOS, organization, signature, and EA home office and field office phone number(s) of the personnel certifying and verifying the debris as free of explosive hazards.

4.2.1 Data Elements for DD Form 1348-1A

In addition to the data elements required and any locally agreed to directives, the DD 1348-1A form must clearly indicate the following for scrap metal:

- Basic material content (Type of metal; e.g., steel or mixed)
- Estimated weight
- Unique identification of each of the containers and seals stated as being turned over
- Location where munitions debris or range-related debris was obtained
- Seal identification, if different from the unique identification of the sealed container.

4.2.2 Certification/Verification Statement (HTRW)

The following certification/verification will be entered on each DD 1348-1A for turnover of munitions debris or range-related debris and will be signed by the SUXOS. This statement will be used on any ranges where RRD is being processed along with MD

> *This certifies that the material listed has been 100 present properly inspected and, to the best of our knowledge and behalf is free of explosive hazards, engine fluids, illumination dials and other visible liquid HTRW materials.*

4.2.3 Certification/Verification Statement (Munitions Debris only)

The following certification/verification will be entered on each DD 1348-1A for turnover of munitions debris and will be signed by the SUXOS on properties where only munitions debris is being processed:

> *This certifies and verifies that the material listed has been 100 percent inspected and to the best of our knowledge and belief, is inert and/or free of explosives or related materials.*

4.3 MAINTAINING THE CHAIN-OF-CUSTODY AND FINAL DISPOSITION

All certified and verified MDAS is no longer considered MPPEH as long as the chain of custody remains intact. The EA PM and SUXOS will arrange for maintaining the chain of custody of all MDAS while being transported offsite for final disposition. See Attachment 2, Form 002 for a copy of the MDAS chain of custody that is to be completed throughout the process. The certified and verified material will only be released to an organization approved by EA beforehand that agree to the following procedure:

- Upon receiving the unopened labeled containers each with its unique identified and unbroken seal ensuring a continued chain of custody, and after reviewing and concurring with all the provided supporting documentation, sign for having received and agreeing with the provided documentation that the sealed containers contained no explosive hazards when received. This will be signed on company letterhead and stating that the contents of these sealed containers will not be sold, traded or otherwise given to another party until the contents have been <u>smelted</u> and are only identifiable by their basic content. See Attachment 2, Form 003 as an example.

- Send notification and supporting documentation to EA documenting the seal containers to the PM that the material has been smelted and are now only identifiable by their basic content. See Attachment 2, Form 004 as an example.

This document will be incorporated by EA into the final report and maintained within the corporate office for a period of no less than three years as documentation supporting the final disposition of munitions debris and range-related debris. A legible copy of inspection, re-inspection, and documentation must accompany the material through final disposition and be maintained for a period of 3 years thereafter and incorporated by EA into any final action reports or the like.

4.3.1 Broken Chain-of-Custody

If the chain of custody is broken, the affected MPPEH must undergo a second 100 % re-inspection. The re-inspection will be conducted and be documented to verify its explosives safety status (identified as either munitions debris or range-related debris).

A legible copy of the re-inspection, and documentation must accompany the material through final disposition and be maintained for a period of 3 years thereafter.

Attachment A

MPPEH Process

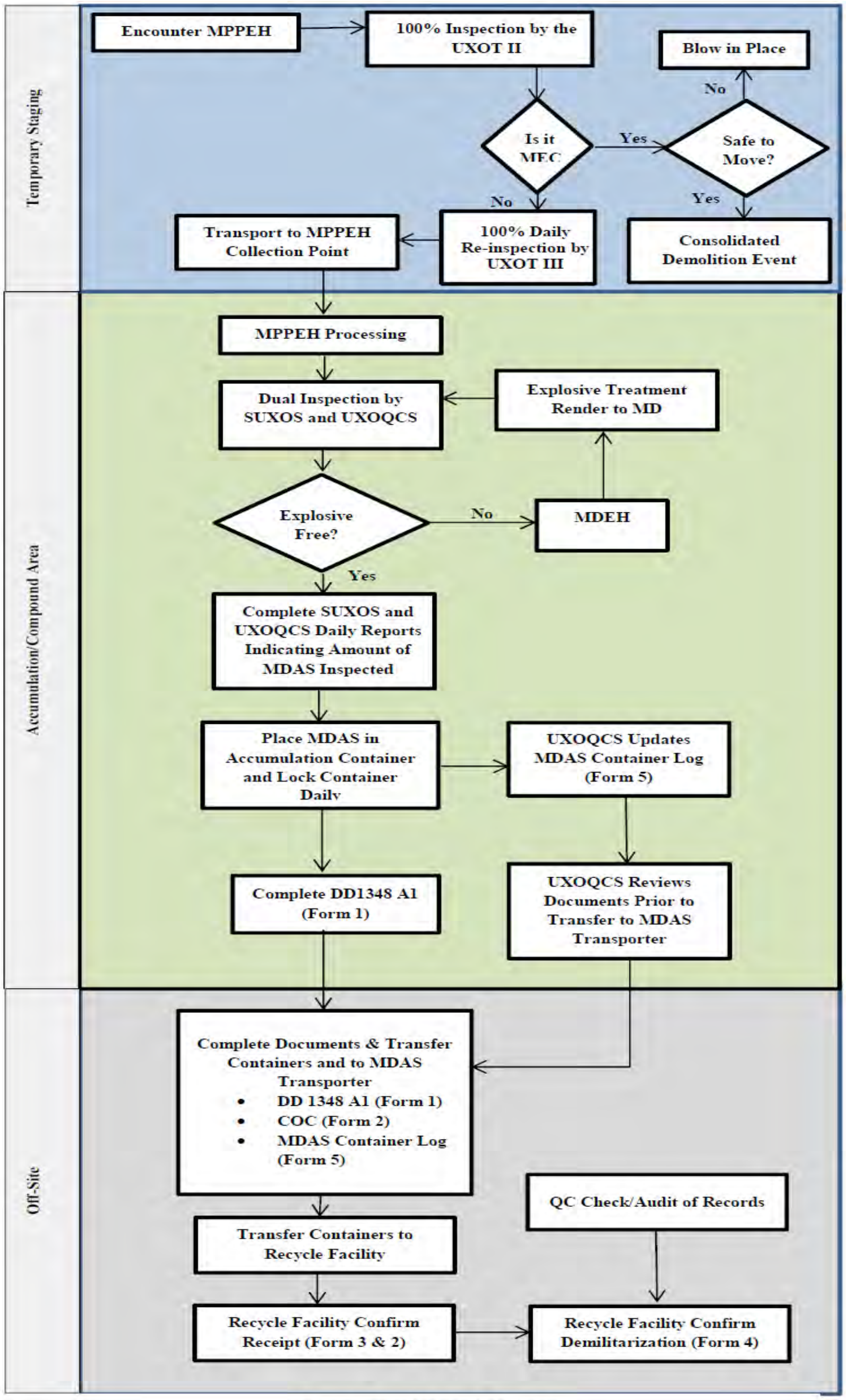

Figure 1: MPPEH Process

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Attachment B

Documentation Forms

Form 001 – DD 1348-1A

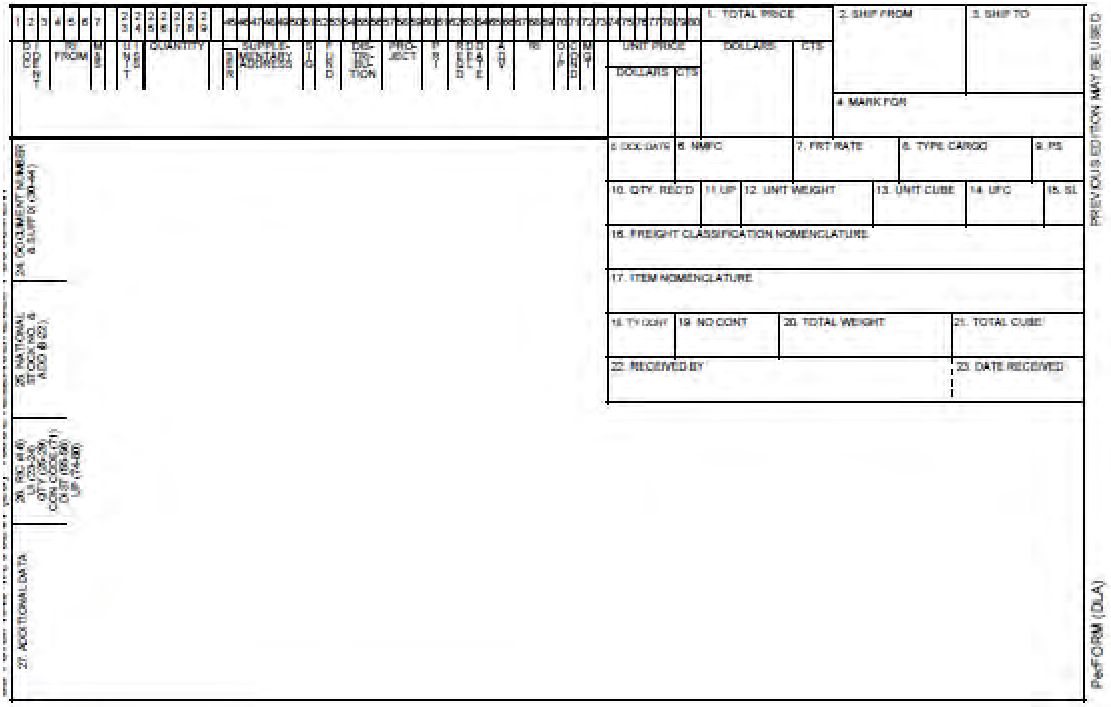
Form 002 – Material Documented as Safe (MDAS) Chain of Custody

Form 003 – Example Material Documented as Safe (MDAS) Receipt Form

Form 004 – Example Material Documented as Safe (MDAS) Disposal Confirmation Form

Form 005 – Material Documented as Safe (MDAS) Container Log

Form 001
DD1348-1A


1. TOTAL PRICE
2. SHIP FROM
3. SHIP TO
4. MARK FOR
QUANTITY
SUPPLEMENTARY ADDRESS
DISTRIBUTION
PROJECT
UNIT PRICE
DOLLARS
CTS
5. DOC DATE
6. NMFC
7. FRT RATE
8. TYPE CARGO
9. PS
10. QTY. REC'D
11. UP
12. UNIT WEIGHT
13. UNIT CUBE
14. UFC
15. SL
16. FREIGHT CLASSIFICATION NOMENCLATURE
17. ITEM NOMENCLATURE
18. TY CONT
19. NO CONT
20. TOTAL WEIGHT
21. TOTAL CUBE
22. RECEIVED BY
23. DATE RECEIVED
24. DOCUMENT NUMBER & SUFFIX (30-44)
25. NATIONAL STOCK NO. & ADD (8-22)
27. ADDITIONAL DATA
PREVIOUS EDITION MAY BE USED
PerFORM (DLA)

Form 002
Material Documented as Safe Chain-of-Custody Form

<table>
<tr><td rowspan="8">General)</td><td colspan="4">Material Documented as Safe Certification Chain of Custody</td></tr>
<tr><td colspan="3">1. Generator's Name and Mailing Address</td><td>1.a Generator's Ph #
( )</td></tr>
<tr><td colspan="3">2. Project Location</td><td>2.a Project Ph #
( )</td></tr>
<tr><td colspan="3">3. MPPEH Contractor Name and Mailing Address</td><td>3.a MPPEH Contractor Ph#
( )</td></tr>
<tr><td colspan="3">4. Government Assigned Verification Name and Mailing Address (if used)</td><td>4.a Verifier Ph #
( )</td></tr>
<tr><td colspan="3">5. Transporter Name and Mailing Address</td><td>5.a Transporter Ph #
( )</td></tr>
<tr><td colspan="3">6. Recycler Name and Mailing Address</td><td>6.a Recycler Ph #
( )</td></tr>
<tr><td>7. Container ID #</td><td>8. Security Seal #</td><td>9. Manifest #</td><td>10. Date</td></tr>
<tr><td rowspan="15">Explosives Safety Status Certification and Verification</td><td>11. Description</td><td>12. Material</td><td>13. QTY</td><td>14. Unit (i.e., drum)</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="4">15. MATERIAL DOCUMENTED AS SAFE CERTIFICATION: This certifies and verifies that the material listed has been 100 percent inspected and to the best of our knowledge and belief, is inert and/or free of explosives or related materials.</td></tr>
<tr><td colspan="4">16. SUXOS Certification</td></tr>
<tr><td>Signature</td><td colspan="2">Address</td><td>Date</td></tr>
<tr><td>Printed/Typed Name</td><td colspan="2"></td><td>Phone</td></tr>
<tr><td colspan="4">17. OESS Verification (if required)</td></tr>
<tr><td>Signature</td><td colspan="2">Address</td><td>Date</td></tr>
<tr><td>Printed/Typed Name</td><td colspan="3">Phone</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4"></td></tr>
<tr><td rowspan="12">Transporter</td><td colspan="4">18. Transporter Acknowledgement of Receipt of Materials (Receiving Signature Verifies that Container was Received with Seal Intact)</td></tr>
<tr><td>Signature</td><td colspan="2">Address</td><td>Date</td></tr>
<tr><td>Printed/Typed Name</td><td colspan="2"></td><td>Phone</td></tr>
<tr><td colspan="4">19. EA Acknowledgement of Transfer of Materials (Signature verifies that Container was Transferred to Transporter with Seal Intact)</td></tr>
<tr><td>Signature</td><td colspan="2">Address</td><td>Date</td></tr>
<tr><td>Printed/Typed Name</td><td colspan="2"></td><td>Phone</td></tr>
<tr><td colspan="4">20. Discrepancy Indication Space</td></tr>
<tr><td>Signature</td><td colspan="2">Address</td><td>Date</td></tr>
<tr><td>Printed/Typed Name</td><td colspan="2"></td><td>Phone</td></tr>
<tr><td colspan="4">21. Recycler Acknowledgement of Receipt of Materials (Receiving Signature Verifies that Drums were Received with Seal Intact)</td></tr>
<tr><td>Signature</td><td colspan="2">Address</td><td>Date</td></tr>
<tr><td>Printed/Typed Name</td><td colspan="2"></td><td>Phone</td></tr>
<tr><td rowspan="8">Demil. and/or Recycle Facility</td><td colspan="4">22. DEMILITARIZATION/RECYCLING CONFIRMATION: This certifies and verifies that each item or items contained have been demilitarized to the minimum requirements of DOD Instruction 4160.21-M-1, Defense Demilitarization Manual. (To be signed by person performing the demilitarization – Recycler or UXO Technician)</td></tr>
<tr><td colspan="4">23. Recycler</td></tr>
<tr><td>Signature</td><td colspan="2">Address</td><td>Date</td></tr>
<tr><td>Printed/Typed Name</td><td colspan="2"></td><td>Phone</td></tr>
<tr><td colspan="4">24. Senior UXO Supervisor Verification</td></tr>
<tr><td>Signature</td><td colspan="2">Address</td><td>Date</td></tr>
<tr><td>Printed/Typed Name</td><td colspan="2"></td><td>Phone</td></tr>
<tr><td colspan="4">25. Final Disposition (If other than recycling)</td></tr>
</table>

Form 003
Example Material Documented as Safe Receipt Form

Company XXXX Recycles
Letterhead

Date: *DDMMYY*

Dear *Mr./Ms.:*

On *DDMMYY*, the contents of sealed container/*s #EA 000X, Seal Serial Number XXXX* were received from EA Engineering, Science and Technology, Inc., *SOMEWHERE* project site.

Company XXXX Recycles has received and inspected the sealed container/s and agree that the material received is MD and contains no explosive hazards.

The contents of the sealed container/s are to be processed in accordance with DoD 4160-21 M-1, and will not be sold, traded or otherwise given to another party until the contents have been smelted and only identifiable by their basic content.

Enclosed is the signed Chain of Custody that was received along with the containers.

Signed:

Name:

Point of Contact Information:

Form 004
Example Material Documented as Safe Disposal Confirmation Form

Company XXXX Recycles
Letterhead

Date: *DDMMYY*

Dear *Mr./Ms.:*

I certify that the contents of sealed container/*s #EA 000X, Seal Serial Number XXXX* received on *DDMMYY* from EA Engineering, Science, and Technology, Inc. from *SOMEWHERE* project site were demilitarized in accordance with guidelines in DoD 4160.21-lVI-l and have been smelted and are only identifiable by their basic content.

Signed:

Name:

Point of Contact Information:

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Form 005
Material Documented as Safe Container Log

Date	MDAS Type (Steel, Iron…)	Quantity	Certifier	Verifier	Container ID	Seal Number	COC Number	Total Items

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Standard Operating Procedure No. 013
for
Surface Clearance Operations

Prepared by

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Revision 0
February 2015

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CONTENTS

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1. PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide all EA Engineering, Science, and Technology, Inc., PBC (EA) employees and subcontractors with the minimum procedures and safety and health requirements applicable to the conduct of analog detection and removal actions at sites potentially containing munitions and explosives of concern (MEC).

This SOP addresses work activities that are pertinent to both Phase 1 and Phase 2 of fYNOP RI activities. Activities such as MEC disposal will only be applied to Phase 2. The remainder of this SOP can also be used following reacquisition of digitally collected geophysical anomalies.

2. SCOPE

This SOP applies to all EA site personnel, including contractor and subcontractor personnel, involved in the conduct of analog detection and magnetometer assisted surface clearance YNOP. The following EA policies and procedures are not all inclusive nor are they applicable in all situations. This SOP is not a stand-alone document and is to be used together with the entire Work Plan, other EA SOPs, applicable federal, state, and local regulations, and contract restrictions and guidance.

3. MAINTENANCE

The Project Manager (PM), in collaboration with the Site Supervisor is responsible for the maintenance of this procedure. Approval authority rests with the Program Quality Control Manager (PQCM).

4. PERSONNEL REQUIREMENTS/RESPONSIBILITIES

The PM is responsible for ensuring availability of resources to safely and effectively implement this SOP.

The SUXOS will ensure that this SOP is implemented in plans, procedures, and training. In addition, he is responsible for oversight and supervision of field personnel, and ensuring compliance with this SOP.

4.1 UXO SAFETY OFFICER

The UXOSO's duties shall include, but are not limited to: analyzing MEC, explosives operational risk, hazards, and safety requirements; establishing and ensuring compliance with all site-specific safety requirements for MEC and explosives operations; enforcing personnel limits and safety exclusion zones (EZ) for MEC clearance operations (if required); and all activities associated with MEC and explosives transportation, storage, and destruction (if required).

4.2 UXO QUALITY CONTROL SPECIALIST

The UXO Quality Control Specialist (UXOQCS) duties shall include, but are not limited to: establishing and ensuring compliance with site-specific quality control requirements for MEC and explosives operations and all activities associated with MEC and explosives transportation, storage, and destruction in accordance with the approved Work Plan.

5. OPERATIONS

5.1 MAGNETOMETER ASSISTED SURFACE CLEARANCE

All analog detection and removal activities at MEC sites will be under the supervision of unexploded ordnance (UXO) qualified personnel. Non-essential personnel will not be allowed in the EZ MEC clearance operations unless prior approval is given by the contracting officer representative. If access is required by non-UXO qualified and non-authorized personnel, all work will stop while they are in the EZ.

Work may continue if authorized visitors are in the EZ. This authorizing process will include approval by the EA PM, EA Corporate Safety and Health Director, and the onsite UXO health and safety officer. Project personnel listed in the Work Plan, including the geophysical teams, the reacquisition team, and the field sampling teams, do not require this approval process. All authorized visitors will be given a safety briefing prior to entering EZ and will be provided a UXO-qualified escort regardless of their qualifications.

During operations, EA personnel will strictly adhere to the APP and the following general safety practices:

- Operations will be conducted during daylight hours only.
- Access to operating areas will be limited to only those personnel necessary to accomplish the specific operation.
- UXO will not be handled, disturbed, or moved.
- During MEC operations the minimum separation distance (MSD) between MGFD and non-UXO operations is the hazardous fragmentation distance (HFD) of the munitions with the greatest fragmentation distance (MGFD), as stated in the approved Explosives Safety Plans.
- During demolition operations personnel remaining on site will be limited to those personnel needed to safely and efficiently prepare the item(s) for destruction.

- All personnel will attend the daily safety briefing (tailgate safety briefing) or a supplemental safety briefing provided by the UXOSO prior to entering the operating area.

- **Anyone** can stop operations for an unsafe act or situation.

- Safety violations and/or unsafe acts will be immediately reported to the UXOQCS / UXOSO.

- Failure to comply with safety rules/procedures may result in termination of employment.

5.2 GRID LAYOUT

Depending on the method selected and approved by the customer, the site layout and search grids will be established using a Global Positioning System (GPS) or compass and measuring tape. Grid establishment will consist of GPS operators and at least one UXO Technician II or above who will provide UXO avoidance including checking the intended survey stake locations with a magnetometer prior to driving stakes into the ground. This will prevent driving stakes into potential subsurface MEC.

5.3 ANALOG SWEEP PROCEDURES

MEC surface sweep operations will include minimum of a UXO Technician III and a UXO Technician II. During intrusive operations UXO Technicians I will operate under the supervision of UXO Technicians II or III. UXO operations will only be performed by qualified UXO Technicians, which are defined as:

- MEC identification
- Access procedures such as excavation, either by hand or using heavy equipment
- Handling of MEC, explosives, or explosive items
- Disposal, including movement, transportation, and final disposal of MEC.

Analog detector sweeps are particularly effective in areas where vegetation and terrain limit the use of larger digital systems. Also, magnetometer and dig approaches should be used when there is insufficient difference between MEC at the site and other metallic fragments and debris, such that digital discrimination is ineffective or cost prohibitive.

5.3.1 Pre-Survey Field Operations

Each piece of field equipment scheduled for that day's use will be function tested prior to commencement of work. Routine testing procedures will be identified, including the criteria for acceptable performance using an instrument verification strip (IVS), and the action to be taken if the equipment is not performing with the parameters established by the manufacturer or fails to detect the items placed within the IVS at the prescribed depths and axis. A maintenance/ calibration log will be maintained for each unit showing the manufacturer, model, serial number, and dates of repair, maintenance and calibration. Instrumentation used in the field will be tested with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacture's specifications. Testing, repair, or replacement records will be filed and maintained by the SUXOS and may be subject to audit at any time.

The manufacturer's written maintenance schedule shall be followed to minimize the downtime of the measurement systems. The operator's responsibility will be to adhere to this maintenance schedule and to arrange necessary and prompt service as required. At a minimum, equipment used daily will be cleaned at the end of each work day and kept in good operating condition. Service to the equipment, instrument, tools, etc. shall be performed by qualified personnel. In the absence of manufacturer's recommended maintenance criteria, a maintenance procedure will be developed based upon previous use of the equipment.

Equipment pre-operation procedures will be observed by the SUXOS and/or UXOQCS and recorded in the daily log. If equipment field checks indicate that a piece of equipment is not operating correctly and field repair cannot be made, the equipment will be tagged and removed from service. The SUXOS and/or UXOQCS will request repair or replacement from logistics. Replacement equipment will meet the same specifications for accuracy and sensitivity as the equipment removed from service. Metal detectors will be field tested each day on a known target to ensure they are operating properly. Fisher and Schonstedt metal detectors do not require calibration; they have a simple "Go/No Go" field operational check. Failure to detect the test target is reason to reject the instrument and return it to the manufacturer for repairs. During daily operations, random checks of metal detectors will be performed to ensure the equipment is operating correctly. Daily maintenance will include cleaning, minor repairs to the equipment, and battery changes when needed. Repairs may include replacing control knobs and tightening connections as the stated in the manufacturer's manual. Major repairs will be accomplished by returning the equipment to the manufacturer. Batteries will be removed from metal detectors when stored for more than 24 hours and before shipment. Documentation of the status of the metal detectors will be recorded on the Technician III's daily journal and site log.

5.3.2 Survey Field Operations

Initially, individual search lanes will be established approximately 5 feet (ft) wide. Each lane will be surveyed using a Schonstedt magnetometer. The operation will begin at one end of each lane and move in a forward direction toward the opposing baseline. During the forward movement the technician moves the magnetometer back and forth from one side of the lane to the other. Both forward movement and the swing of the magnetometer are performed at a pace that ensures the entire lane is searched and that the instrument is able to appropriately respond to metallic surface debris and subsurface anomalies. When a ring-off occurs the UXO Technician halts and investigates if the source is from a metallic object on the surface or a subsurface anomaly.. Throughout this operation the team leader closely monitors the team's individual performance to ensure these procedures are being performed correctly.

5.4 SURFACE MEC/UXO

MEC will be identified by two UXO Technician IIIs or greater and the condition determined to be acceptable or unacceptable to move. If the item is determined to be acceptable to move the item can be consolidated with other MEC items for disposal. If determined to be unacceptable to move it will be marked (flagged) in accordance with the approved Work Plan pending disposition. If disposal cannot be arranged the same day as the MEC/ is identified, a guard will be posted during the non-working hours to ensure the item is not disturbed or moved.

6. RECORD KEEPING

The team leader (UXO Technician III) will record at a minimum will contain a record of the following:

- Weather
- Instrument details and serial number
- Team personnel
- Grids worked
- GPS location
- Start and stop times
- MEC items encountered.

The data to be recorded for each item discovered during anomaly excavation will include the following (as applicable):

- Type (e.g., munitions debris, material potential presenting an explosive hazard [MPPEH], UXO, and non-MEC Scrap)
- Description (e.g., "projo, 20-millimeter [mm], practice, MK105" and "base, coupling, firing device")
- Initial Condition (e.g., expended, inert, live, and to be determined)
- Approximate length
- Approximate width
- Depth
- Approximate weight
- Found in a pit?

- Piece of fragmentation?
- Initial disposition (e.g., left in place and removed to scrap pile)
- Requires demolition?

All data will be turned into the Site Geophysicist at the end of the day.

7. REFERENCES

Applicable sections of EPA, 40 CFR Parts 260 to 299, Protection of Environment

Applicable sections of DOT, 49 CFR Parts 100 to 199, Transportation

AR 385-64, Ammunition and Explosives Safety Standards

AR 200-1, Environmental Protection and Enhancement

AR 385-10, The Army Safety Program

AR 385-16, System Safety Engineering and Management

AR 385-40 w/USACE supplement, Accident Reporting and Records

DA PAM 385-64, Ammunition and Explosives Safety Standards

DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives

DOD Manual 6055.09-M, DOD Ammunition and Explosives Safety Standards

DOD 4160.21-M, Defense Reutilization and Marketing Manual

EA Corporate Safety and Health Program (CSHP)

OSHA, 29 CFR 1910, Occupational Safety and Health Standards

OSHA, 29 CFR 1926, Construction Standards

TM 9-1300-200, Ammunition General

TM 9-1300-214, Military Explosives

USACE EM 385-1-1, Safety and Health Requirements Manual

USACE EM 385-1-97, Explosives Safety and Health Requirements Manual

USACE ER 385-1-92, Safety and Occupational Health Document Requirements for Hazardous Waste Remedial Actions

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Standard Operating Procedure No. 025
for
Soil Sampling

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle, Suite 400
Hunt Valley, Maryland 21031

Revision 0
December 2014

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CONTENTS

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1. SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure is to delineate protocols for sampling surface and subsurface soils. Soil samples give an indication of the area and depth of site contamination, so a representative sample is very important.

2. MATERIALS

The following materials may be required:

Bucket auger or push tube sampler	Split-spoon, Shelby tube, or core barrel sampler
Drill rig and associated equipment	Stainless steel bowl
Personal protective equipment as required by the Health and Safety Plan	Stainless steel spoon, trowel, knife, spatula (as needed)

3. PROCEDURE

3.1 SUBSURFACE SAMPLES

Don personal protective equipment. Collect split-spoon, core barrel, or Shelby Tube samples during drilling. Upon opening sampler, or extruding sample, immediately screen soil for volatile organic compounds using either a photoionization detector or flame ionization detector. If sampling for volatile organic compounds, determining the area of highest concentration, use a stainless steel knife, trowel, or laboratory spatula to peel and sample this area. Log the sample in the Field Logbook while it is still in the sampler. Peel and transfer the remaining sample in a decontaminated stainless steel bowl. Mix thoroughly with a decontaminated stainless steel spoon or trowel. Place the sample into the required number of sample jars. Preserve samples as required. Discard any remaining sample into the drums being used for collection of cuttings. Decon sampling implements. All borings will be abandoned.

NOTE: If sample recoveries are poor, it may be necessary to composite samples before placing them in jars. In this case, the procedure will be the same, except that two split-spoon samples will be mixed together. The Field Logbook should clearly state that the samples have been composited, which samples were composited, and why the compositing was done.

Samples taken for geotechnical analysis will be undisturbed samples, collected using a thin-walled (Shelby tube) sampler.

3.2 SURFICIAL SOIL SAMPLES

Don personal protective equipment. Remove vegetative mat. Collect a sample from under the vegetative mat with a stainless steel trowel, push tube sampler, or bucket auger. If a representative sample is desired over the depth of a shallow hole or if several shallow samples are to be taken to represent an area, composite as follows:

- As each sample is collected, place a standard volume in a stainless steel bowl.
- After all samples from each hole or area are in the bucket, homogenize the sample thoroughly with a decontaminated stainless steel spoon or spatula.

If no compositing is to occur, place sample directly into the sample jars. Place the leftover soil in the auger borings and holes left by sampling. If necessary, add clean sand to bring the subsampling areas back to original grade. Replace the vegetative mat over the disturbed areas. Samples for volatile organic compounds will not be composited. A separate sample will be taken from a central location of the area being composited and transferred directly from the sampler to the sample container. Preserve samples as required. Decon sampling implements.

4. MAINTENANCE

Not applicable.

5. PRECAUTIONS

Refer to the Health and Safety Plan.

Soil samples will not include vegetative matter, rocks, or pebbles, unless the latter are part of the overall soil matrix.

6. REFERENCES

ASTM International. Method D1586-84, Penetration Test and Split-Barrel Sampling of Soils.

———. Method D1587-83, Thin Walled Sampling of Soils.

Department of the Army, Office of the Chief of Engineers. 1972. Engineer Manual 1110-2-1907 Soil Sampling. 31 March.

Appendix D

Field Forms

E A ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.
SUXOS DAILY REPORT

Project No. **Day/Date** ________________ **Report No.**_________

Project Title & Location:

Weather: Clear ____ Partly Cloudy _____ Cloudy ____ Rainfall___ (% of workday)

Temperature During Workday: High___ Low___Humidity_______

1. WORK PERFORMED BY CONTRACTORS/SUBCONTRACTORS

Contractor	Crafts	Hours	Description of Work

2. OPERATING EQUIPMENT DATA (Not hand tools)

Equipment	Date of Arrival / Departure	Owned or Rented	Hours Used	Hours Idle	Hours of Rep./Main

3. WORK PERFORMED TODAY (Indicate location and description of work performed by prime and/or subcontractors).

4. QUALITY CONTROL INSPECTIONS AND RESULTS (Include a description of preparatory, initial or follow-up inspections/meetings; check of subcontractors work, materials delivered to site, comments on proper storage of materials, include comments on corrective actions to be taken).

Inspect delivered

5. QUALITY CONTROL TESTING AND RESULTS (Comment on tests and equipment checks)

6. DAILY SAFETY INSPECTIONS (Include comments on new hazards to be added to Hazard Analysis and corrective action of any safety issues).

E A ENGINEERING, SCIENCE, AND TECHNOLOGY, INC.
DAILY QUALITY CONTROL REPORT

Project No.:_________ **Day/Date: __________** **Report No.:______**

7. REMARKS (Include conversations with or instructions from the Government representatives; delays of any kind that impact the job; conflicts in the contract documents; comments on change orders; and environmental considerations; etc.).

8. CONTRACTOR'S VERIFICATION: I certify that to the best of my knowledge the above report is complete and correct. All material, equipment used, and work performed during this reporting period is in compliance with the contract plans and specifications except as noted above.

Site Supervisor / SUXOS

E A Engineering, Science and Technology Inc.

EA Engineering, Science, and Technology, Inc.

Tailgate Safety Briefing

1. Reason for Briefing:			
	Daily Safety Briefing		New Site Procedure
	Initial Safety Briefing		New Site Information
	New Task Briefing		Review of Site Information
	Periodic Safety Meeting		Other: (Specify)

2. Personnel Attending:

Name	Signature	Position

Briefing Given By:

3. Topics: (Check All That Apply)

	Site Safety Personnel		Decontamination Procedures
	Site/Work Area Description		Emergency Response/Equipment
	Physical Hazards		On-Site Injuries/Illnesses
	Chemical/Biological Hazards		Reporting Procedures
	Heat/Cold Stress		Directions to Medical Facility
	Work/Support Zones		Drug and Alcohol Policies
	PPE		Medical Monitoring
	Safe Work Practices		Evacuation/Egress Procedures
	Air Monitoring		Communications
	Task Being Performed		Confined Spaces
	OE Precautions		Other:

EA Engineering, Science, and Technology, Inc.

Tailgate Safety Briefing (Continued)

4. Remarks:

EA Engineering, Science, and Technology, Inc.

Team Leader Grid Sheet

Project: Harley Davidson *MRS #_________Grid #_______* *Date________*

Team____________ *Team Leader________________*

1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
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10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				
SW Corner	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Date	Number of Digs	MEC (#/type)	MDAS (lbs/type)	OD (lbs)	Area Complete	% of Grid Complete	Average Depth
Total:							

UXO/MEC or Other Significant Items:

EA Engineering, Science, and Technology, Inc.

***Team Leader Grid Sheet** (continued)*

GPS Locations ID of MEC and/or significant MDAS:

Item	*Northing*	*Easting*

Photograph ID of MEC, significant MDAS, and all MDAS:

Item	*Photo ID #*

EA Engineering, Science, and Technology, Inc.

DAILY QC REPORT

PROJECT:____

LOCATION OF WORK:____

DESCRIPTION OF WORK:____

WEATHER: ☐ **(CLEAR)** ☐ **(FOG)** ☐ **(P. CLOUDY)** ☐ **(RAIN)** ☐ **(WINDY)**

TEMPERATURE: **MIN.**_______ ^{0}**F** **MAX.**_______ ^{0}**F**

1. WORK COMPLETED TODAY:

____
____
____
____

2. WORK COMPLETED BY QC STAFF:

____
____
____
____

3. ALL WORK PERFORMED IN CONFORMANCE WITH WORK PLAN REQUIREMENTS? YES ☐ **NO** ☐

IF NOT EXPLAIN

____
____
____

4. NON-CONFORMANCE/DEFICIENCIES REPORTED:

____
____
____

5. **COMMENTS**____
____
____

CERTIFICATION: I certify that the above report is complete and correct and that I, or my representative, have inspected all work identified on this report and have determined to the best of my knowledge and belief that noted work activities are in compliance with work plans and specifications, except as may be noted above.

____

Project QC Specialist Date

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EA Engineering, Science, and Technology, Inc.

FIELD PERSONNEL QUALIFICATIONS AND VERIFICATION FORM

*CANDIDATE:*_______________________________________ *POSITION/LEVEL:*______________________________________

*PROJECT:*____

REVIEW ITEMS		*CANDIDATE QUALIFICATIONS*	*VERIFIED BY & DATE*
EXPERIENCE	*REQUIRED: AREA & YEARS*		
	ACTUAL: AREA AND YEARS		
EDUCATION	*REQUIRED: AREA & YEARS*		
	ACTUAL: AREA AND YEARS		
CERTIFICATION & REGISTRATIONS	*REQUIRED: AREA & YEARS*		
	ACTUAL: AREA AND YEARS		
TRAINING	*REQUIRED: AREA & YEARS*		
	ACTUAL: AREA AND YEARS		
OTHER	*REQUIRED: AREA & YEARS*		
	ACTUAL: AREA AND YEARS		

Field Change Request (FCR) Form		
FCR #:	**DATE:**	
PROJECT NAME:	**CLIENT REP:**	
1. Description (Items involved, submit sketch, if applicable): (Use continuation sheet if necessary)		
2. Reason for Change (Use continuation sheet if necessary)		
3. Recommended Disposition (Submit sketch, if applicable): (Use continuation sheet if necessary)		
Preparer of FCR (Print name and sign)	Preparer's Title	Date
PM- Reviewed (Print name and sign)	Accepted (Y/N)	Date
QCM – Reviewed (Print name and sign)	Accepted (Y/N)	Date
SUXOS – Reviewed (Print name and sign)	Accepted (Y/N)	Date
Client – Reviewed (Print name and sign)	Accepted (Y/N)	Date

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EA Engineering, Science, and Technology, Inc.

NON-CONFORMANCE REPORT

<table>
<tr><td colspan="2">PROJECT: NCR NO. DATE:
TO:

ORIGINAL TO EA CORPORATE QC MANAGER</td></tr>
<tr><td colspan="2">ITEM: ____
WORK PLAN REFERENCE
REQUIREMENT:____

NONCONFORMANCE:</td></tr>
<tr><td colspan="2">ISSUED BY: NAME: TITLE: ORGANIZATION:</td></tr>
<tr><td colspan="2">DATE:</td></tr>
<tr><td colspan="2">DISPOSITION: _________ACCEPT ________REJECT</td></tr>
<tr><td colspan="2">DISPOSITION APPROVALS:</td></tr>
<tr><td>UXOQCS DATE</td><td>FCR REQUIRED? ☐ YES ☐ NO</td></tr>
<tr><td>PROJECT MANAGER DATE</td><td>DISTRIBUTION</td></tr>
<tr><td colspan="2">REMARKS:</td></tr>
</table>

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CORRECTIVE ACTION PLAN

(2) CAR#	(3) PRIORITY: HIGH ☐ NORMAL ☐	(4) DATE PREPARED:

PART A: NOTICE OF DEFICIENCY

(5) PROJECT:	
(6) PROJECT MGR:	(7) QC MGR/STAFF:
(8) CONSTRUCTION MGR:	(9) MRS MANAGER:
(10) ISSUED TO (INDIVIDUAL & ORGANIZATION)	
(11) REQUIREMENT & REFERENCE	
(12) PROBLEM DESCRIPTION & LOCATION: (13) CAP REQUIRED? YES ☐ NO ☐ (14) RESPONSE DUE:	
(15) ISSUED BY (PRINTED NAME & TITLE) SIGNATURE: DATE:	(16) MANAGEMENT CONCURRENCE:

PART B CORRECTIVE ACTION

(17) PROPOSED CORRECTIVE ACTION/ACTION TAKEN	
(18) PART B COMPLETED BY (NAME & TITLE) DATE	(19) QC CONCURRENCE

PART C

(20) CAR VERIFICATION AND CLOSE OUT: (CHECK ONLY ONE & AND EXPLAIN STIPULATIONS, IF ANY) ☐ APPROVED FOR CLOSURE WITHOUT STIPULATIONS ☐ APPROVED FOR CLOSURE WITH FOLLOWING STIPULATIONS COMMENTS/STIPULATIONS: (21) CLOSED BY (PRINTED NAME AND TITLE) SIGNATURE: DATE:

EA Engineering, Science, and Technology, Inc.

CORRECTIVE ACTION PLAN INSTRUCTION SHEET

(1) QC Manager: Verify that the total number of pages includes all attachments.

(2) QC Manager: Fill in CAR number from CAR log.

(3) CQC System Manager: Fill in appropriate priority category. High priority indicates resolution of deficiency requires expediting corrective action plan and correction of deficient conditions noted in the CAR and extraordinary resources may be required due to the deficiencies impact on continuing operations. Normal priority indicates that the deficiency resolution process may be accomplished without further impacting continuing operations.

(4) CAR Requestor: Fill in date CAR is initiated.

(5) CAR Requestor: Identify project name, number, CTO, and WAD.

(6) CAR Requestor: Identify Project Manager

(7) CAR Requestor: Identify CQC System Manager.

(8) CAR Requestor: Identify project organization, group, or discrete work environment where deficiency was first discovered.

(9) CAR Requestor: Identify line manager responsible for work unit where deficiency was discovered.

(10) QC Manager: Identify responsible manager designated to resolve deficiency (this may not be work unit manager).

(11) CAR Requestor: Identify source of requirement violated in contract, work planning document, procedure, instruction, etc; use exact reference to page and, when applicable, paragraph.

(12) CAR Requestor: Identify problem as it relates to requirement previously stated. Identify location of work activities impacted by deficiency.

(13) QC Manager: Identify if Corrective Action Plan (CAP) is required. CAP is typically required where one or more of the following conditions apply: CAR priority is High; deficiency requires a rigorous corrective action planning process to identify similar work product or activities affected by the deficiency; or deficiency requires extensive resources and planning to correct the deficiency and to prevent future recurrence.

(14) QC Manager: Identify date by which proposed corrective action is due to QC for concurrence.

(15) QC Manager: Sign and date CAR and forward to responsible manager identified in (10) above.

(16) Responsible Manager: Initial to acknowledge receipt of CAR.

(17) Responsible Manager: Complete corrective action plan and identify date of correction. Typical corrective action response will include statement regarding how the condition occurred, what the extent of the problem is (if not readily apparent by the problem description statement in [12]), methods to be used to correct the condition, and actions to be taken to prevent the condition from recurring. If a CAP is required, refer to CAP only in this section.

(18) Responsible Manager: Sign and date corrective action response.

(19) QC Manager: Initial to identify concurrence with corrective action response from responsible manager.

(20) QC Manager: Check appropriate block to identify if corrective action process is complete so that CAR may be closed. Add close-out comments relevant to block checked.

(21) QC Manager: Indicate document closeout by signing and dating.

EA Engineering, Science, and Technology, Inc.

CORRECTIVE ACTION REQUEST (CAR)

PART A: TO BE COMPLETED BY PROJECT MANAGER OR DESIGNEE

(1)PROJECT:		
(2) PROJECT MGR:	(3) QC MGR/STAFF:	
(4) CAR NO (S)AND DATE (S) ISSUED		
(5) DEFICIENCY DESCRIPTION AND LOCATION		
(6) PLANNED ACTIONS	(7) ASSIGNED RESPONSIBILITY	(8) COMPLETION DUE DATE
(9) PROJECT MANAGER SIGNATURE: DATE:		

PART B TO BE COMPLETED BY QCS SYSTEM MANGER OR DESIGNEE

(10) CAP REVIEWED BY	DATE
(11) REVIEWER COMMENTS	
(12) CAP DISPOSITION: (CHECK ONLY ONE AND EXPLAIN STIPULATIONS, IF ANY. ☐ APPROVED WITHOUT STIPULATIONS ☐ APPROVED WITH STIPULATIONS ☐ APPROVED DELAYED, FURTHER PLANNING REQUIRED COMMENTS:	
(13) QC MANAGER SIGNATURE	DATE

EA Engineering, Science, and Technology, Inc.

CORRECTIVE ACTION REQUEST (CAR) INSTRUCTION SHEET

(1) QC Manager: Verify that the total number of pages includes all attachments.

(2) QC Manager: Fill in CAR number from CAR log.

(3) CQC System Manager: Fill in appropriate priority category. High priority indicates resolution of deficiency requires expediting corrective action plan and correction of deficient conditions noted in the CAR and extraordinary resources may be required due to the deficiencies impact on continuing operations. Normal priority indicates that the deficiency resolution process may be accomplished without further impacting continuing operations.

(4) CAR Requestor: Fill in date CAR is initiated.

(5) CAR Requestor: Identify project name, number, CTO, and WAD.

(6) CAR Requestor: Identify Project Manager

(7) CAR Requestor: Identify CQC System Manager.

(8) CAR Requestor: Identify project organization, group, or discrete work environment where deficiency was first discovered.

(9) CAR Requestor: Identify line manager responsible for work unit where deficiency was discovered.

(10) QC Manager: Identify responsible manager designated to resolve deficiency (this may not be work unit manager).

(11) CAR Requestor: Identify source of requirement violated in contract, work planning document, procedure, instruction, etc; use exact reference to page and, when applicable, paragraph.

(12) CAR Requestor: Identify problem as it relates to requirement previously stated. Identify location of work activities impacted by deficiency.

(13) QC Manager: Identify if Corrective Action Plan (CAP) is required. CAP is typically required where one or more of the following conditions apply: CAR priority is High; deficiency requires a rigorous corrective action planning process to identify similar work product or activities affected by the deficiency; or deficiency requires extensive resources and planning to correct the deficiency and to prevent future recurrence.

(14) QC Manager: Identify date by which proposed corrective action is due to QC for concurrence.

(15) QC Manager: Sign and date CAR and forward to responsible manager identified in (10) above.

(16) Responsible Manager: Initial to acknowledge receipt of CAR.

(17) Responsible Manager: Complete corrective action plan and identify date of correction. Typical corrective action response will include statement regarding how the condition occurred, what the extent of the problem is (if not readily apparent by the problem description statement in [12]), methods to be used to correct the condition, and actions to be taken to prevent the condition from recurring. If a CAP is required, refer to CAP only in this section.

(18) Responsible Manager: Sign and date corrective action response.

(19) QC Manager: Initial to identify concurrence with corrective action response from responsible manager.

(20) QC Manager: Check appropriate block to identify if corrective action process is complete so that CAR may be closed. Add close-out comments relevant to block checked.

(21) QC Manager: Indicate document closeout by signing and dating.

Appendix E

Summary of Previous Investigations and Findings

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Site Wide Investigations

Since 1984, numerous environmental investigations and remedial efforts have been conducted at the fYNOP and H-D facility as part of the ongoing potentially responsible party (PRP) HTRW project. Media samples, including groundwater and soil, have been collected for analysis from areas throughout the fYNOP (SAIC 2006, Alion 2007).

A Resource Conservation and Recovery Act (RCRA) Facility Assessment completed in January 1989, describes solid waste management units (SWMUs) 20 and 21 as containing fired, 37 mm shells and shell fragments, along with sand deposits. The SWMU's were discovered during the 1984 Gettysburg Electronics survey, however, the findings area described as only one area. Gettysburg Electronics performed a systematic search for buried drummed wastes over a 59-acre portion at the eastern end of the facility. According to the Gettysburg Electronics report, one pit was excavated on the hillside east of Building 30. This pit was located in the pine woods at approximately N9075 and E19325 (coordinate system unknown, possibly a local grid system), and covered an area approximately 30-foot in diameter. The shell fragments were buried with a sand deposit and contained no live rounds, according to the report. The report further stated that there was no indication of an environmental problem associated with the area. There was no indication in the report as to the status of the sand and suspect MD observed during the 1984 investigation (Alion 2007). Maps presented by H-D's contractor, SAIC, indicate the suspected location of this area to the north and east of the proof testing ranges (Alion 2007) (Figure 2-2). No historic documentation was found to indicate the source of the materials (Alion 2007). In May 2007, several smaller anomalies were identified by SAIC in the area of SWMUs 20 and 21 while conducting geophysical reconnaissance surveys in the area northwest of Building 16. In a memorandum to the USACE, SAIC stated that "the nature of the anomalies cannot be determined without further investigation and that any intrusive investigations will be performed by Qualified UXO technicians" (Alion 2007).

Inventory Project Report

In 1991, CENAB prepared an Inventory Project Report (INPR) for the fYNOP. The Findings and Determination of Eligibility (FDE), signed 5 June 1991, determined that the site was eligible under DERP-FUDS for further assessment. The INPR recommended a project to address remaining hazards associated with DoD and other previous owner operations, specifically a PRP/HTRW project was recommended and approved. An addendum was completed for the INPR in April 1992 and an Ordnance and Explosive Waste (OEW) project was recommended to address hazards associated with munitions (to include unexploded ordnance [UXO]) potentially remaining at the fYNOP due to former proof testing operations.[1] The INPR addendum identified munitions used and suspected to be used at the fYNOP and evaluated the Risk Assessment Code (RAC) score associated with the fYNOP (USACE 1991, USACE 1992, and USACE 1995). The INPR reported a RAC score of 4 for the entire fYNOP.[2]

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[1] The term OEW is no longer used in the DERP-FUDS program.

[2] RAC scores range from 1, being the highest category of risk, to 5, being the lowest.

Explosive Ordnance Disposal (EOD) Unit Removal Actions

In April 1993, an underground concrete pit/structure (MRS 2) was discovered to contain MEC. Items identified in the concrete pit included 20-mm, 37-mm, and 3-inch naval gun rounds as well as assorted small arms ammunition. H-D notified the Springettsbury Township Police Department of the discovery. The U.S. Army EOD Unit from Fort Indiantown Gap, Pennsylvania, performed a 14-day cleanup in this area. Numerous 20mm, 37mm, and 3-in naval gun rounds were removed from the former misfire pit. The concrete pit/structure, which was located between Buildings 14 and 16, was subsequently termed the Building 14 misfire pit as discussed in Section 2.4.5 below (SAIC 2006, Alion 2007).

Records also indicate that the EOD team responded to an ordnance discovery at Building 16 (AOC #2) in November 2002. This response included the removal and detonation of 40mm antiaircraft practice, and 37mm dummy fused projectiles. A misfire pit near Building 16 was not located during this response action; however, the EOD team indicated that the area had the potential for ordnance contamination (SAIC 2006, Alion 2007).

Archive Search Report

The USACE Rock Island District prepared an ASR for the fYNOP in 1995 (USACE 1995). The ASR included a description of previous investigations performed, site description, historical ordnance presence, site eligibility, visual site inspection observations, evaluation of ordnance hazards, the presentation of site-specific ordnance technical data, and a description of other environmental hazards observed during the ASR site visit. The ASR identified 5 areas for further investigation designated Areas A through E and summarized as follows:

- **Parking Lot/Dump (Area A**) [corresponds to MRS 1] – This area located in the west parking lot was reported to contain ammunition (corroded bullets and empty shell casings discovered during drilling). The ASR describes the area as an historical landfill or general dump and indicates that the area is considered as having OEW contamination. The ASR team did not locate any ordnance in this area during the site visit (USACE 1995).
- **Proof Ranges Sand Pits (Area B**) [corresponds to MRS 5 and AOC 2] – This area is comprised of the sand backstop at the ends of both the single (Building 14) and double (Building 16) proof (firing) ranges. The ASR describes the area as having the potential for OEW contamination. The ASR team did not locate any ordnance in Area B or the buildings and land surrounding Area B during the site visit (USACE 1995).
- **Building 14 Misfire Pit (Area C)** [corresponds to MRS 2] – The ASR confirmed that this area is comprised of an in-ground concrete bunker structure and that this area was the site of the 1993 removal action by the Fort Indiantown Gap EOD. The ASR team did not locate any ordnance in Area C and the ASR describes the area as having no potential for OEW contamination (USACE 1995).
- **Suspect 20mm Dump Site (Area D)** [corresponds to MRS 3] – The ASR team documented that this area was located on a map received from H-D personnel indicating the presence of a 20mm dump between buildings 14 and 16. The ASR team did not

locate any ordnance in Area D; however, the ASR documents that the area has the potential for "OEW" contamination (USACE 1995).

- **Building 16 Misfire Pit (Area E)** [corresponds to MRS 4] – The ASR confirmed that only one misfire pit (Area B) was annotated on the map received from H-D personnel. However, the ASR indicated that a similar pit near a door in close proximity to the gun mounts in Building 16 could be present. A survey of the area by the ASR team failed to locate the presence of a pit/bunker. The ASR team concluded that although no ordnance was located in Area E, the area has the potential for "OEW" contamination (USACE 1995).
- **Remaining lands (Area F)** – The ASR documented that no historical information and no information gathered during the ASR (including visual surveys) indicated any confirmed or potential contamination from "OEW" in the remaining lands (USACE 1995).

The ASR noted that Chemical Warfare Material was not used or stored at fYNOP (USACE 1995).

Archive Search Report Supplement

In 2004, the USACE Rock Island District completed an ASR Supplement for the fYNOP (USACE 2004a). The ASR Supplement identified five (5) ranges and/or "burial pits" at the YfNOP. 3 These ranges/burial areas include: Burial Area (Parking Lot), Burial Area (Building 14 Misfire Pit), Burial Area (20-mm Dump), Burial Area (Building 16 Misfire Pit), Proof Range.4

The ASR Supplement identified munitions used and suspected to be used at each area and evaluated the risk (RAC score) associated with each of the burial areas/ranges at the fYNOP (USACE 2004a). As noted in Table 2-1, MRS 1 and MRS 3 (the Burial Area [Parking Lot] and the Burial Area [20-mm Dump], respectively) were assigned a RAC score of 5, indicating the lowest possible hazard severity level. Contributing to the low hazard severity of the RAC scores for these two areas was the type of ordnance (practice) and the location (subsurface) of the MD found/suspected in these areas. RAC scoring for the other areas, (MRS 2, MRS 4, and MRS 5 had a RAC score of 3) is driven by the potential for MEC to be present in these areas and the accessibility of the areas (USACE 2004a). It is noted that the scoring for the ASR Supplement was completed prior to USACE conducting the time critical removal action (TCRA) at the fYNOP.

Time Critical Removal Action

In 2004, Plexus Scientific Corporation (Plexus), under contract to CENAB, completed a TCRA on four suspect disposal areas at the fYNOP (Plexus 2004). The objective of the TCRA was to remove inert projectiles and potential propellant-filled casings from the four suspect disposal areas. Areas

[3] The ASR Supplement uses the term "burial pit" to refer to an area which is known or suspected to contain ammunitions or ammunition debris (also known as MD). Boundaries are likely arbitrary based on historical documents, photos, interviews, and/or a site inspection. Burials typically are associated with demilitarization sites, range debris dumps, etc. No standard layout is available for burial pits (USACE 2004a). An MRS is any area on a defense site that is known or suspected to contain UXO, DMM, or MC) (e.g., former ranges or munitions burial areas).

[4] The area designated as the Proof Range only includes the location occupied by Building No. 14, although the ASR included both proof ranges (Buildings 14 and 16).

included in the scope of the TCRA included: misfire pit near Building 14 (MRS 2), misfire pit near Building 16 (AOC 2), a suspect 20-millimeter (mm) dump site (MRS 3), and two proof bunkers (butt stops and sand piles) located near Building 16 (AOC 2). The Removal Action, which constitutes a Munitions Response (MR) for Munitions and Explosives of Concern (MEC), was conducted in a single mobilization from 16 August to 30 September 2004. The scope of work for the Removal Action consisted of mobilization and site preparation; MEC characterization activities; MEC removal operations; Ordnance and Explosives (OE)/MEC disposition; and material management. Below is a summary of the findings.

Building 16 Proof Bunkers (AOC 2) - Approximately 125 cubic yards (CY) of slag, projectiles and sand was removed from the two proof bunkers (i.e., target stop butts and sand piles) located on the east and west sides of Building 16. Steel plates were removed from structurally unsound roofs within the bunkers and air drying was performed to facilitate removal of the projectiles and other waste contained therein. Slag was segregated from other material removed from the bunkers. The remaining material removed from the bunkers was sifted on site using a mobile screen plant and vacuum truck to segregate the projectiles from the sand. Approximately 4.5 tons of projectiles suspected to be MEC and other debris were segregated during screen plant operations. About 400-500 pounds of the suspect MEC had identification features of sand filled or black powder-filled projectiles (Plexus 2004).5

Building 14 Misfire Pit (MRS 2) - The Plexus team performed geophysical surveying, cleared and grubbed, dewatered, and removed the concrete structure of the misfire pit due east and southeast of Building 14 at a location identified by the USACE Baltimore District and H-D (GPS location - N240581, E2259315). The excavated pit was backfilled with the soil removed during excavation of the structure (Plexus 2004, Alion 2007).

Suspect 20-mm Dump Site (MRS 3) – Clearing/grubbing, land surveying and geophysical surveying were performed on approximately 2.5 acres at the suspect location of a 20-mm dump site (Plexus 2004, Alion 2007). A magnetometer survey performed on 25-ft. transects in that area did not detect breaks indicative of past trenching or landfill operations. Magnetometer and metal detector surveying identified 31 contacts in this area; all of the contacts were excavated. One of the contacts was a 37-mm target practice round (MEC); the other contacts were inert metal parts. The single 37-mm round was judged to be an anomaly; the 37-mm round and other debris were removed from this AOC (Plexus 2004, Alion 2007).

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[5] The TCRA used the term "MEC" throughout to refer to the projectiles recovered in the Building 16 backstop area during the removal operation. This terminology mainly refers to the items prior to their characterization for disposal. As presented in Section 5.3 of the TCRA the items were certified as inert and classified as wholly-inert projectiles (Section 2.4.6.6 of the SI). The current DoD/Army terminology describes materials potentially presenting an explosive hazard as MPPEH, and typically this would apply to items that have not been certified by a UXO technician as MEC or MD. Alion has revised the TCRA terminology used to describe the findings prior to certification and after certification by a UXO technician. The terms "projectile or MPPEH" are used initially when referring to the non-certified items recovered during the TCRA (Section 2.4.6.7). The term "MD" describes the certified findings of the TCRA as discussed in the waste disposal section of the TCRA report- addressed in Section 2.4.6.7 of the SI.

Building 16 Misfire Pit (MRS 4) - The USACE Baltimore District and H-D identified the misfire pit southeast of Building 16 and due east of Building 15 adjacent to a fire hydrant, recessed within a 4 foot (ft) by 4 ft revetment (GPS location - N240609, E2259630). Plexus excavated this area and did not find a misfire pit in this location. No further action was recommended at the Building 16 misfire pit location (Plexus 2004, Alion 2007).

MEC Disposition – Ten representative projectiles (37mm projectile some of which were identified as suspect armor-piercing [AP]) were drilled to determine if their contents posed an explosive safety hazard. Results of physical inspection and field EXPRAY testing of the contents by a Senior Unexploded Ordnance Supervisor (SUXOS) determined the drilled projectiles were sand-filled and did not pose an explosive safety hazard. Based on the prior site history and results of the drilled projectiles inspection/testing, the remaining projectiles were sheared on site to expose the hollow cavities to ensure they posed no explosive safety hazard. EXPRAY testing was also performed. None of the projectiles was found to contain explosive residues and were certified by the on-site SUXOS to be Wholly-Inert Projectiles (WIPs) (Plexus 2004, Alion 2007).

Materials Management – The sheared WIPs, classified as MD in accordance with DoD/Army terminology were drained of sand, placed into wooden boxes along with other MD removed from the bunkers and the suspect 20-mm dump site, and the MD was transported to an off-site lead smelter under chain-of-custody for recycling. Smelting of 4.5 tons of this material was performed on 8 October 2004, completing demilitarization of this material. Slag (MD) found in the sand in the east target stop butt was tested and found to contain lead at sufficient concentrations to cause this material to be classified as hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Plexus removed approximately 20 CY of slag and a small amount of sand in direct contact with the sand from the bunkers and placed it in a pile at a paved location immediately south of the Building 16 target stop butts and Building 15 as designated by H-D. The slag was placed on top of the ground surface and was covered by polyethylene plastic for disposition by H-D. The SUXOS physically inspected the slag to ensure no MEC was present prior to placement in the stockpile (Plexus 2004, Alion 2007).

Laboratory analysis performed by others for H-D confirmed the remaining sand in the east target stop butt did not exhibit characteristics of a RCRA hazardous waste for lead as previously suspected. That sand was then removed from the bunkers, sifted in the on-site screen plant and placed in piles at locations on the YNOP site designated by H-D. The sand was placed on top of the ground surface and was covered by polyethylene plastic for disposition by H-D. The SUXOS physically inspected the sifted sand to ensure MEC was not present prior to placement in the stockpiles (Plexus 2004, Alion 2007).

Removal Action

In March 2007, Harley-Davidson's contractor, SAIC, discovered a suspect projectile about 400 feet east of Building 30 while marking proposed boring locations near an old landfill. The item was measured as approximately 40mm diameter by 4inches. The projectile was removed on 22 March 2007 by the Pennsylvania State Troopers' Hazardous Device and Explosive Section (Alion 2007). The identification of the projectile (MEC versus MD) is unknown.

A 37mm projectile was found by a contractor on March 25, 2008 between Buildings 14 and 16. This area of the facility is currently being accessed by Harley-Davidson workers approximately ten (10) times each day. The identification of the projectile (MEC versus MD) is unknown.

2007 Site Investigation

The SI field work included a single sampling event which was conducted on the 12th and 13th of July 2007. The SI field work was conducted in accordance with the PWP (Alion 2005) and the Final SS-WP (Alion 2007). A qualitative site reconnaissance for MEC and sample collection and analyses for MC was completed. A total of 5.05 acres was assessed through qualitative reconnaissance. A total of 11 surface soil (includes 2 background surface soil samples), 5 subsurface soil, and 5 groundwater samples were collected. One additional dust sample (from the ground surface adjacent to a ventilation duct) was collected from within the eastern backstop of Building 16. Given the location/accessibility of the dust, the sample was compared against surface soil screening criteria. In accordance with the SS-WP, surface soil samples were collected as composite samples (seven-point wheel composite) while the subsurface soil and groundwater samples and the dust sample were collected as discrete samples.

The initial summary of risk from MEC and MC for the fYNOP MRAs is concluded from the 2007 SI report as presented in detail in Section 2.7. The fYNOP is a low risk for MEC (low probability of encountering MEC) given previous removal actions and findings to date. Based on sampling results, the fYNOP does pose a risk to human health and the environment due to elevated concentrations of metals (specifically, antimony, copper, lead, nickel, and zinc) that exceed the Act 2 SWHS in three MRAs (MRS 5, AOC 1, AOC 2).

Along with the findings of the SI report, numerous recommendations were identified to protect Harley-Davidson workers or contractors accessing the identified MRAs and AOCs. Harley-Davidson has a security-controlled access gate and fence installed in 2012, as well as, access-limiting engineering controls (i.e. plywood doors and covers) to prevent contact with ventilations systems and the backstops at Building 16. These controls reduce the potential for contact with lead impacted dust. Additionally, “Do Not Enter” sings and orange snow fencing is posted at the entrance to the concrete structures/backstops in AOC 2.

2007 Electromagnetic Survey

Following the 2007 Site Investigation, the former spent 37-mm shell disposal area was identified as AOC1. Two OE safety specialists from the USACE Baltimore District mobilized to the fYNOP on May 26, 2009. The purpose of this visit was to inspect potential anomaly areas that were not previously cleared in AOC1 and identified as Anomaly A, B, C, D, and E (shown on Figure 6) using analog and digital geophysical methods. Work began at Anomaly B, followed by locations E, C, A, and D. Using a metal detector, magnetic meter, and a shovel, the ground area at each anomaly was scanned and probed by the OE specialists. The EM31 data, in addition to the instrument readings and observations conducted by the USACE, were used to confirm the status of MD at each location. “No Contacts” (meaning no evidence of MD) were confirmed at all but Anomaly B. At the Anomaly B area, many small targets were found in an area measuring approximately 20 feet by 10 feet. This vicinity was generally level and appeared to be partially cut into the hillside where it is heavily wooded. Single targets were confirmed to be many iron fragments within the top six to eight inches of the surface. At least two of these fragments were confirmed to be fired projectiles. None of the fragments were removed from the area.

Eastern Landfill (SWMU 17)

The Eastern Landfill (SWMU 17) is located in the eastern portion of the Site. According to the 2009 Supplemental RI, the former landfill was in operation from 1964 through 1987. A geophysical survey was conducted by REWAI in 1986 and identified a large conductivity anomaly beginning 300 feet west of the perimeter road (the eastern Site boundary) and stretching west (SAIC 2009). Additionally four test pits were excavated in 1986 to a maximum of 8 feet. Numerous, cultural, metallic and non-metallic debris was identified in the test pits, however, no munitions or MD was found. Subsequent soil samples collected from the test pits indicated elevated concentrations of VOCs in excess of the PADEP soil-to-groundwater MSCs.

During the 1999 site-wide RI sampling, soil gas samples and soil samples from 5 test pits were collected in the former landfill area. No soil sample detected constituents (VOCs) exceeded applicable soil screening criteria (SAIC 2009). A supplemental RI was conducted in 2009 and included 11 subsurface soil borings. Recovered soil included anthropogenic fill material and no detected analyte concentrations exceed PADEP Act 2 soil-to-groundwater or direct contact MSCs.

Other Remedial Activities

Numerous remedial actions have occurred across fYNOP including the removal of former bunkers and magazines (Buildings 17 through 23) and a partial demolition of Building 16 in 2002. Also at Building 16, hazardous sand from the east backstop and dust from a former air handling unit was removed by SAIC in 2004. Additionally, impacted soil was removed from directly in front of Building 16 in 2008 and stockpiled behind the east butt. Both removal actions will be confirmed during performance of the RI.

Restructuring Activities

As part of a Sitewide restructuring project of the Harley-Davidson facility, Building 15, 30, 60, and portions of Building 14 were demolished in 2010-2011. Also during the restructuring project, soil was stockpiled in the northeast portion of the fYNOP following excavation from associated construction/demolition activities and the excavation of 2 stormwater management ponds. The stockpiled soil was spread and graded north of the former Building 30 location, and south of the former Building 15 location. Soil place north of Building 30 overlays fill material spread by Plexus in 2002. The combination of material means as much as 15 feet of fill material may cover the original fYNOP ground surface.

Also, as part of the restructuring project, a security fence was installed in 2012 to further restrict access to the northeast portion of fYNOP. Currently, no Harley-Davidson employee or contractor accesses this area daily. SAIC conducts quarterly inspections of fencing, warning signs, barriers, and locks for the remaining buildings and backstops.

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Science Applications International Corporation (SAIC), 2007. *Memo: EM Survey Report Addendum Harley Davidson Plant from Tom Messing and Jeffery Warren P.G. June 2007*

SAIC. Supplemental Remedial Investigations Soil Report - Former York Naval Ordnance Plant. York, Pennsylvania. December 2009.

Appendix F

Appendix F, Harley-Davidson Sample Nomenclature and Data Deliverable Requirements

TABLE B-3
SAMPLE NUMBERING SCHEME

mm = Sample Station/Media Type	Examples Soil Boring = SB Surface Soil Sample = SS Sediment Sample = SD Test Pit = TP Monitoring Well = MW (or CW) Residential Well = RW Surface Water Sample = SW Spring = SP Soil Gas = SG Roll-off = RO Waste Characterization = WC Quality Control sample = QC
NNN = Sample Number	The Field Manager will maintain a listing of three digit station identifiers and correlate them to specific sampling/station locations.
nn/nn = Sample Interval in Feet Below Ground Surface (for soils), or Feet below measuring point (for water)	Examples Soil Sampling: 12/15= Top of interval is 12 feet and bottom of interval is 15 feet below ground surface. Water Sampling: 12/12= Pump depth/intake depth set at 12 feet below measuring point. 0/0= indicates that intake depth is unknown. Roll Off or Soil Pile Sampling: 0/0.5 = surface soil sample taken from top 6 inches. X/X = depth for composite sampling.
z = Sample Type	Examples 0 = Primary Investigative Sample 1 = Field Duplicate Sample 2 = Trip Blank 3 = Equipment Rinsate 4 = Site Source Water Blank 5 = Investigation Derived Waste (IDW) (total analysis) 5T = Investigation Derived Waste (IDW) (TCLP analysis)

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TABLE B-5
LABORATORY STANDARD DATA DELIVERABLES FORMS LIST

Method Requirements	Deliverables
Requirements for all methods:	
- Holding time information and methods requested	Signed chain-of-custody forms
- Discussion of laboratory analysis, including any laboratory problems	Case narratives
- LCS (run with each batch of samples processed)	Results (control charts when available)
Organics: GC/MS analysis	
- Sample results, including TICs	EPA Form 1 or equivalent
- Surrogate recoveries	EPA Form 2 or equivalent
- Matrix spike/spike duplicate data	EPA Form 3 or equivalent
- Method blank data	EPA Form 4 or equivalent
- GC/MS tune	EPA Form 5 or equivalent
- GC/MS initial calibration data	EPA Form 6 or equivalent
- GC/MS continuing calibration data	EPA Form 7 or equivalent
- GC/MS internal standard area data	EPA Form 8 or equivalent
Organics: GC analysis	
- Sample results	EPA Form 1 or equivalent
- Surrogate recoveries	EPA Form 2 or equivalent
- Matrix spike/spike duplicate data	EPA Form 3 or equivalent
- Method blank data	EPA Form 4 or equivalent
- Initial calibration data	EPA Form 6 or equivalent
If calibration factors are used	A form listing each analyte, the concentration of each standard, the relative calibration factor, the mean calibration factor, and the %RSD
- Calibration curve if used	Calibration curve and correlation coefficient
- Continuing calibration data	EPA Form 9 or equivalent
- Positive identification (second column confirmation)	EPA Form 10 or equivalent
Metals	
- Sample results	EPA Form 1 or equivalent
- Initial and continuing calibration	EPA Form 2 or equivalent, dates of analyses and calibration curve, and the correlation coefficient factor
- Method blank	EPA Form 3 or equivalent and dates of analyses
- ICP interference check sample	EPA Form 4 or equivalent and dates of analyses
- Spike sample recovery	EPA Form 5A or equivalent
- Postdigestion spike sample recovery for ICP metals	EPA Form 5B or equivalent
- Postdigestion spike for GFAA	EPA Form 5B or equivalent
- Duplicates	EPA Form 6 or equivalent
- LCS	EPA Form 7 or equivalent
- Standard additions (when implemented)	EPA Form 8 or equivalent
- Holding times	EPA Form 13 or equivalent
- Run log	EPA Form 14 or equivalent
Wet Chemistry	
- Sample results	Report result
- Matrix spike recovery	% Recovery
- Matrix spike duplicate or duplicate	% Recovery and % RPD
- Method blank	Report results
- Initial calibration	Calibration curve and correlation coefficient
- Continuing calibration check	Recovery and % difference
- LCS	LCS result and control criteria

GC = gas chromatography
ICP = inductively coupled plasma
MS = mass spectrometry
RPD = relative percent difference
TIC = tentatively identified compound
GFAA = graphite furnace atomic absorption
LCS = laboratory control standard
PCB = polychlorinated biphenyl
RSD = relative standard deviation

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TABLE B-6
LABORATORY STANDARD ELECTRONIC DATA DELIVERABLES (EDD)

EDD Fields (Max Length)	Description
SMP_ID (15)	The original client sample identification number. For Lab QC samples this field may be left empty or filled with a place holder like 'QC' or 'NA' for LCS and blanks. The original client sample ID should be used for MS, MSD, and SUR samples.
LAB_ID (15)	The laboratory's sample identification number.
DATE_SMP (10)	The date the sample was collected in the field (MM/DD/YYYY).
TIME_SMP (10)	The time the sample was collected in the field (MM/DD/YYYY).
DATE_REC (10)	The date the sample was received by the laboratory (MM/DD/YYYY).
DATE_EXT (10)	The date the sample was extracted (MM/DD/YYYY). The extraction refers to any preparatory techniques such as extraction, digestion, and separation.
DATE_ANA(10)	The date the sample was analyzed (MM/DD/YYYY).
TIME_ANA(5)	The time the sample was analyzed (HH:MM).
MATRIX (10)	The sample matrix. Valid values are Water, Solid, or Air.
METHOD (21)	The method requested by the client (i.e., SW846 8080). This should not be the lab method number.
RES_TYPE (4)	The laboratory result type. Currently the loading routine only handles the following values:
	REG-results of a primary analysis of a client sample
	REA- results of a reanalysis of a client sample
	DIL- results of an analysis of a diluted client sample
	LCS-results of a laboratory control sample as %recovery
	LCST-expected (true) result of a laboratory control sample as a concentration
	LCSF-actual (final) result of a laboratory control sample as a concentration
	SUR-surrogate recovery as % recovery
	MS-matrix spike recovery as a % recovery
	MST- expected (true) result of a matrix spike sample as a concentration
	MSF- actual (final) result of a matrix spike sample as a concentration
	MSD-matrix spike duplicate recovery as relative percent difference
	MSDT- expected (true) result of a matrix spike duplicate sample as a concentration
	MSDF- actual (final) result of a matrix spike duplicate sample as a concentration
	BLK-result of a laboratory blank sample.
CAS_NUM (15)	The CAS number or blank if no CAS number is available.
PARAMTR (50)	Chemical name for the analytic parameter.
RESULTS (N)	The analytic result
UNITS (15)	The units for the result.
LABQUAL (6)	The qualifiers assigned by the laboratory.
DET_LIMIT (N)	The Contract-Required Detection Limit for the analyte being measured. It should be reported in the same units as the result.
REP_LIMIT (N)	The Contract-Required Reporting Limit for the analyte being measured. It should be reported in the same units as the result.
UNC (N)	The 2 sigma error in the net count rate for radiological analyses. Should be expressed in the same units as the analytic result.
DILUTION (N)	The overall dilution of the sample aliquot. A value of one should correspond to nominal conditions for the method. Values less than one correspond to concentrations.
SMP_WT (N)	The weight or volume of the sample used for the analysis.
WT_UNITS (2)	The units for the sample weight or volume.
FILTERED (1)	Must have 'F' if the sample was filtered either by the lab or in the field.
PCT_SOL (N)	Percent solids
TIC (10)	Enter 'TIC' or retention time for tentatively identified compound. Blank if not a TIC.

The laboratory EDD may be delivered either as an Excel spreadsheet or as a comma or tab delimited file readable by Excel. The file name must include the SDG number or equivalent. For example, if multiple files were submitted for the same SDG, the filename could be the SDG number followed by a sequential number for each file in the SDG. A file cannot contain more than one SDG. Multiple analytic fractions may be present in the file. The first row of the file should contain the field names. The expected field names and comments about them are listed below. Fields do not have to be present in the order specified and additional fields may be included; however, columns must be present for all fields identified below. N-Indicates that the field requires a numeric entry.

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Attachment 2

Munitions Response Remedial Investigation Phase I Update and Path Forward Discussions Former York Naval Ordnance Plant York, Pennsylvania July 2015

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Munitions Response Remedial Investigation
Phase I Update and Path Forward Discussions
Former York Naval Ordnance Plant
York, Pennsylvania

July 28, 2015

EA Engineering, Science, and Technology, Inc., PBC

Agenda

- Introduction
- Phase I Remedial Investigation (RI) Results
- Phase II RI Technical Approach
- Schedule Discussions
- Wrap Up and Questions

Introduction

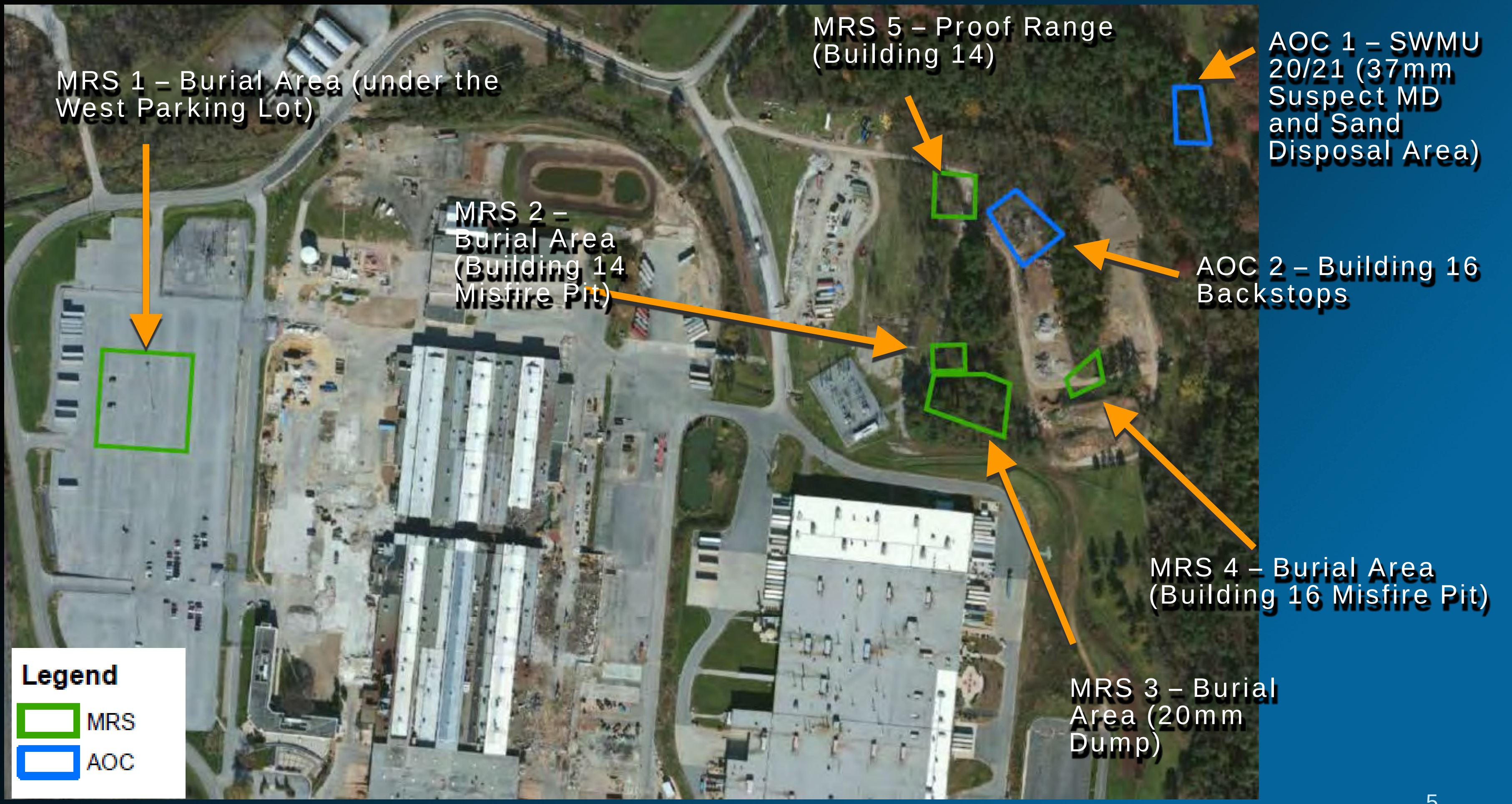
- Discuss results of Phase I efforts
- Discuss path-forward for proposed Phase II field activities
- Achieve concurrence on path forward to establish budget and scope for Phase II

Phase I Summary

- Conducted surface clearance of 117 grids (20.34 acres) in the area surrounding Munitions Response Site (MRS) 2 through 5 and Area of Concern (AOC)1 and 2 - 28 April through 19 May 2015
- Analog geophysical techniques used to identify subsurface anomalies and confirm the historical Conceptual Site Model (CSM)

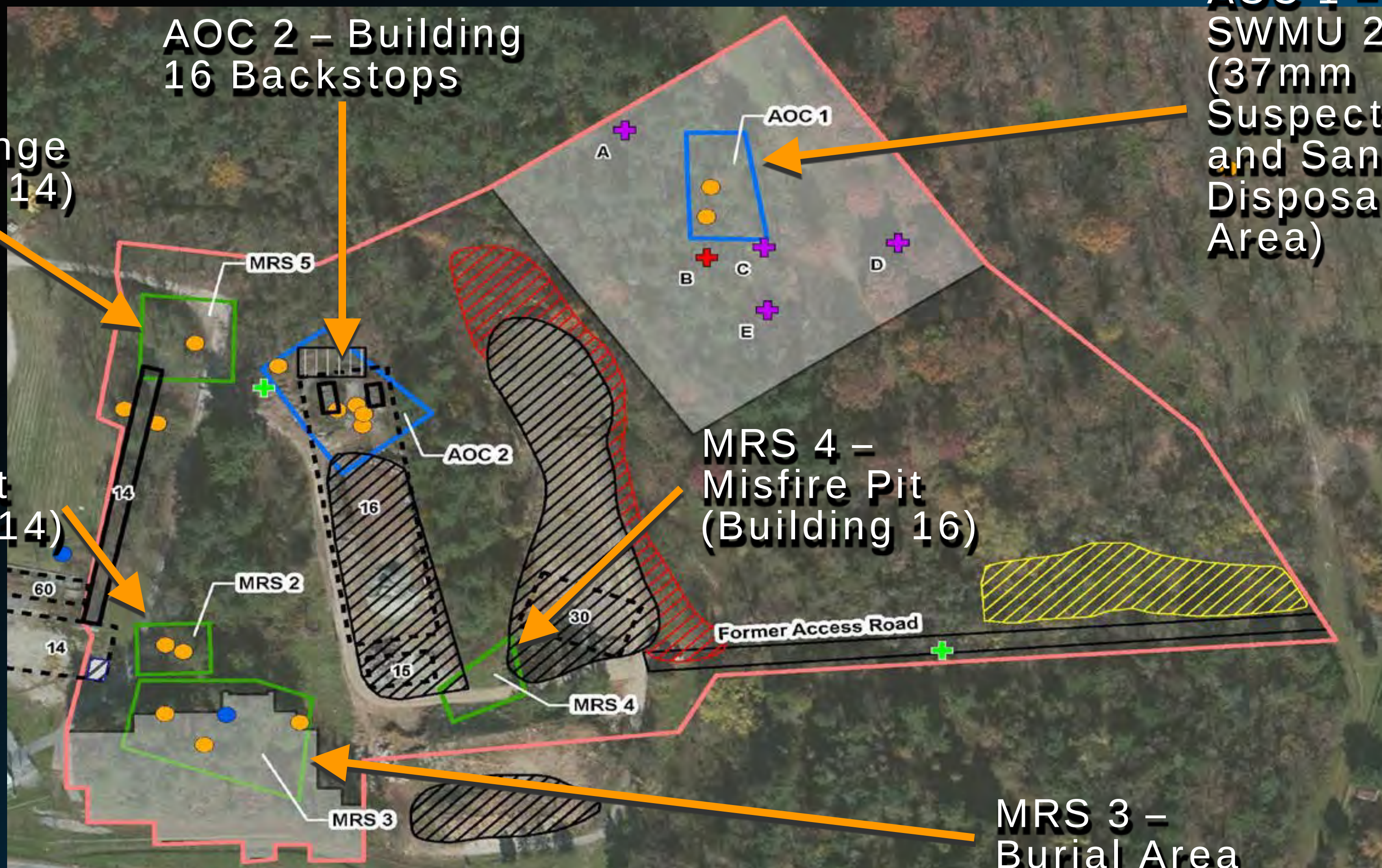
Site Overview

- 7 Areas (5 MRSs and 2 AOCs) originally identified



Phase I RI Study Area

- **Phase I RI focused on 4 MRSs and 2 AOCs in former range area**



AOC 2 – Building 16 Backstops

MRS 5 – Proof Range (Building 14)

AOC 1 – SWMU 20/21 (37mm Suspect MD and Sand Disposal Area)

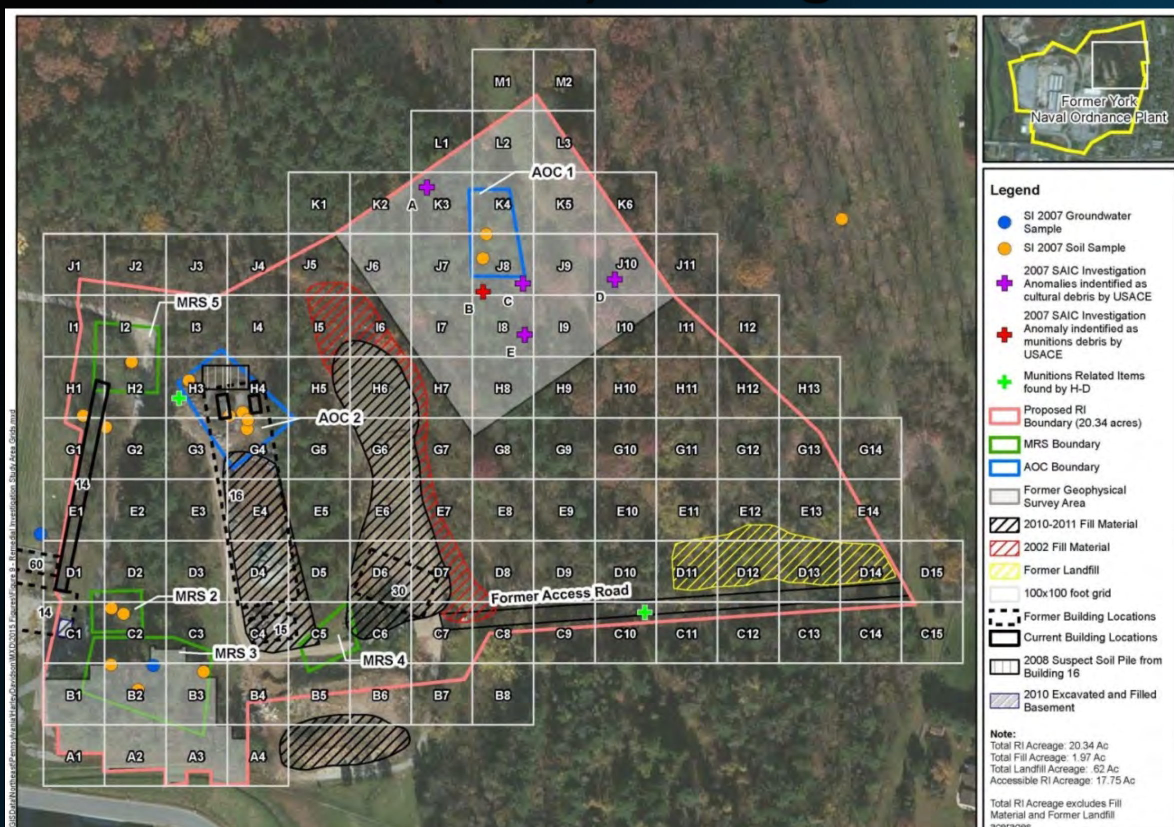
MRS 2 – Misfire Pit (Building 14)

MRS 4 – Misfire Pit (Building 16)

MRS 3 – Burial Area (20mm Dump)

Phase I RI Results

- RI boundary created to encompass ranges and previous Munitions Debris (MD)/Munitions and Explosives of Concern (MEC) or Unexploded Ordnance (UXO) findings



Area divided into grids - 117 Grids (100 feet by 100 feet) identified as 20.34 acres

Phase I RI Results

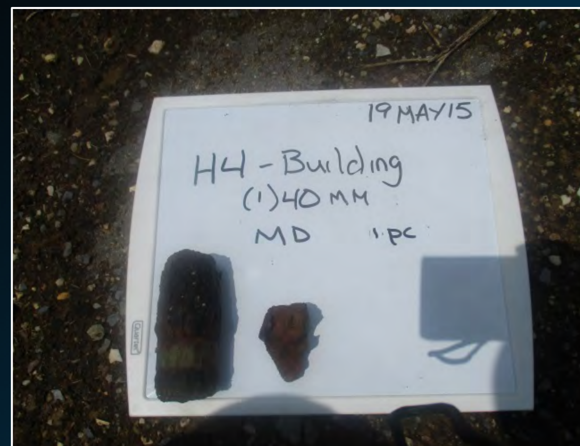
- **Completed grid staking, mowing, and surface clearance in 3+ weeks**

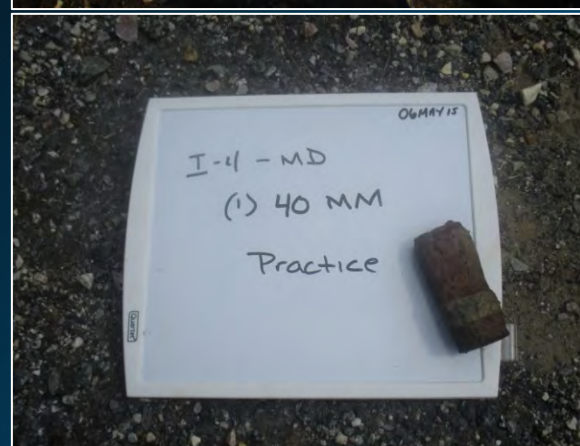
Phase I RI Results

- No MEC/UXO found
- 11 items identified as MD removed
- 1,228 lbs. of Non-Munition Related Debris (NMRD) recycled

Phase I RI Results

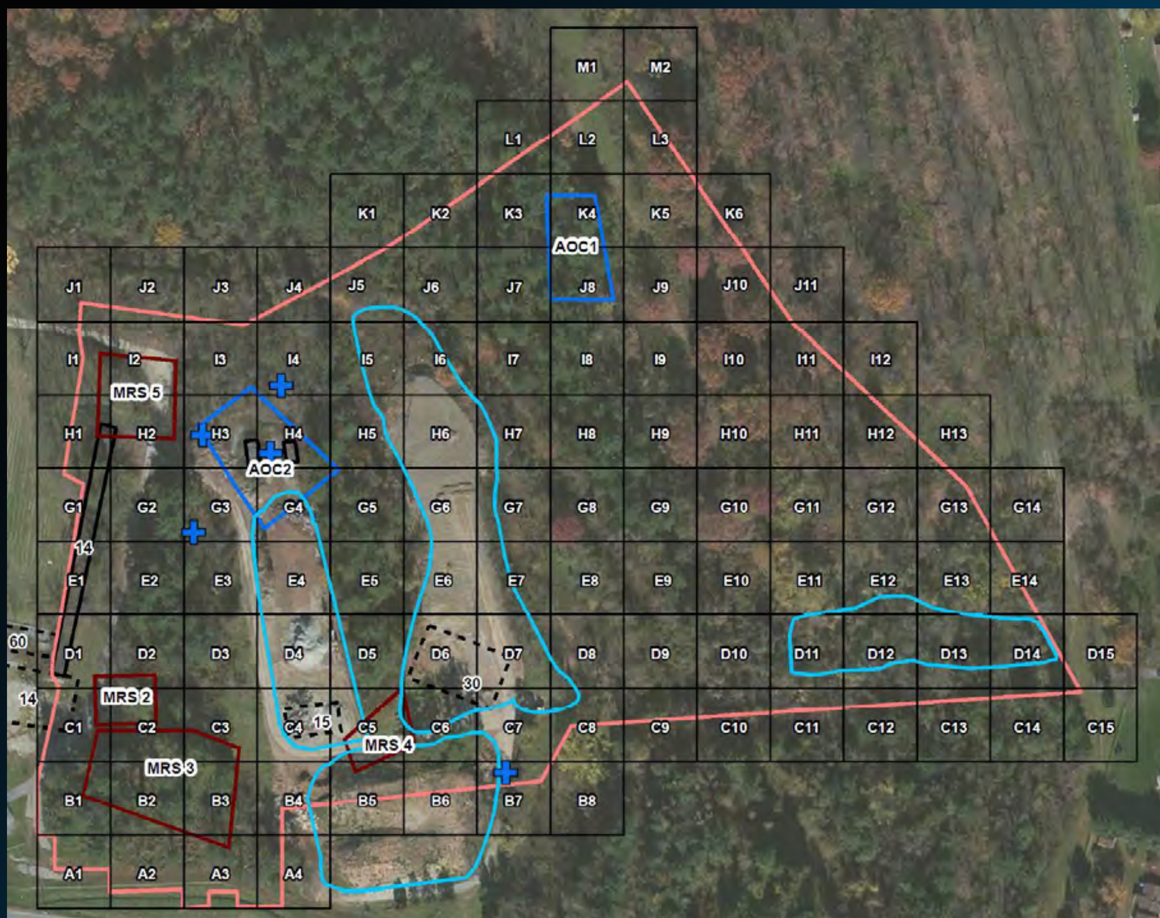
- MD identified as 40 millimeter (mm) training/practice projectiles recovered in grids H3, H4, G3, B7, and I4





Phase I RI Results

- Locations of MD (40 mm training/practice projectiles) recovered during Phase I (H3, H4, G3, B7, and I4)



Munitions Debris

Phase I RI Results

- **Examples of NMRD recovered and recycled (includes chains, gears, piping, scrap metal, etc.)**

Phase I RI Results

- **Conducted visual inspection of Building 14 exterior and interior with focus on the backstops, air handling, and sand loading/sifting areas**

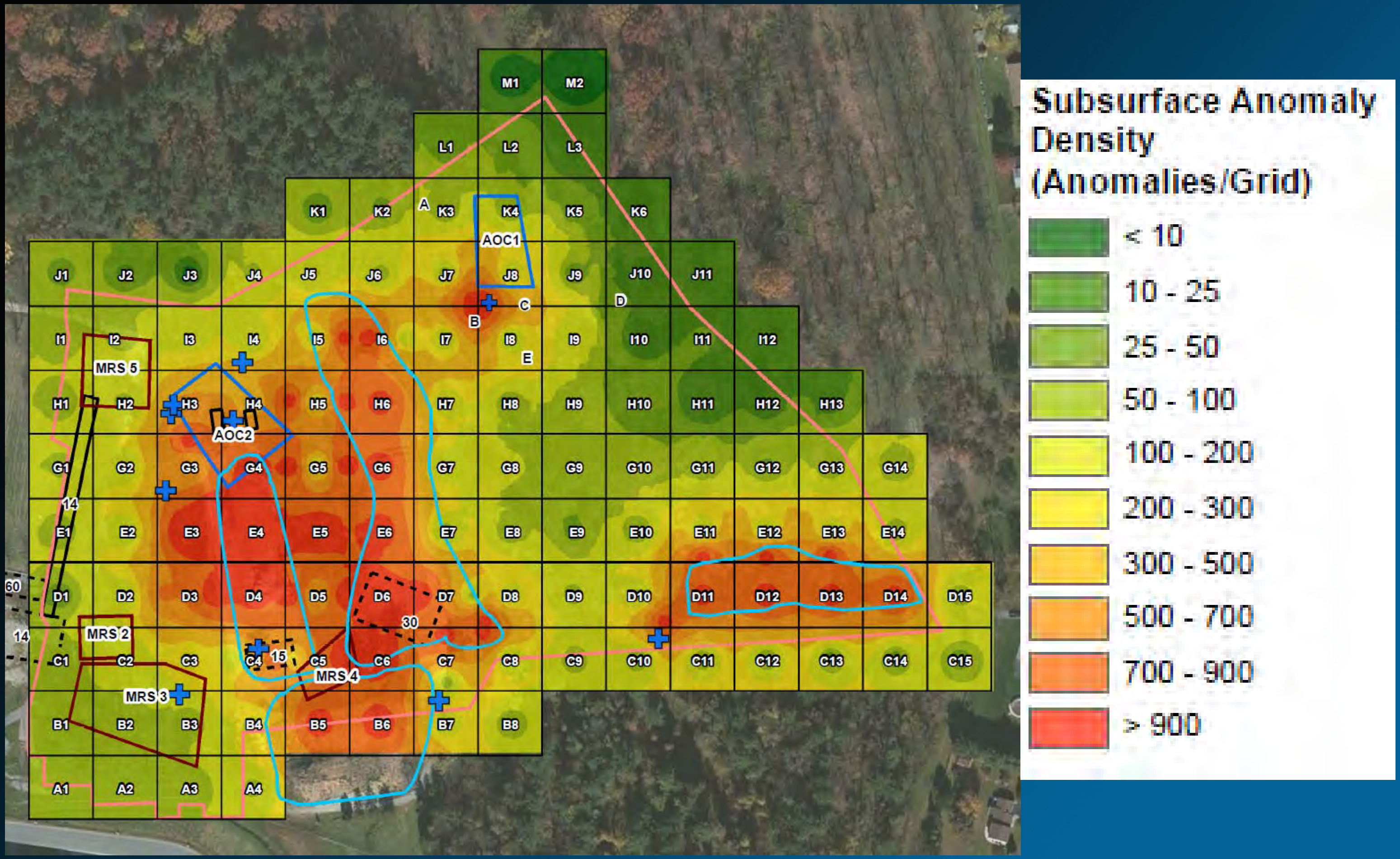


Phase I RI Results

- Building 14 MD (20 mm and 40 mm-training/practice projectiles) from the backstop area
- No MEC/UXO found

Analog Geophysics Subsurface Results

- Anomaly counts were compiled and plotted

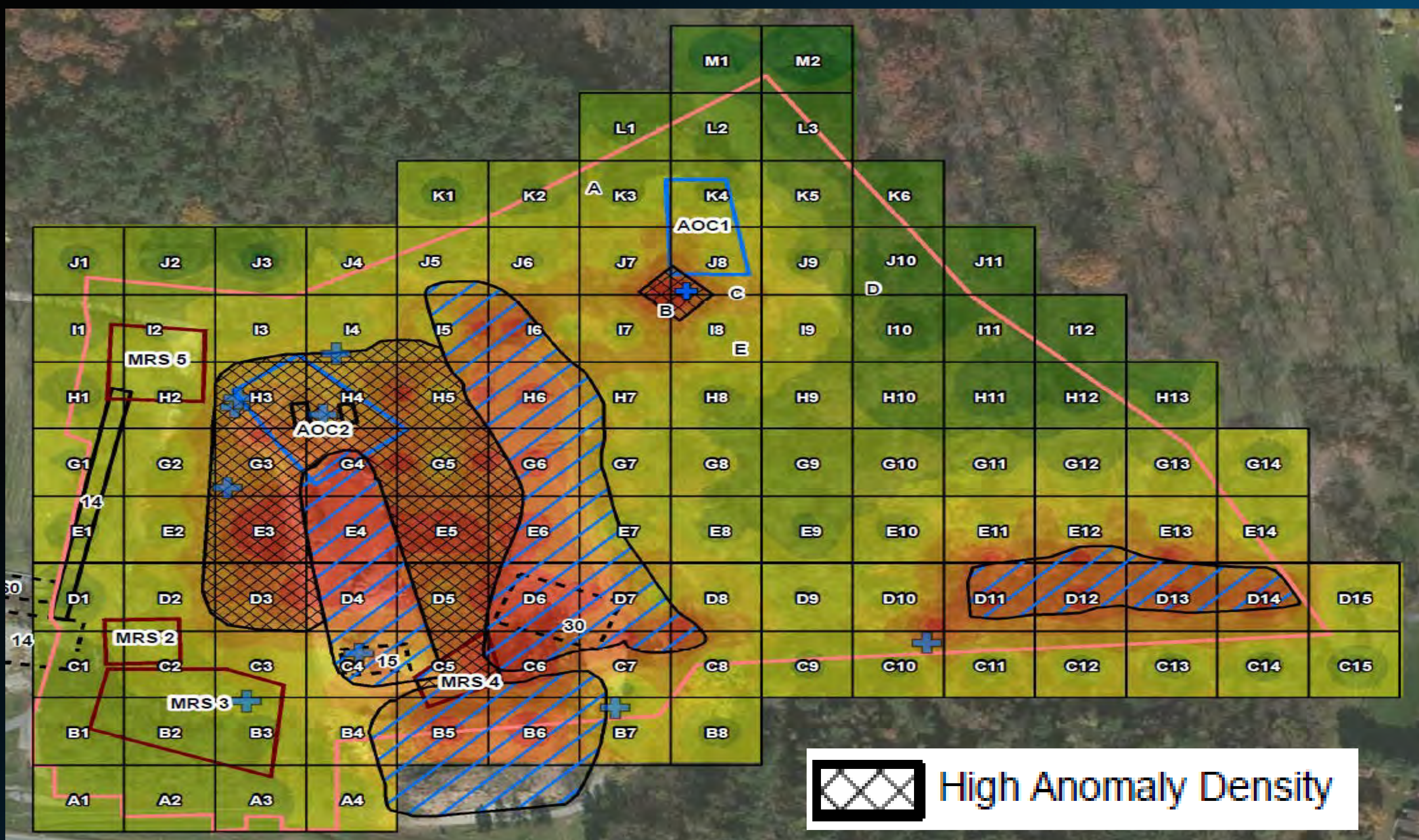


Phase I RI Results

- Multiple grids were identified as saturated (deemed as greater than 1000 anomalies),
- Grids with Fill areas also observed to be saturated
- Several grids had large anomalous areas:
  - E3: 1,264 anomalies (9 large anomalies)
  - D3: 736 anomalies (6 large anomalies)
- All MD items found on surface in and around AOC 2 except one item in grid B7 (south of ranges)
- Anomalies observed up to proposed RI boundary; therefore remainder of grid beyond proposed boundary was mowed and cleared (no MEC/UXO or MD findings outside RI boundary)
- Area divided for further analysis

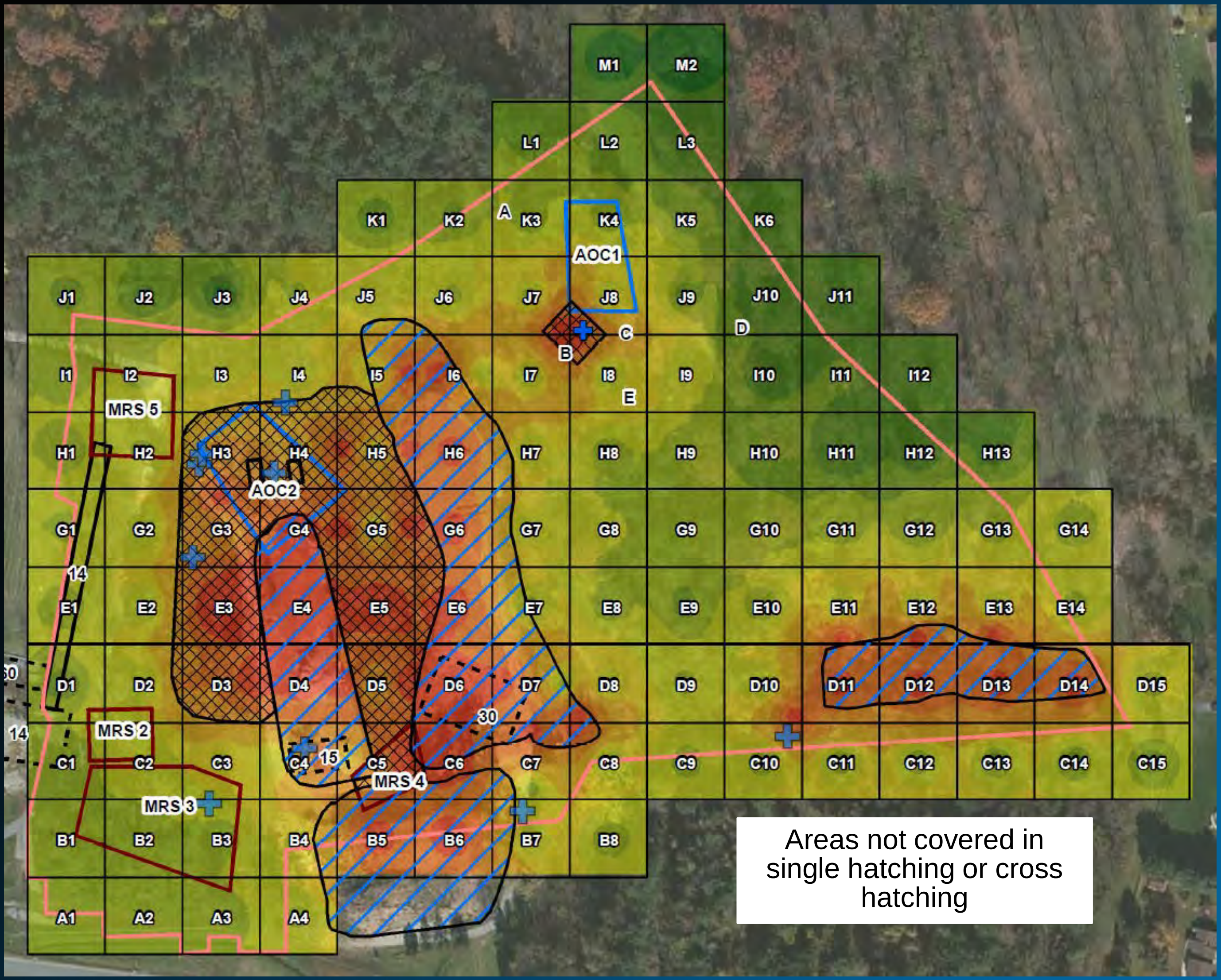
Phase I RI Results

- **Subdivision of Areas Based on Surface Clearance and Analog Geophysics**
  - **AREA 1: High Anomaly Density Areas**



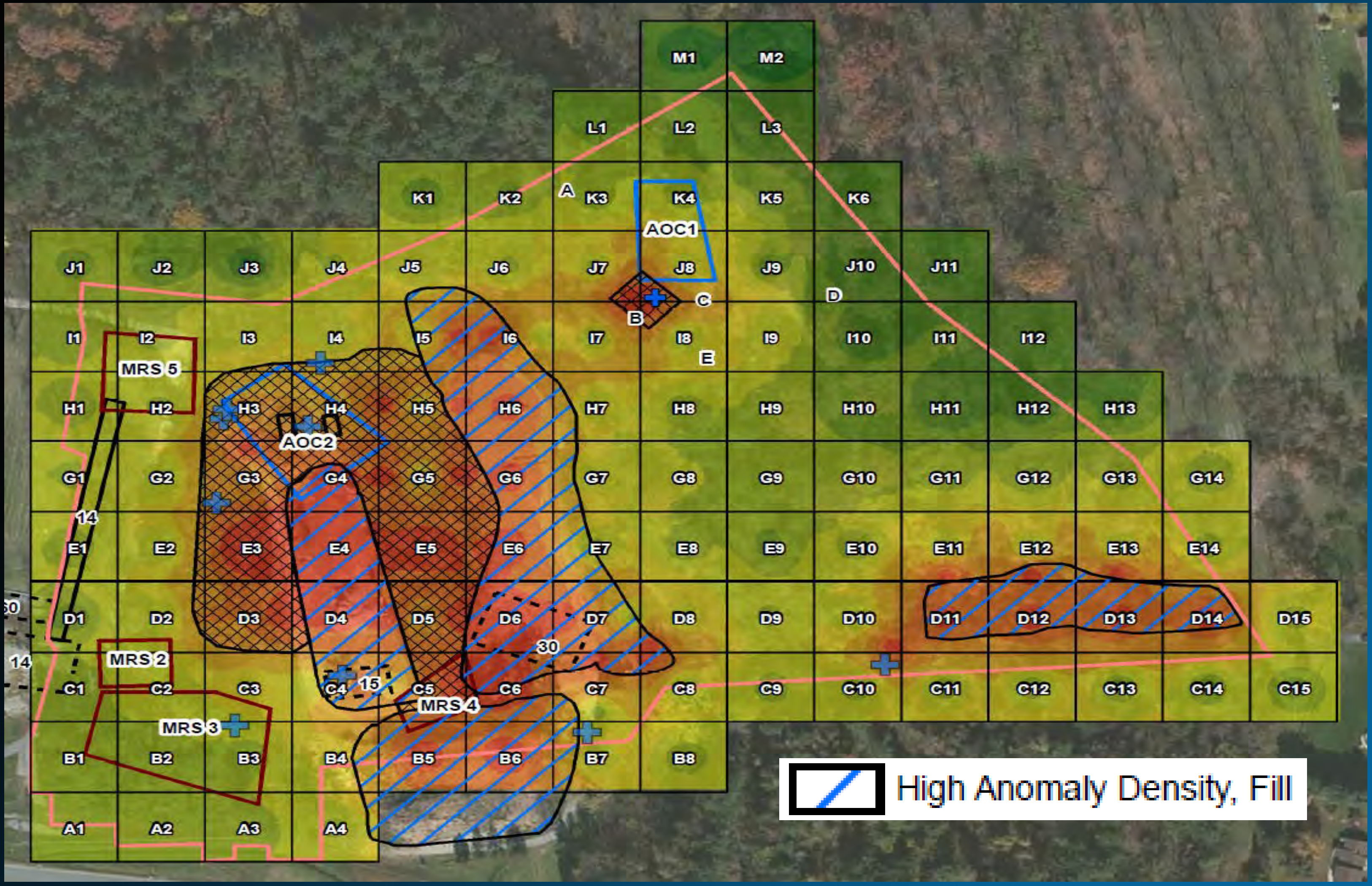
Phase I RI Results

- **AREA 2: Low Anomaly Density Areas**



Phase I RI Results

- AREA 3: High Anomaly Density Areas - Associated with Landfill or Backfilled Areas



Review of CSM relative to Findings

- No changes to CSM for area encompassing MRS 2-5 and AOC 1 and 2; confirmed historical findings and use; no MEC/UXO, no different types of MD
- Summary of sources:
  - Past use as firing ranges included the use of 20 mm, 37 mm, and 40 mm practice ammunition on test ranges (Buildings 14/16)
  - Sifting of backstop sands and removal of munitions debris with reuse of sands
  - No specific historical information on disposal quantities or specific disposal areas except ASR interview findings and subsequent findings

Review of CSM relative to Findings

- Areas in and around MRS/AOCs have been investigated using analog and digital geophysics (excluding inaccessible areas)
- Only confirmed MEC items found to date were unfired practice rounds associated with Building 14 “misfire pit” (MRS 2) removed during 1993 TCRA included:
  - Unfired rounds (no High Explosives) identified to include 20-mm Target Practice (TP) cartridges, 3-inch anti-aircraft gun TP cartridges, 37-mm TP cartridges, a 37-mm M74 shot cartridge, and 105 assorted small arms cartridges

Review of CSM relative to Findings

- MD found around Building 16 backstop area during Phase and historically (associated with use and /or Time Critical Removal action [TCRA])
- MD found in other grids (B7 and C10) possibly associated with road used to haul items to AOC 1 area)
- Unknown status of items removed by Explosive Ordnance Division (EOD)/Police in 2007, suspected to be MD based on appearance/ability to move (need to be confirmed)
- 20 mm disposal area reportedly located between Buildings 14 and 16 (identified as MRS 3) not confirmed during the TCRA

Review of CSM relative to Findings

- Disposal area identified by Gettysburg Electronics and confirmed by SAIC/USACE 2007 (identified as AOC 1)
- Building 16 backstops cleaned out during TCRA no MEC found, MD found in one backstop
- Building 14 backstops still have sand and MD as identified during recent investigations, no MEC/UXO found
- Current use - limited use of the area (Fish and Wildlife, electric/utility inspections, well sampling, maintenance and security inspections)
- Future Use Goal – industrial reuse

Phase II RI Goals

- Determine nature and extent of MEC and MD within the proposed RI boundary
- Determine nature and extent of MC in surface and subsurface soil and groundwater

Proposed Phase II RI Technical Approach

- Proposed Phase II Technical Approach includes the use of:
  - Statistical sampling to intrusively investigate subsurface anomalies to determine nature and extent of MEC
  - Intrusively investigate disposal pit features (e.g. large anomalies, saturated areas) identified during the Phase I RI investigations
  - Conduct Munitions Constituent (MC) sampling of impacted areas (areas where MEC, MD, or backstop sand is found), with focus on larger areas

Proposed Phase II RI Technical Approach

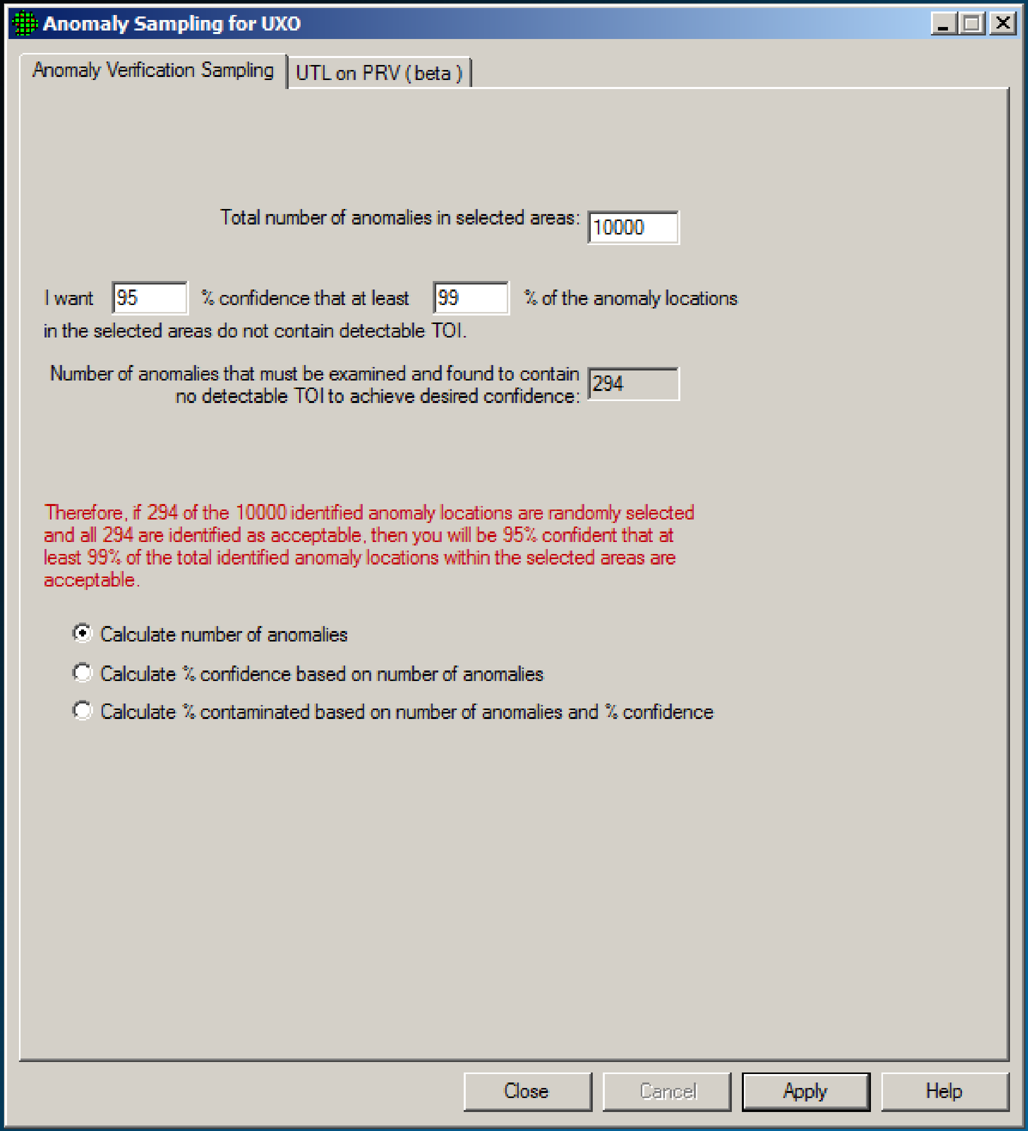
- Use of Visual Sampling Plan (VSP) software to develop sampling approach for Phase II RI efforts
  - Presumptively Clean/Verification Sampling Approach Module of VSP used in analysis
  - Considered using area-based VSP sampling approach; however, this approach assumes no prior knowledge of anomaly density and would require investigating high percentage of saturated areas –therefore not used

Proposed Phase II RI Technical Approach

- VSP Input:
  - Demonstrate that 99% of remaining anomalies are not MEC with 95% level of confidence
  - Number of anomalies to investigate based on total number of anomalies within each area
  - Use of grid sheets to estimate number of anomalies within each area (Low density versus High density)
- VSP Output:
  - Number of Anomalies to Investigate reaches Maximum of 300 for each area

Proposed Phase II RI Technical Approach

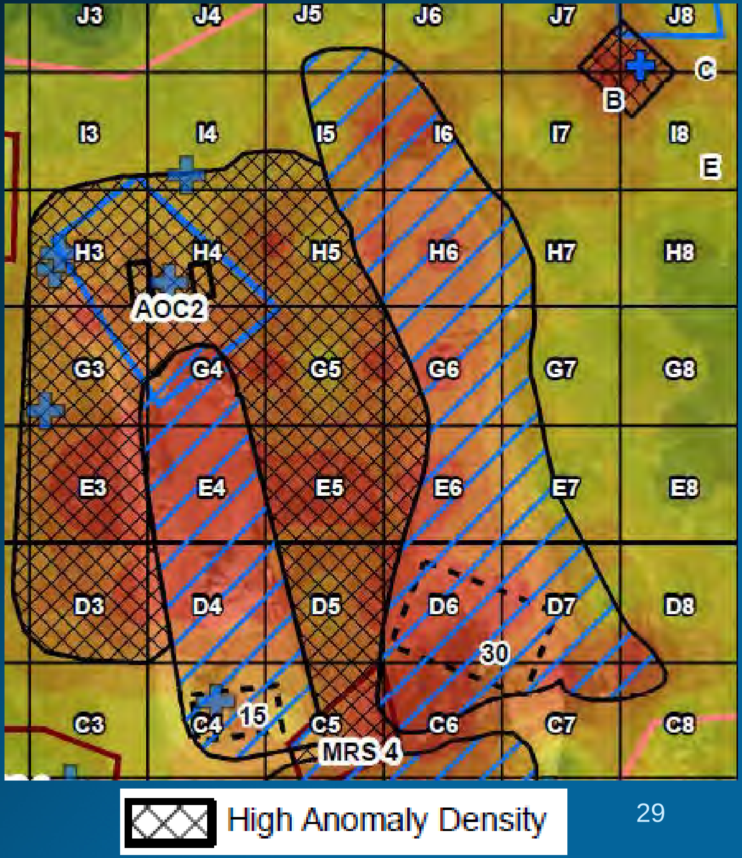
- **VSP output for "High Anomaly Density Area"**



Proposed Phase II RI Technical Approach

AREA 1: High Density Anomaly Areas

- Intrusively investigate approximately ~300 randomly selected anomalies (to achieve confidence of remaining anomalies are not MEC)
- MC sampling



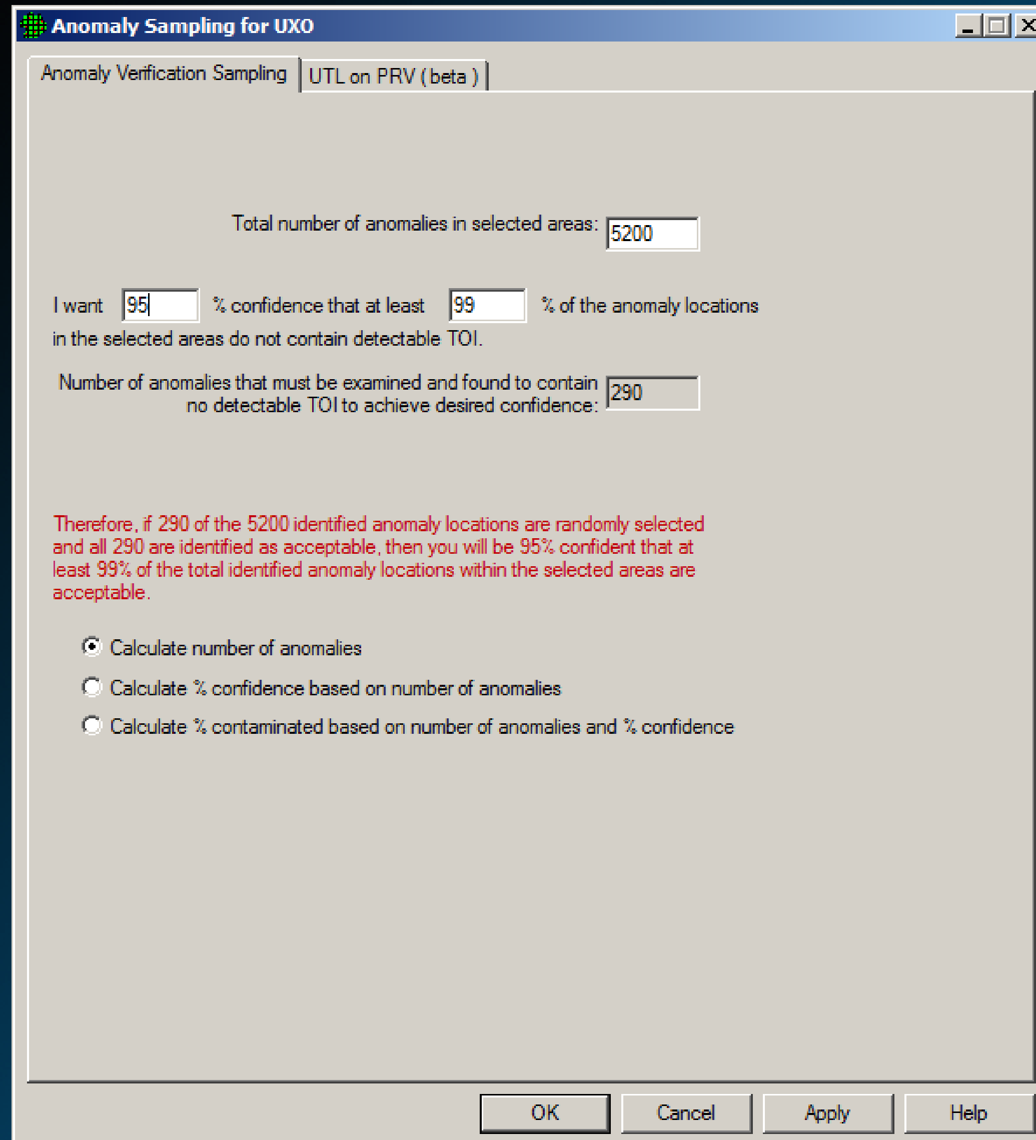
Proposed Phase II RI Technical Approach

AREA 1: High Density Anomaly Areas (continued)

- **Consists of 2.5 acres**
- **No MEC previously identified**
- **MD items including expended 20 mm, 37 mm and 40 mm practice projectiles found in and around AOCs 1 and 2**
- **Most grids saturated**
- **Digital Geophysics not effective in saturated areas**
- **Use surface clearance grid sheets to identify and intrusively investigate potential disposal areas (e.g. large anomalies, potential for 20 mm disposal pit southwest of AOC 1)**

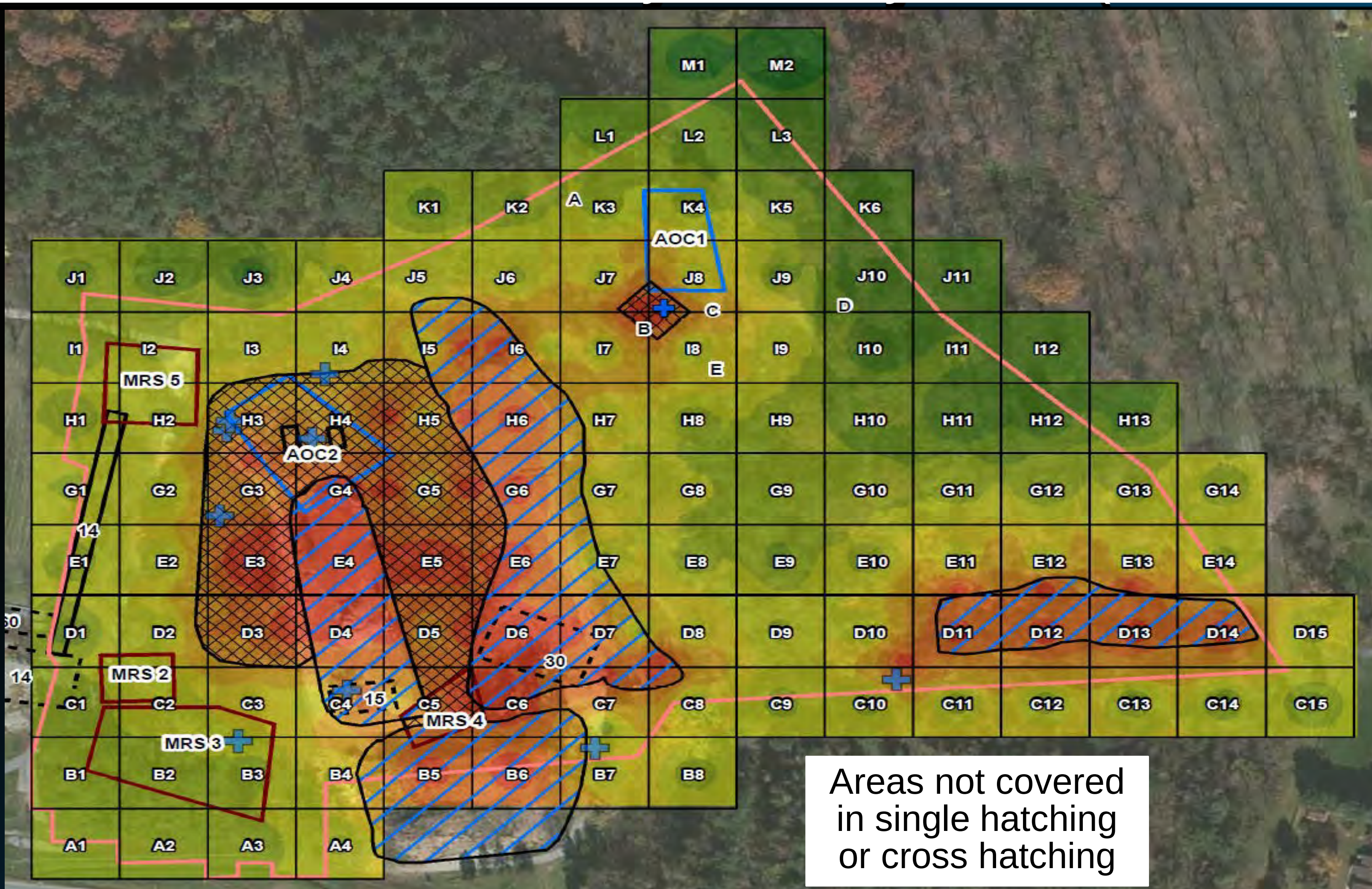
Proposed Phase II RI Technical Approach

- VSP output for "Low Anomaly Density Area"



Proposed Phase II RI Technical Approach

AREA 2: Low Anomaly Density Area (continued)



Proposed Phase II RI Technical Approach

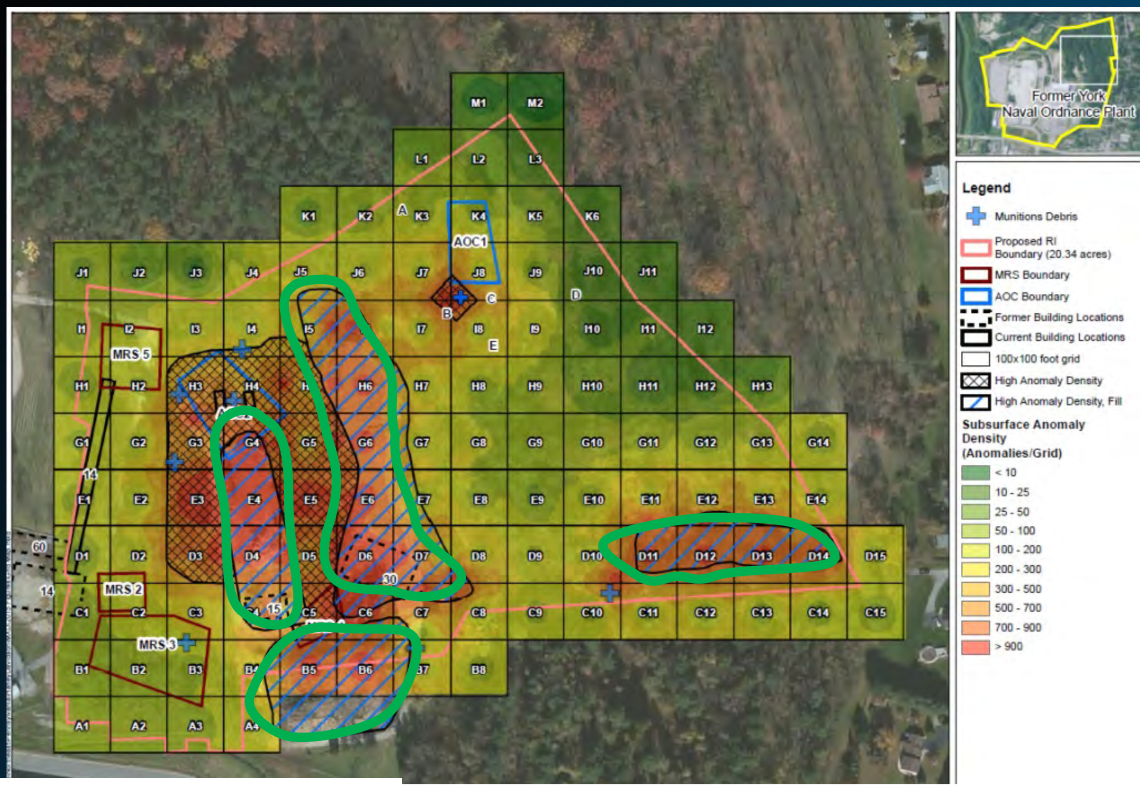
AREA 2: Low Anomaly Density Area

- Low Anomaly Density Area (14 Acres)
- No MEC identified other than misfire pit which was removed during TCRA
- Several MD items found including expended 37mm and 40mm practice projectiles
- Use surface clearance grid sheets to identify and intrusively investigate potential disposal areas (e.g., suspect 20mm disposal pit SW of AOC 1)
- Intrusively investigate approximately ~300 randomly selected anomalies (to achieve confidence that remaining anomalies are not MEC)
- MC sampling

Proposed Phase II RI Technical Approach

AREA 3: High Anomaly Density Landfill/Backfill Areas

- **No MEC or MD identified, No further RI activities addressed in FS and decision documents**



High Anomaly Density, Fill (Areas covered in single hatching and outlined in green)

Proposed Phase II RI Technical Approach

- **MRS 1 – West Parking Lot (York County Industrial Development Authority)**
  - **Derives its shape and location from the USACE Archive Search Report (ASR) that created a "square" shape range area encompassing a location where a former York Naval Ordnance Plant (fYNOP) employee had drawn an "X" on a map.**
  - **The "X" was to indicate the location of a former "dump" area used by fYNOP.**

Proposed Phase II RI Technical Approach

- Area "F" (2009 Draft Supplemental RI Report) is in proximity to where the "X" in the ASR map was originally drawn. Area F was investigated/capped with several feet of soil and asphalt as a result of the Eden Road reconstruction project. MD historically identified (inert projectile per ASR);
- No MD/MC identified in MRS during SI or reconstruction
- Protective Covenant issued as part of the Agreement of Sale which restricts:
  - Use of groundwater
  - Disturbance of engineering controls present on the site in accordance with any soil management plan and applicable laws.

Proposed Phase II RI Technical Approach

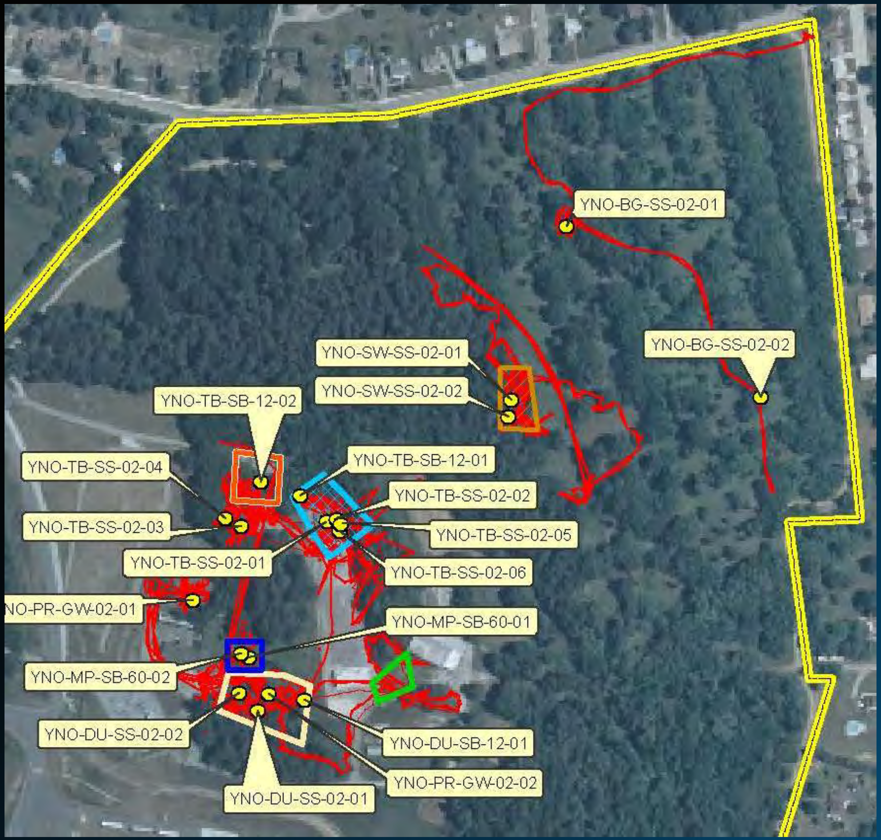
- Proposed MRS 1 Phase II Approach (for discussion):
  - Geophysical investigation?
  - Soil borings?
  - Test pits?
  - Groundwater sampling?
  - Revise current land use controls (LUCs) for MRS 1 closure (i.e. to include UXO avoidance procedures)?

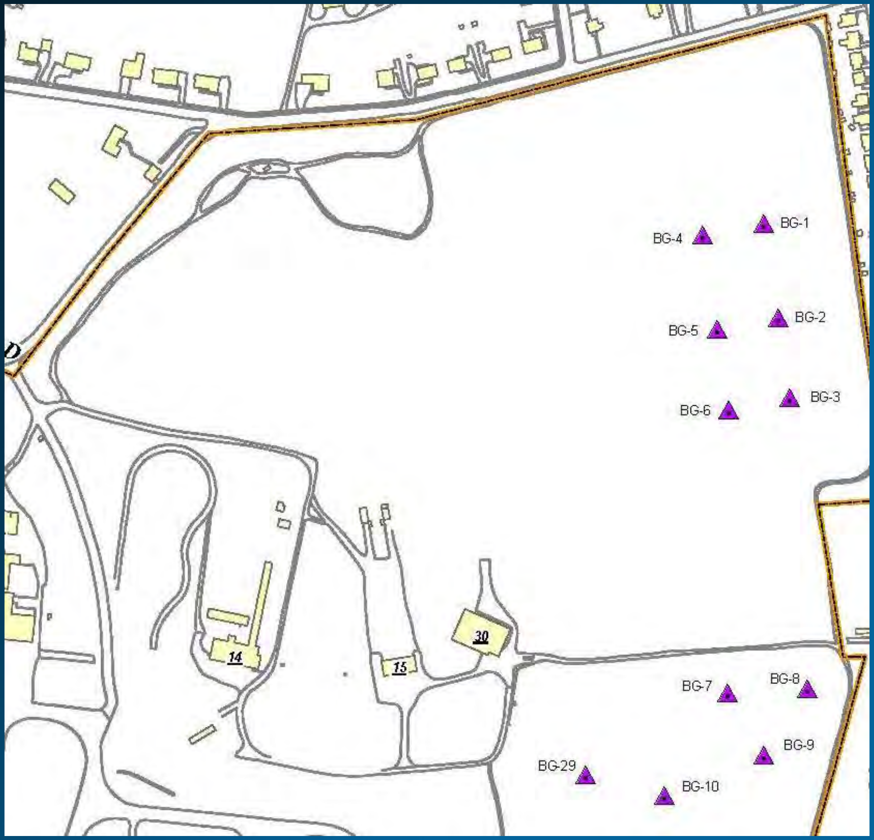
Proposed Phase II RI MC Sampling Technical Approach

- Collect surface/subsurface soil samples
  - Analytes to include select explosives and metals
- Collect groundwater samples from new or existing monitoring wells downgradient of identified disposal areas
  - Analytes to include select explosives and metals
- Locations identified based on findings to date or from disposal areas identified during Phase II RI activities

Review of SI MC Sampling Results

- **Soil sample locations from 2007 SI and background soil sample locations from 2009 Supplemental Soils RI**





Review of SI MC Sampling Results

- Review of soil background results
  - 2007 SI sample results (metals) within range of 2009 supplemental RI samples

		Sample Name:	USEPA Region III RBC Screening Value (1)	Ecological Screening Values (2)	2009 Supplemental RI Soil Background		YNO-BG-SS-02-01	YNO-BG-SS-02-02
		Sample Date:			BG-1 to BG-6	BG-7 to BG-10	7/12/2007	7/12/2007
		Parent Name:						
					East of RI Study Area	South of RI Study Area		
Analyte	CAS	Unit						
Metals								
ALUMINUM	7429-90-5	mg/kg	100000	pH > 5.5	7490-17600	10600-16900	10900	10700
ANTIMONY	7440-36-0	mg/kg	41	0.27	<1	<1	0.3 UL	0.35 L
BARIUM	7440-39-3	mg/kg	20000	330	81.9-123	123-134	149	121
COPPER	7440-50-8	mg/kg	4100	28	3.43 - 8.98	3.13 - 6.35	8.2	7.9
IRON	7439-89-6	mg/kg	72000	NUT	10900-15600	11700-14700	12900	13900
LEAD	7439-92-1	mg/kg	800	11	20.6 - 35.5	17.9 - 33.4	27.6	22
NICKEL	7440-02-0	mg/kg	2000	38	5.77 - 10.4	5.37 - 7.93	8.2	6.3
ZINC	7440-66-6	mg/kg	31000	50	36.9 - 75.8	28.7 - 54.2	41.2 J	34.9 J

Review of SI MC Sampling Results

- **AOC 1: One sample exceeded background and the Ecological Screening Value for lead**

	Sample Name:		USEPA Region III RBC Screening Value (1)	Ecological Screening Values (2)	2009 Supplemental RI Soil Background		YNO-SW-SS-02-01	YNO-SW-SS-02-02
	Sample Date:				BG-1 to BG-6	BG-7 to BG-10	7/12/2007	7/12/2007
	Parent Name:							
	MRS:				East of RI Study Area	South of RI Study Area	AOC 1	AOC 1
Analyte	CAS	Unit						
Metals								
ALUMINUM	7429-90-5	mg/kg	100000	pH > 5.5	7490-17600	10600-16900	9840	10000
ANTIMONY	7440-36-0	mg/kg	41	0.27	<1	<1	0.3 L	0.28 UL
BARIUM	7440-39-3	mg/kg	20000	330	81.9-123	123-134	110	159
COPPER	7440-50-8	mg/kg	4100	28	3.43 - 8.98	3.13 - 6.35	8.7	7.2
IRON	7439-89-6	mg/kg	72000	NUT	10900-15600	11700-14700	16800	17500
LEAD	7439-92-1	mg/kg	800	11	20.6 - 35.5	17.9 - 33.4	29.4	36.3
NICKEL	7440-02-0	mg/kg	2000	38	5.77 - 10.4	5.37 - 7.93	7.5	8.5
ZINC	7440-66-6	mg/kg	31000	50	36.9 - 75.8	28.7 - 54.2	36.1 J	31.3 J

Note: MRS 2: No SI soil sample exceeds Screening Values and no sampling was conducted in MRS 4

Review of SI MC Sampling Results

- **AOC 2: All three samples exceeded background and/or Ecological Screening Values for one or more analytes to include: antimony, barium, copper, lead, and zinc**

	Sample Name:		USEPA Region III RBC Screening Value [1]	Ecological Screening Values [2]	2009 Supplemental RI Soil Background		YNO-TB-SB-12-01	YNO-TB-SS-02-01	YNO-TB-SS-02-02
	Sample Date:				BG-1 to BG-6	BG-7 to BG-10	7/12/2007	7/12/2007	7/12/2007
	Parent Name:								
	MRS:				East of RI Study Area	South of RI Study Area	AOC 2	AOC 2	AOC 2
Analyte	CAS	Unit							
Metals									
ALUMINUM	7429-90-5	mg/kg	100000	pH > 5.5	7490-17600	10600-16900	11100	1230	1240
ANTIMONY	7440-36-0	mg/kg	41	0.27	<1	<1	2.3 L	1.3 L	7.1 L
BARIUM	7440-39-3	mg/kg	20000	330	81.9-123	123-134	167	129	983
COPPER	7440-50-8	mg/kg	4100	28	3.43 - 8.98	3.13 - 6.35	76.2	81.7	472
IRON	7439-89-6	mg/kg	72000	NUT	10900-15600	11700-14700	29400	3950	13700
LEAD	7439-92-1	mg/kg	800	11	20.6 - 35.5	17.9 - 33.4	485	36.7	305
NICKEL	7440-02-0	mg/kg	2000	38	5.77 - 10.4	5.37 - 7.93	27.4	23.1	8.7
ZINC	7440-66-6	mg/kg	31000	50	36.9 - 75.8	28.7 - 54.2	479 J	48.1 J	1110 J

Review of SI MC Sampling Results

- **MRS 3: All three samples exceed background and/or Ecological Screening Values for one or more analytes to include: copper, lead, and zinc**

	Sample Name:		USEPA Region III RBC Screening Value (1)	Ecological Screening Values (2)	2009 Supplemental RI Soil Background		YNO-DU-SB-12-01	YNO-DU-SS-02-01	YNO-DU-SS-02-02
	Sample Date:				BG-1 to BG-6	BG-7 to BG-10	7/12/2007	7/12/2007	7/12/2007
	Parent Name:								
	MRS:				East of RI Study Area	South of RI Study Area	MRS 3	MRS 3	MRS 3
Analyte	CAS	Unit							
Metals									
ALUMINUM	7429-90-5	mg/kg	100000	pH > 5.5	7490-17600	10600-16900	10600	13700	8270
ANTIMONY	7440-36-0	mg/kg	41	0.27	<1	<1	0.27 UL	0.41 L	0.88 L
BARIUM	7440-39-3	mg/kg	20000	330	81.9-123	123-134	143	106	98.4
COPPER	7440-50-8	mg/kg	4100	28	3.43 - 8.98	3.13 - 6.35	49.7	19.6	13
IRON	7439-89-6	mg/kg	72000	NUT	10900-15600	11700-14700	15600	22300	12800
LEAD	7439-92-1	mg/kg	800	11	20.6 - 35.5	17.9 - 33.4	101	66.9	54.3
NICKEL	7440-02-0	mg/kg	2000	38	5.77 - 10.4	5.37 - 7.93	7.9	12.1	8.7
ZINC	7440-66-6	mg/kg	31000	50	36.9 - 75.8	28.7 - 54.2	68.8 J	87.8 J	65.2 J

Review of SI MC Sampling Results

- **MRS 5: All three samples exceed background and/or Ecological Screening Values for one or more analytes to include: antimony, barium, copper, iron, lead, nickel, and zinc***

	Sample Name:		USEPA Region III RBC Screening Value (1)	Ecological Screening Values (2)	PADEP Direct Contact MSC (Residential)	2009 Supplemental RI Soil Background		YNO-TB-SB-12-02	YNO-TB-SS-02-03	YNO-TB-SS-02-04
	Sample Date:					BG-1 to BG-6	BG-7 to BG-10	7/12/2007	7/12/2007	7/12/2007
	Parent Name:									
	MRS:					East of RI Study Area	South of RI Study Area	MRS 5	MRS 5	MRS 5
Analyte	CAS	Unit								
Metals										
ALUMINUM	7429-90-5	mg/kg	100000	pH > 5.5	190000	7490-17600	10600-16900	14400	8560	14600
ANTIMONY	7440-36-0	mg/kg	41	0.27	88	<1	<1	0.26 UL	1.4 L	0.63 L
BARIUM	7440-39-3	mg/kg	20000	330	44000	81.9-123	123-134	87.9	347	120
COPPER	7440-50-8	mg/kg	4100	28	8100	3.43 - 8.98	3.13 - 6.35	9.1	444	17.9
IRON	7439-89-6	mg/kg	72000	NUT	150000	10900-15600	11700-14700	17200	24300	24600
LEAD	7439-92-1	mg/kg	800	11	500	20.6 - 35.5	17.9 - 33.4	16.4	746	45.7
NICKEL	7440-02-0	mg/kg	2000	38	4400	5.77 - 10.4	5.37 - 7.93	7.6	13.2	12.8
ZINC	7440-66-6	mg/kg	31000	50	66000	36.9 - 75.8	28.7 - 54.2	31.8 J	923 J	69.8 J

- **NOTE: YNO-TB-SS-02-03 was collected downgradient of the air handling unit for Building 14. This sample also exceed the PADEP Direct Contact Residential MSC but not Industrial.**

Proposed Phase II RI MC Sampling Technical Approach

- Exceedances of ecological screening criteria and human health screening criteria (Direct Contact Residential MSC exceedance for lead in one sample)
- Path forward (for discussion):
  - Human health risk assessment for Building 14?
  - Determine the need for an ecological risk assessment?
  - Confirm screening criterial (look at Act 2 and EPA)?
  - Additional data to incorporate from Building 16 dust removal?

Schedule

- Phase II RI Schedule Overview for Discussion
  - Develop budgetary estimate for Phase II RI activities *– August 2015*
  - Phase II Work Plan Addendum and Review Period(s) *– September 2015 thru November 2015*
  - Field Efforts *– December 2015 thru January 2016*
  - Draft and Final Phase II Reporting and Review Period(s) *– February 2016 thru July 2016*
- Feasibility Study/Proposed Plan/Decision Document

  – August 2016 thru Feb 2017 (projected)

Wrap Up / Questions

Attachment 3

Standard Operating Procedures (SOPs)

(electronic on CD only)

LIST OF SOPs

- **SOP No. 01 – Blind Seeding**
- **SOP No. 03 – Subsurface Utility Clearance**
- **SOP No. 05 – Field Logbooks**
- **SOP No. 06 – Hand and Power Tool Operation**
- **SOP No. 07 – Intrusive Operations**
- **SOP No. 11 – Vegetation Removal**
- **SOP No. 12 – Munitions Debris Inspection**
- **SOP No. 13 – Monitoring Well Sample Collection**
- **SOP No. 14 – Data Management and Quality Control of Data**
- **SOP No. 19 – Monitoring Well Installation**
- **SOP No. 25 – Soil Sampling**
- **SOP No. 65 – DGM Geophysical Sensor Verification**
- **SOP No. 66 – DGM Data Collection**
- **SOP No. 67 – DGM Data Processing**
- **SOP No. 68 – DGM Target Reacquisition**

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Standard Operating Procedure No. 1
for
Blind Seeding

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle, Suite 400
Hunt Valley, Maryland 21031

Revision 01
December 2015

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CONTENTS

1. PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide munitions potentially possessing explosive hazards (MPPEH) procedures at EA Engineering, Science, and Technology, Inc., PBC (EA). This SOP is not meant to be all inclusive, nor is it applicable in all situations. This policy is not a standalone document; rather, it is to be used in conjunction with the applicable project-specific Work Plan (WP); Quality Control Plan (QCP); Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP); applicable federal, state, and local regulations; contract restrictions; and guidance.

2. INTRODUCTION

This SOP applies to all site personnel, including subcontractor personnel, involved in the conduct of operations on munitions response sites requiring the implementation of quality control (QC) procedures using *blind seeding* as a QC tool. This SOP is not intended to contain all of the requirements needed to ensure compliance.

"*Blind seeding*" is a QC process in which the quality assurance (QA) or QC personnel intentionally emplace munitions and explosives of concern (MEC) / discarded military munitions (DMM)-like objects within the munitions response area (MRA) / munitions response site (MRS) or area in the munitions response (MR) project production area (in the case commercial projects) to test and validate the MEC/DMM detection process employed. The emplaced objects are called "*blind seeds*". The validity of blind seeding as a QA/QC tool is based on the assumption that seed items will accurately mimic the smallest actual MEC or DMM items expected to be found within the MRA/MRS or production area. Industry Standard Objects (ISOs) will be used to simulate the smallest type of MEC or DMM items expected to be found. If the MR production team (typically an unexploded ordnance [UXO] Team) detects the placed ISOs, the QA/QC personnel can assume the MEC/DMM detection procedures are working as planned. On the other hand, if the MR production team fails to find a blind seed, the detection process is either inadequate or being implemented inadequately.

There are two types of blind seeds to be considered when implementing the blind seeding program as described below:

1. Detection Seeds: Place detection seed items within areas to be investigated at depths representative to the expected items to be located with the MRA/MRS or production area for the type of MR action being employed.

2. Coverage Seeds: Place Blind Coverage Seed items within areas to be investigated below the surface duff layer.

3. MAINTENANCE

The Project Manager (PM) and the on-site Quality Control person/UXO Quality Control Specialist (UXOQCS), in collaboration with the Senior UXO Supervisor (SUXOS) is responsible for the maintenance of this procedure. Final approval authority rests with the EA Program Quality Control Manager (PQCM) or designated delegate.

3.1 IMPLIMENTATION OF BLIND SEEDING PROCEDURES

The following table is to be used for the implementation of the blind seeding program.

Type of MR Action	Smallest Munition Expected	ISO (note 1)	Depth	Type of Seed	Frequency
RI	37MM Projectile	Pipe Nipple	6-12 Inches	Detection Seed	At least 1 per DGM grid, minimum 1 per day

Note: 1. ISO is to be as close to same dimensions as the Smallest Munition Expected to find.

3.2 PASS/FAIL CRITERIA

The following table addresses the pass/fail criteria and follow-on actions.

Type of MR Action	Pass	Fail	Action
RI	ISO location flagged	ISO location not flagged by survey team or reported to UXOQCS upon grid mag & flag completion	Analyze and discuss path forward regarding data (refer to work plan QC section)

3.3 ROLES AND RESPONSIBILITIES

The following outlined section, addresses the roles and responsibilities for each position normally involved in a MR projects in regard to the blind seed program.

3.3.1 Project Manager

- Ensure that current and thorough blind seeding procedures are implemented.

3.3.2 Senior Unexploded Ordnance Supervisor

- Responsible for ensuring work and QC plans specify the procedures and responsibilities for instituting the blind seeding procedures are being followed and implemented.
- Assist the QC personnel / UXOQCS in provide the materials and supplies necessary for implementing the blind seeding program.

3.3.3 UXO Quality Control Specialist

- Formulate a plan for implementing the blind seeding program in coordination with the SUXOS.
- Prepare and serialize each ISO to be utilized.
- Place all blind seeds prior investigation of the MRSs.
- Compare ISO placement coordinate with detection coordinates collected by Survey Team Post Mag & Flag (RI Only).
- Implement a tracking program that records the following for each ISO placed (see Exhibit 1: Blind Seed Tracking Log):
  a. ISO Serial number
  b. MRS & Grid Number that the ISO was placed in
  c. GPS Coordinates
  d. Depth and Axis
  e. Date Placed
  f. Date Recovered
  g. Team Number that turned in ISO (IRA Only)
  h. UXO Team member who located ISO
  i. Compare recorded subsurface anomaly locations to GPS survey coordinates for each surface anomaly.

3.3.4 GPS Survey Team

- Assist the UXOQCS with placement of ISOs
- Provide the UXOQCS with Mag & Flag coordinates of detected subsurface anomalies.

3.3.5 UXO Technician III/Team Leader

- Complete Blind Seed Tracking Log
- Return all recovered ISOs to the UXOQCS the same day located/recovered.

3.3.6 UXO Technician II

- Recover and report the location of any ISOs found with the area being investigated and notify the UXO Technician III/Team Leader.

Exhibit 1

Blind Seed Tracking Log

Example of Blind Seed Tracking Log

ISO Serial Number	MRS & Grid Number ISO Placed	GPS Coordinates	Date Placed	Date Recovered/Detected	Team Number that Recovered or Detected ISO	UXO Team member who located ISO	Remarks/Comments

Standard Operating Procedure No. 003
for
Subsurface/Utility Clearance

Prepared by

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Revision 0
December 2014

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CONTENTS

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1. SCOPE AND APPLICATION

1.1 PURPOSE

The purpose of this Standard Operating Procedure is to prevent injury to workers and damage to subsurface structures (including tanks, pipe lines, water lines, gas lines, electrical service, etc.) during ground disturbance activities (including drilling, augering, sampling, use of direct-push technologies, excavation, trenching, concrete coring or removal, fence post installation, grading, or other similar operations).

1.2 LIMITATIONS

The procedures set forth in this document are the suggested procedures but may not be applicable to particular sites based on the site-specific considerations. The Project Manager is responsible for making a site-specific evaluation of each site to determine whether the Subsurface/Clearance Procedures should be utilized or require modification. If safety or other site-specific considerations require a modified or different procedure, the Project Manager should review the modified procedure with the Business Unit Director, Profit Center Manager, or Senior Technical Reviewer.

1.3 SCOPE

This procedure provides minimum guidance for subsurface clearance activities, which must be followed prior to and during ground disturbance activities at EA project sites. Even after completing the subsurface clearance activities required in this procedure, all ground disturbance activities should proceed with due caution.

Deviations from this procedure may be provided on an exception basis for specific situations, such as underground storage tank systems removals, verified aboveground/overhead services/lines, undeveloped land/idle facilities, shallow groundwater conditions, soil stability, or well construction quality assurance/quality control concerns, etc.

EA or its subcontractors are responsible for, and shall ensure that, all ground disturbance activities are completed safely, without incident, and in accordance with applicable federal, state, and local regulations.

This procedure shall not override any site-specific or consultant/contractor procedures that are more stringent or provide a greater degree of safety or protection of health or the environment.

2. PROCEDURES

The EA Project Manager or his designee must complete the Subsurface Clearance Procedure Checklist (Appendix A) in conjunction with the following procedures. The checklist must be completed before initiating any ground disturbance activities. The completed checklist must be submitted to the appropriate team individuals, subcontractors, and/or the client and included in the project files.

2.1 SAFETY

A Health and Safety Plan must be available onsite and followed by all contractors and subcontractors.

All work areas shall be defined and secured with safety cones, safety tape, construction fence, other barriers, or signs as appropriate.

Site work permits must be obtained as required by site procedures. Based on site conditions or classification, the use of intrinsically-safe equipment may be required.

To ensure the safety of all onsite personnel and subsurface structure integrity, consideration should be given to de-energizing and locking out selected site utilities or temporarily shutting down a portion of or the entire facility.

2.2 PREPARATION TASKS

Objective—To gather all relevant information about potential subsurface structures prior to the actual site visit.

2.2.1 Obtain Permits and Site Access

The consultant/contractor is responsible for following all applicable laws, guidance, and approved codes of practice; obtaining all necessary permits and utility clearances; and securing site access permission.

2.2.2 Historic Site Information

Obtain most recent as-built drawings and/or site plans (including underground storage tank, product, and vent lines) as available.

NOTE: As-built drawings may not accurately depict the locations and depths of improvements and subsurface structures and should, therefore, not be **solely** relied upon.

EA should obtain any other site information such as easements, right-of-ways, historical plot plans, fire insurance plans, tank (dip) charts, previous site investigations, soil surveys, boring logs, and aerial photographs, etc. as relevant to the planned ground disturbance activities.

Where applicable, EA should also contact contract personnel who may have historic site knowledge.

2.2.3 Mark-Outs

Objective—To identify location of subsurface structures on surface.

EA must ensure that a thorough mark-out at the site is completed to locate electrical, gas, telephone, water, sewer, low voltage electric lines, product delivery pipelines, fiber optic, and all other subsurface utilities/services.

- Where available, public utility companies must be contacted to identify underground utilities. (This can be accomplished through the One-Call system in most instances.)

- In addition, where available and warranted by site conditions, a private utility/pipeline mark-out company should be contracted to perform an electronic subsurface survey to identify the presence of suspected hazardous or critical underground utilities and subsurface structures. In some cases, this is necessary to confirm public utility mark-outs in the vicinity of planned ground disturbance activities.

EA will review all available site plan subsurface information with the private mark-out company to assist in locating utilities and other subsurface structures.

NOTE: Mark-outs may not accurately depict the exact locations of improvements and subsurface structures and should, therefore, not be **solely** relied upon.

Where possible, EA personnel are encouraged to be onsite at the time of subsurface mark-outs. This is to ensure accuracy and understanding of subsurface structures identified and provides an opportunity to exchange information with mark-out company personnel regarding planned work activities.

Subsurface structures should be marked throughout the entire work area(s) with adequate materials (e.g., site conditions may require paint and tape/flags). Ground disturbance activities must be started within 30 days of mark-out, unless local ordinances specify a shorter time period. If activities are not started within required time period or markings have faded, mark-outs must be redone.

EA personnel will record time and date of mark-out request and list all companies contacted by the service and confirmation number. This should be available for review onsite and checked off after visual confirmation of markings.

2.2.4 Initial Site Visit

Objective—To compare the site plan to actual conditions based on information gathered in Procedures 2 and 3 above, obtain additional site information needed, and prepare a vicinity map.

EA will document all findings and update the site plan with this information. On third party sites, close coordination with the site owner's representatives for mark-outs, review of as-builts, and other information reviews should be conducted prior to work. Project Managers are encouraged to provide updated as-built information to the client.

In some regions, it may be more effective and efficient to conduct the site visit at the same time the contractor and drill rig are mobilized to the site. The inspection should include the following activities and may include others as determined by the consultant/contractor and the Project Manager.

2.2.5 Utilities

EA shall perform a detailed site walk-through for the purpose of identifying all aboveground indicators of subsurface utilities/services that may be leading to or from buildings within the planned work area. The inspection shall include, but not be limited to, the following:

- Utility mark-outs
- Aboveground utilities
- Area lights/signs
- Phones
- Drains
- Junction boxes
- Natural gas meters or connections
- Other utilities including: fire hydrants, on/below grade electrical transformers, splice cages, sewer lines, pipeline markers, cable markers, valve box covers, clean-outs/traps, sprinkler systems, steam lines (including insulated tanks that may indicate steam lines), and cathodic protection on lines/tanks
- Observe paving scars (i.e., fresh asphalt/concrete patches, scored asphalt/concrete).

NOTE: In many cases, the onsite location of low-voltage electrical lines and individual property water and sewer line branches may be approximated by using the following technique:

- Locate the entry/connection location at the facility building
- Attempt to identify utility connections for the mains (water sewer, etc.) by locating clean-outs, valve manways, etc. The location path of the utility is likely with the area between the main connection and facility building connection. Subsurface electrical line locations from the facility building to signs, lamps, etc. can be estimated with the same process.

2.2.6 Other Subsurface Systems

Some other subsurface systems to be cognizant of during subsurface activities include product delivery systems (i.e., at gas stations) and existing remediation systems.

2.2.7 Selection of Ground Disturbance Locations

EA will utilize the information collected to this point in combination with regulatory requirements and project objectives to select ground disturbance locations. Ground disturbance locations should also consider the location of overhead obstructions (e.g., power lines). Work at active gasoline retail locations must consider several special considerations that should be outlined in the site-specific safety and health plan.

2.2.8 Review of Selected Locations with the Client

EA will review the selected ground disturbance locations with the client. EA will not proceed with the subsurface activities until the plan has been discussed with the client. During execution of the project, subsurface activities are required outside of the area previously approved by the client. EA will submit these changes to the client for approval prior to execution.

2.2.9 Ground Disturbance Activity Sequence

EA will plan ground disturbance activities starting at the point farthest from the location of suspected underground improvements. This is done to determine the natural subsurface conditions and to allow EA site personnel to recognize fill conditions.

Experience has shown that the following warning signs may indicate the presence of a subsurface structure:

- Warning tape (typically indicative of underground services).
- Pea gravel/sand/non-indigenous material (typically indicative of tanks or lines).
- Red concrete (typically indicative of electrical duct banks).

- The abrupt absence of soil recovery in a hand auger. This could indicate pea gravel or sand that has spilled out of the auger. This may not be indicative in areas where native soil conditions typically result in poor hand auger recoveries.

- Any unexpected departure from the native soil or backfill conditions as established by prior onsite digging.

If any of these conditions is encountered by EA site personnel, digging should stop and the client should be contacted.

3. SUBSURFACE CLEARANCE METHODS

The method used to delineate the subsurface should be compatible with the inherent associated risk given the type of facility/property, soil stratigraphy, and the location of the ground disturbance activity, such that required delineation is obtained. It should be noted that in areas where there is paving, sufficient paving should be removed to allow clear visibility of the subsurface conditions during clearance activities. The following is a list of potential clearance methods that may be used on a job site:

- Vacuum digging
- Probing
- Hand digging
- Hand augering
- Post-hole digging.

EA personnel will evaluate the potential for electrical shock or fire/explosion for each subsurface disturbance project and will evaluate as necessary the use of non-conductive or non-sparking tools (i.e., fiberglass hand shovels, and thick electrically insulating rubber grips on hand augers or probes). The potential need for the use of non-conductive materials, electrical safety insulated gloves, and footwear will also be evaluated on a case-by-case basis.

3.1 SUBSURFACE CLEARANCE PROCEDURES FOR DRILLING, DIRECT-PUSH TECHNOLGY, AUGERING, FENCE POST INSTALLATION, OR OTHER BOREHOLE INSTALLATION ACTIVITIES

The area to be delineated will exceed the diameter of the largest tool to be advanced and sufficiently allow for visual inspection of any obstructions encountered.

3.2 SUBSURFACE CLEARANCE PROCEDURES FOR TRENCHING/ EXCAVATION ACTIVITIES

Appropriate subsurface clearance methods should be conducted along the length and width of the excavation at a frequency sufficient to ensure adequate precautions have been applied to the entire work area. The frequency and density of investigations will be based on site knowledge, potential hazards, and risks of the work area to surrounding locations (e.g., proximity to a residential area or school).

Whenever subsurface structures are exposed, EA will cease work and mark the area (e.g., flags, stakes, cross bracing) to ensure the integrity of these exposed structures is maintained during subsequent trenching/excavation/backfilling.

Uniform color codes for marking of underground facilities are provided in Appendix B.

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Appendix A

Subsurface Clearance Procedure Checklist

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Subsurface Clearance Procedure Checklist

Site Identification: ____________________

Project Consultant/Contractor: ____________________

Section 1: Safety, Preparation Tasks, and Mark-Outs

Activity	**Yes**	**No**	**N/A**	**Comments including Justification if Response Is No or Not Applicable**
Health and Safety Plan is available and all contractors and subcontractors are familiar with it.				
All applicable local, state, and federal permits have been obtained.				
Site access/permission has been secured.				
Most recent as-built drawings and/or site plans (including underground storage tank, product, and vent lines) obtained.				
Reviewed site information to identify subsurface structures relevant to planned site activities (easements, rights-of-way, historical plot plans, fire insurance plans, tank dip charts, previous site investigations, soil surveys, boring logs, aerial photographs, etc.).				
Utility mark-outs have been performed by public utility company(s). Mark-outs clear/visible.				
Subsurface structure mark-outs performed by private mark-out company. Mark-outs clear/visible.				
Additional Activities: Were dig locations reviewed with site representative?				

Section 2: Initial Site Visit and Selecting Ground Disturbance Locations

Activity	**Yes**	**No**	**N/A**	**Comments including Justification if Response Is No or Not Applicable**
Location of all aboveground indicators of subsurface utilities/services that may be leading to or from buildings within the planned work area has been identified.				
Location of utility mark-outs by all utility companies previously contacted has been identified within required time period.				
Location of all subsurface structure mark-outs by private mark-out company has been identified within required time period.				
Location of area lights/signs and associated subsurface lines identified.				
Location of all phones and associated subsurface lines identified.				
Location of all drains and associated interconnecting lines identified.				
Location of all electrical junction boxes and associated interconnecting lines identified				
Location of all natural gas meters or connections and all interconnecting lines identified				

Completed by: ____________________
Name

Signature: ____________________ __________
Company Date

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Appendix B

Uniform Color Codes for Excavation

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APWA UNIFORM COLOR CODE

WHITE - Proposed Excavation

PINK - Temporary Survey Markings

RED - Electric Power Lines, Cables, Conduit and Lighting Cables

YELLOW - Gas, Oil, Steam, Petroleum or Gaseous Materials

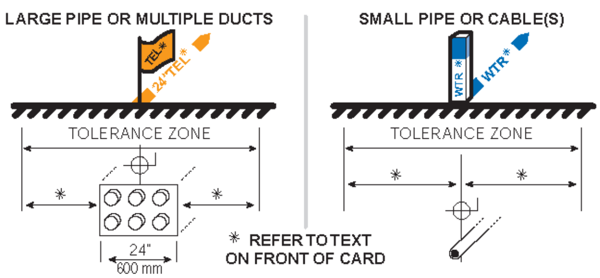
ORANGE - Communication, Alarm or Signal Lines, Cables or Conduit

BLUE - Potable Water

PURPLE - Reclaimed Water, Irrigation and Slurry Lines

GREEN - Sewers and Drain Lines

TYPICAL MARKING



Customize with your center's phone and address information

GUIDELINES FOR UNIFORM TEMPORARY MARKING OF UNDERGROUND FACILITIES

This marking guide provides for universal use and understanding of the temporary marking of subsurface facilities to prevent accidents and damage or service interruption by contractors, excavators, utility companies, municipalities or any others working on or near underground facilities.

ONE-CALL SYSTEMS
The One-Call damage prevention system shall be contacted prior to excavation.

PROPOSED EXCAVATION
Use white marks to show the location, route or boundary of proposed excavation. Surface marks on roadways do not exceed 1.5" by 18" (40 mm by 450 mm). The facility color and facility owner identity may be added to white flags or stakes.

USE OF TEMPORARY MARKING
Use color-coded surface marks (i.e., paint or chalk) to indicate the location or route of active and out-of-service buried lines. To increase visibility, color coded vertical markers (i.e., stakes or flags) should supplement surface marks. Marks and markers indicate the name, initials or logo of the company that owns or operates the line, and width of the facility if it is greater than 2" (50 mm). Marks placed by other than line owner/operator or its agent indicate the identity of the designating firm. Multiple lines in joint trench are marked in tandem. If the surface over the buried line is to be removed, supplementary offset markings are used. Offset markings are on a uniform alignment and clearly indicate the actual facility is a specific distance away.

TOLERANCE ZONE
Any excavation within the tolerance zone is performed with non-powered hand tools or non-invasive method until the marked facility is exposed. The width of the tolerance zone may be specified in law or code. If not, a tolerance zone including the width of the facility plus 18" (450 mm) measured horizontally from each side of the facility is recommended.

ADOPT UNIFORM COLOR CODE
The American Public Works Association encourages public agencies, utilities, contractors, other associations, manufacturers and all others involved in excavation to adopt the APWA Uniform Color Code, using ANSI standard Z535.1 Safety Colors for temporary marking and facility identification.

Rev. 4/99

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Standard Operating Procedure No. 05
for
Field Logbooks

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
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Hunt Valley, Maryland 21031

Revision 01
Date: December 2015

STANDARD OPERATING PROCEDURE – SOP 05
FIELD LOGBOOKS

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to delineate protocols for recording environmental field sampling information in the Field Logbook.

2.0 MATERIALS

The following materials may be required:

- Field Logbook
- Indelible ink pen

3.0 PROCEDURE

All information pertinent to a field survey or sampling effort will be recorded in a bound logbook. Each page/form will be consecutively numbered, dated, and signed. All entries will be made in indelible ink and all corrections will consist of line-out deletions that are initialed and dated. The person making the correction will provide a brief explanation for the change. There should be no blank lines on a page. A single blank line or a partial blank line (such as at the end of a paragraph) should be lined to the end of the page. If only part of a page is used, the remainder of the page should have an "X" drawn across it. At a minimum, entries in the logbook will include but not be limited to the following:

- Project number
- Unique, sequential field sample number
- Purpose of sampling
- Location, description, and log of photographs of each sampling point
- Details of the sample site
- Name and address of field contact
- Documentation of procedures for preparation of reagents or supplies which become an integral part of the sample
- Identification of sample crew members
- Type of sample (e.g., surface soil, subsurface soil)
- Suspected waste composition
- Number and volume of sample taken
- Sampling methodology, including distinction between grab and composite sample
- Sample preservation
- Date and time of collection
- Collector's sample identification number(s)
- Sample shipment (e.g., name of the laboratory and cartage agent: Federal Express, United Parcel Service, etc.)

- References such as maps of the sampling site
- Field observations (e.g., incidental odors, soil color, grain size, plasticity, moisture content, layering, Unified Soil Classification System classification, etc.)
- Any field measurements made
- Signature and date by the personnel responsible for observations
- Decontamination procedures.

Sampling situations vary widely. No general rules can specify the extent of information that must be entered in a logbook. However, records should contain sufficient information so that someone can reconstruct the sampling activity without relying on the collector's memory.

4.0 PRECAUTIONS

None.

5.0 REFERENCES

U.S. Environmental Protection Agency. 1980. *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, QAMS-005/80.

USEPA. 1990. *Sampler's Guide to the Contract Laboratory Program*. EPA/540/P-90/006, Directive 9240.0-06, Office of Emergency and Remedial Response, Washington, D.C. December.

USEPA. 1991. *User's Guide to the Contract Laboratory Program*. EPA/540/O-91/002, Directive 9240.0-01D, Office of Emergency and Remedial Response. January.

Standard Operating Procedure No. 06
for
Hand and Power Tool Operation

Prepared by

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Revision 01
Date: December 2015

STANDARD OPERATING PROCEDURE – SOP 06
HAND AND POWER TOOL OPERATION

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide all EA Engineering, Science, and Technology, Inc., PBC (EA) employees and subcontractors with the minimum safety and health requirements and procedures applicable to the conduct of operations involving the use of power and hand tools.

2.0 SCOPE

This SOP applies to all site personnel, to include contractor and subcontractor personnel, involved in the conduct of operations that require the use of power and hand tools. This SOP is not intended to contain all the requirements needed to ensure regulatory compliance. Consult the documents listed in Section 6.0 of this SOP for additional compliance issues.

3.0 MAINTENANCE

The Project Manager (PM), in collaboration with the Site Supervisor and/or Senior Unexploded Supervisor (SUXOS) (dependent on the project organization) is responsible for the maintenance of this procedure. Approval authority rests with the Program Quality Control Manager (PQCM).

4.0 PERSONNEL REQUIREMENTS AND RESPONSIBILITIES

4.1 PROJECT MANAGER

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

4.2 SITE SUPERVISOR/SENIOR UXO SUPERVISOR

The Site Supervisor and/or the SUXOS (dependent on the project organization) will ensure that this SOP is reviewed prior to power and hand tool operations. The Site Supervisor and/or the SUXOS will also ensure that relevant sections of this SOP are discussed in the tailgate safety briefings.

4.3 UXO TECHNICIAN III

The Unexploded Ordnance Technician III (UXOTIII) shall be responsible for the field implementation of this SOP and for implementing the safety and health requirements outlined in Section 5.1 of this SOP. In the absence of a SUXOS, the UXOTIII shall be responsible for implementing the SUXOS's responsibilities.

4.4 SITE SAFETY AND HEALTH OFFICER/UXO SAFETY OFFICER

The Site Safety and Health Officer (SSHO) and/or the UXO Safety Officer (UXOSO) (dependent on the project organization) will be responsible for ensuring that the safety and health hazards and control techniques associated with this SOP are discussed during the initial site hazard training and the daily tailgate safety briefings. The SSHO and/or UXOSO will also be responsible for daily inspection of site operations and conditions to ensure their initial and continued compliance with this SOP and other regulatory guidelines.

5.0 PROCEDURE

All personnel, including contractor and subcontractor personnel, involved in power and hand tool operations shall be familiar with the potential safety and health hazards associated with their usage, and with the work practices and control techniques to be used to reduce or eliminate those hazards.

5.1 SAFETY AND HEALTH OPERATIONAL CONTROL TECHNIQUES

5.1.1 Power Tools

Power tools have great capability for inflicting serious injury upon personnel, if they are not used and maintained properly. To control the hazards associated with power tool operation, the safe work practices listed below shall be observed when using power tools:

- Operation of power tools shall be conducted by authorized personnel familiar with the tool, its operation, and the manufacturer’s recommended safety precautions.
- Power tools shall be inspected prior to use, and defective equipment shall be removed from service, and properly labeled/tagged until repaired.
- Power tools designed to accommodate guards shall have such guards properly in place.
- Loose fitting clothing or long hair shall not be permitted around moving parts.
- Hands, feet, and other appendages shall be kept away from all moving parts.
- Maintenance and/or adjustments to equipment shall not be conducted while it is in operation or connected to a power source.
- An adequate operating area shall be provided, allowing sufficient clearance for operation.
- Good housekeeping practices shall be followed at all times.

5.1.2 Hand Tools

Use of improper or defective tools can contribute significantly to the occurrence of accidents on site. Therefore, the work practices listed below shall be observed when using hand tools:

- Hand tools shall be inspected for defects prior to each use.
- Defective hand tools shall be removed from service, properly labeled/tagged until properly repaired, or discarded.
- Tools shall be selected and used in the manner for which they were designed.
- Be sure of footing and grip before using any tool.
- Do not use tools that have split handles, mushroom heads, worn jaws, or other defects.
- Gloves shall be worn to increase gripping ability and/or if cut, laceration, or puncture hazards exist during the use of the tool.
- Safety glasses or a face shield shall be used, if the use of tools presents an eye/face hazard.
- Do not use makeshift tools or other improper tools.
- When working at heights above 4 feet, tools shall be secured to prevent them from falling.

5.2 SAFETY AND PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

The following safety measures and personal protective equipment (PPE) shall be used in preventing or reducing exposures associated with power and hand tool operations. These requirements will be implemented, unless superseded by specific requirements stated the Site Specific Safety and Health Plan.

- Safety glasses with side shields shall be worn at all times when operating, servicing, or working around hand or power tools.
- Hearing protection shall be worn during power tool operation.
- Leather, or other protective, gloves shall be worn when using hand/power tools.

- Protective face shields shall be worn for all power tool operations that have the potential for generating flying fragments, objects, chips, particles, or similar.

6.0 REFERENCES

The following Occupational Safety and Health Administration (OSHA) standards and U.S. Army Corps of Engineers (USACE) requirements directly apply to the conduct of operations associated with this SOP. In the event that other hazards are associated with the conduct of this SOP, consultation of other SOPs and regulatory references may be needed:

- OSHA Construction Standard 29 CFR, Part 1910, Subpart O

- OSHA General Industry Standard 29 CFR, Part 1926, Subpart I

- USACE Engineer Manual 385-1-1, Section 13.

Standard Operating Procedure No. 07
for
Intrusive Operations

Prepared by

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Revision 01
Date: December 2015

STANDARD OPERATING PROCEDURE – SOP 07
INTRUSIVE OPERATIONS

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide all applicable EA Engineering, Science, and Technology, Inc., PBC (EA) employees and subcontractors with the minimum procedures and safety and health requirements applicable to the conduct of analog detection at sites potentially containing munitions and explosives of concern (MEC). This SOP can also be used following reacquisition of selected digital geophysical anomalies.

2.0 SCOPE

This SOP applies to all EA site personnel, including contractor and subcontractor personnel, involved in the conduct of analog detection and removal actions on an MEC-contaminated site. The following EA policies and procedures are not all inclusive nor are they applicable in all situations. This SOP is not a stand-alone document and is to be used together with the entire Work Plan, UFP-QAAP (if applicable), other EA SOPs, applicable Federal, State, and local regulations, and contractual requirements, restrictions and guidance documents. Consult the documents listed in Section 8.0 of this SOP for additional compliance issues.

3.0 MAINTENANCE

The Project Manager (PM), in collaboration with the Senior Unexploded Supervisor (SUXOS) is responsible for the maintenance of this procedure. Approval authority rests with the Program Quality Control Manager (PQCM).

4.0 PERSONNEL REQUIREMENTS AND RESPONSIBILITIES

All Unexploded Ordnance (UXO) UXO Qualified Personnel (UXOQPs) and UXO Technicians (UXOTs) and Support Workers (SW) will meet the minimum qualifications for personnel conducting MEC related activities as per Department of Defense Explosive Safety Board (DDESB) Technical Paper 18 (TP-18).

4.1 PROJECT MANAGER

The PM is responsible for ensuring availability of resources to safely and effectively implement this SOP.

4.2 SENIOR UXO SUPERVISOR

The SUXOS will ensure that this SOP is implemented in plans, procedures, and training. In addition, he/she is responsible for oversight and supervision of field personnel, and ensuring compliance with this SOP and the Work Plan or UFP-QAAP (as applicable).

4.3 UXO QUALITY CONTROL SPECIALIST

The Unexploded Ordnance Quality Control Specialist (UXOQCS) ensures compliance with the Project Quality Assurance Project Plan and uses analog hand held instruments and/or the instrument used for the detection of the anomaly (i.e., EM 61), to perform quality control surveillance of completed grids / transects and/or anomaly excavations in accordance with the Work Plan or UFP-QAAP (as applicable).

4.4 UXO SAFETY OFFICER

The Unexploded Ordnance Safety Officer (UXOSO) ensures that all activities including intrusive investigation of anomalies, and soil sampling are conducted in a safe manner, in accordance with the approved Work Plan, UFP-QAAP, the Site Specific Health and Safety Plan, this SOP, and all applicable regulatory guidance. The Unexploded Ordnance Safety Officer (UXOSO) ensures that all activities are conducted in a safe manner, in accordance with the approved Work Plan, the Site Specific Health and Safety Plan, this SOP, and applicable regulatory guidance. The UXOSO's duties shall include, but are not limited to: evaluating operational risk, hazards, and safety requirements; establishing and ensuring compliance with all site-specific safety requirements and explosives operations; enforcing personnel limits and safety exclusion zones (EZ); and all activities associated with MEC and explosives transportation, storage, and destruction.

4.5 INTRUSIVE ACTIVITIES

Intrusive activities will be accomplished in accordance with the Site Specific Health and Safety Plan and applicable explosive safety documents and/or Work Plan. Safety Zones and team separation distances shall be established and maintained at all times as per the approved explosive safety documents and/or Work Plan. Authorized visitors, including non-essential personnel, shall request access via radio prior to entering an exclusion zone. Work will be suspended while non-essential personnel are within the exclusion zone.

4.6 GRID NETWORK ESTABLISHMENT

Depending on the approved method selected, site layout and grid network will be established using a Global Positioning System (GPS). Grid establishment may be accomplished by professional land surveyors (if required) or competent GPS operators and will be accompanied by a UXO Technician II or above who will provide UXO escort and anomaly avoidance during the boundary and grid network establishment. Grid corner stakes will be labeled in accordance with location and procedure established in the Work Plan or UFP-QAAP (as applicable).

4.7 INTRUSIVE PROCEDURES

UXO team sizes vary and will be in accordance with the approved Work Plan or UFP-QAAP (if applicable). Intrusive operations require a minimum of one UXO Technician III (Team Leader) and one UXO Technician II.

4.7.1 PRE-SURVEY FIELD OPERATIONS

Hand Held detectors and other electronic equipment will be maintained and tested or function tested in accordance with the manufacturer's instructions. Each piece of field equipment scheduled for that day's use will always be tested daily in a pre-established Instrument Verification Strip (IVS).

Tests and/or function checks will be observed by the UXOQCS and recorded in the UXOQCS daily log. If equipment field checks indicate that a piece of equipment is not operating correctly and field repair cannot be made, the equipment will be tagged and removed from service. Some handheld detectors are not and do not require calibration; they have a simple “Go/No Go” field operational check. Failure to detect the test targets is reason to reject the instrument and return it to the manufacturer for repairs. Documentation of the status of the handheld instruments will be recorded on the Team Leader’s (Technician III’s) daily journal/logbook.

4.7.2 “MAG AND DIG” PROCEDURES

For “mag and dig” procedures, individual search lanes will be established within each specified grid. Each lane will be surveyed using a hand held detector. Mag and flag activities will begin at one end of each lane and move in a forward direction toward the opposing baseline. During the forward movement the technician moves the hand held detector back and forth from one side of the lane to the other. Both forward movement and the swing of the magnetometer are performed at a pace that ensures the entire lane is searched and that the instrument is able to appropriately respond to surface and subsurface anomalies. When a subsurface anomaly or surface object is encountered, the UXO Technician halts and investigates the anomaly or object at that time, or places a pin flag into the ground to mark its location for later investigation. Throughout this operation the team leader closely monitors the team’s individual performance to ensure these procedures are being performed correctly.

4.7.3 MANUAL ANOMALY EXCAVATIONS

Excavations for individual anomalies will be conducted using the hand held detectors to assist the team in determining the location and orientation of the detected item. UXO Technicians excavating anomalies shall initially remove no more than a 6-inch layer of soil alongside the location of the anomaly, being careful not to impact the item. The UXO Technician will conduct a visual and instrument search using a detector to further pinpoint the anomaly as needed. This process shall be repeated until the audible signal from the magnetometer indicates the object is close to the surface. Once this determination has been made, soil will be removed by hand until the source of the anomaly is located.

4.7.4 MANUAL ANOMALY EXCAVATIONS USING EARTH MOVING MACHINERY

Earth Moving Machinery (EMM) may be used to excavate large anomalies (e.g., pits) or deep anomalies if required. EMM will not be used to excavate within 12 inches of the suspected MEC or material potential presenting an explosive hazard (MPPEH). The excavation will proceed slowly to ensure the item is not broached by the EMM. All anomalies shall be uncovered sufficiently by hand to obtain a positive identification of the item. While excavating with EMM, a UXO Technician will be stationed in a position that is out of the reach of the excavation equipment but affords a view of the excavation site.

In the event that EMM is used to excavate an anomaly within 12 inches the equipment operator will be afforded a level of safety by incorporating engineering controls to protect the operator. This can be accomplished by "armoring" (shielding) the EMM as per DDESB TP-16.

5.0 RECORD KEEPING

The team leader (UXO Technician III) will maintain a field logbook, which at a minimum will contain a record of the following:

- Weather
- Instrument details and serial number
- Team personnel
- Grids worked
- Start and stop times
- MEC items encountered

The data to be recorded in the field log book or on a field tablet for each item discovered during anomaly excavation will include the following (as applicable):

- Type (e.g., munitions debris, MPPEH, UXO, and non MEC related debris (NMRD)
- Nomenclature (if possible) and description of the MEC item/s (e.g., "projo, 20-millimeter [mm], practice, MK105" and "base, coupling, firing device")
- Initial Condition (e.g., expended, inert, live, and to be determined)
- Approximate length
- Approximate width
- Depth
- Orientation
- Approximate weight
- Found in a pit?
- Piece of fragmentation?

- Initial disposition (e.g., left in place and removed to scrap pile)
- Requires demolition or storage

6.0 REFERENCES

EA Corporate Safety and Health Program (CSHP)

OSHA, 29 CFR 1910, Occupational Safety and Health Standards

OSHA, 29 CFR 1926, Construction Standards

Applicable sections of EPA, 40 CFR Parts 260 to 299, Protection of Environment

Applicable sections of DOT, 49 CFR Parts 100 to 199, Transportation

USACE EM 385-1-1, Safety and Health Requirements Manual

USACE ER 385-1-92, Safety and Occupational Health Document Requirements for Hazardous Waste Remedial Actions

USACE EM 385-1-97, Explosives Safety and Health Requirements Manual

DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives

DOD Manual 6055.09-M, DOD Ammunition and Explosives Safety Standards

DOD 4160.21-M, Defense Reutilization and Marketing Manual

DA PAM 385-64, Ammunition and Explosives Safety Standards

AR 385-64, Ammunition and Explosives Safety Standards

AR 200-1, Environmental Protection and Enhancement

AR 385-10, The Army Safety Program

AR 385-16, System Safety Engineering and Management

AR 385-40 w/USACE supplement, Accident Reporting and Records

TM 9-1300-200, Ammunition General

TM 9-1300-214, Military Explosives

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Standard Operating Procedure No. 011
for
Vegetation Removal

Prepared by

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Hunt Valley, Maryland 21031

Revision 0
February 2015

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CONTENTS

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1. PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide EA Engineering, Science and Technology, Inc., PBC (EA) employees and subcontractors with the minimum procedures and safety and health requirements applicable to perform vegetation removal operations on sites contaminated with munitions and explosives of concern (MEC).

2. SCOPE

This SOP applies to all EA site personnel, including contractor and subcontractor personnel, involved in the conduct of vegetation removal operations on a site potentially contaminated with MEC. This policy is not a stand-alone document; rather, it is to be used together with the applicable project-specific Work Plan; Site-Specific Health and Safety Plan Addendum; Quality Assurance Project Plan (QAPP); applicable federal, state, and local regulations; and contract restrictions and guidance. Consult the documents listed in Section 10.0 of this SOP for additional compliance issues.

3. MAINTENANCE

The Project Manager (PM), in collaboration with the Senior Unexploded Ordnance Supervisor (SUXOS) is responsible for the maintenance of this procedure. Approval authority rests with the Project Quality Control Manager (PQCM).

4. PERSONNEL REQUIREMENTS/RESPONSABILITIES

4.1 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.

4.2 RESPONSIBLE PERSONNEL

Only those personnel that meet the requirements set forth by the Client and EA will be utilized at the project site to facilitate safe and efficient vegetation removal operations.

5. TRAINING

All training on equipment will be either formal or on-the-job (OJT) training. This training will be documented by site personnel and subject to review for accuracy and completeness.

6. PERSONAL PROTECTIVE EQUIPMENT

Level D personal protective equipment (PPE) is required for all personnel engaged in vegetation removal operations. Clothing includes, but is not limited to:

- Coveralls or work clothing as prescribed
- Work gloves, leather or canvas as appropriate
- Safety Glasses
- Hard Hats (if necessary)
- Composite toed safety boots
- Hearing protection, noise attenuators, or ear plugs
- Dust mask, as required by wind conditions and/or the presence of airborne particulate matter
- Other personal protective equipment (PPE) as needed. (e.g., face shield, chainsaw chaps, etc.).

7. TEAM COMPOSITION

The Vegetation Removal Team will consist of three qualified personnel, as a minimum. These personnel may include any or all of the following:

- Unexploded ordnance (UXO) Technician III
- UXO Technician II or I
- Laborers.

7.1 UXO TECHNICIAN III

The UXO Technician III is UXO qualified and directs the operation and other team personnel within the context of removal requirements. In addition, the UXO Technician III must be familiar with the equipment being utilized.

7.2 OPERATOR

The operator(s) will be qualified and trained on the equipment being utilized (e.g., chainsaw, weed eater, hand tools etc.) and operate the equipment in a safe and efficient manner. The operator performs daily inspections and maintenance functions as recommended in the operator's manual. The operator will perform other duties as needed or directed.

8. SAFETY

Safety is paramount and all personnel will observe those safety precautions/warnings that apply or may apply to vegetation removal operations. The precautions listed below are general in nature and personnel will need to review applicable publications for more specific safety precautions/warnings. Distances listed are the minimum required.

- Teams will be separated by 75 feet (Team Separation Distance):
  - Former York Naval Ordnance Plant – 75 feet.
- Maintain safe separation distance from UXO personnel engaged in intrusive work.
- Distances may be increased by the U.S. Army Corps of Engineers (USACE) Ordnance Explosive (OE) Safety Specialist as determined by site history, UXO items encountered, terrain features, and other factors that may apply.
- Use equipment safety features.
- Safety precautions/warnings found in the operator's manual/manufacture's publications will be observed.
- Maintain 6 inches of ground clearance during removal operations.
- Communications will be maintained between the SUXOS and operator(s) at all times.
- Maintain site control.
- Observe UXO safety precautions for items encountered or suspected.
- Ensure PPE is appropriate, serviceable, and worn/used in a proper manner.

9. OPERATIONAL PROCEDURES

Personnel will not enter within 10 ft of an operating piece of equipment. If at any time personnel enter closer than 10 ft, the operator will immediately stop, return the engine to idle speed, and cease operations. Prior to operations commencing, a communications check with all team personnel will be conducted. Hand signals will be devised and used as a means of communication. All team personnel must know these hand signals prior to operations commencing. The hand signals will be documented on the tailgate safety-briefing sheet each morning of operations and at each change of team personnel.

The UXO Technician III will be responsible for the direction and manner in which the vegetation is to be removed. Only low lying brush and trees less than 4 inch diameter will be removed. Prior to removal operations commencing, a visual search/survey is conducted to determine the hazards that may be encountered, which may include munitions and explosives of concern (MEC), terrain slope, vegetation, wildlife, environmental concerns, and PPE requirements. The UXO Technician III will perform a visual search for MEC, ordnance scrap, surface debris, and any other obstruction/object that may pose a hazard to team personnel. Hazardous items, impassable terrain, or vegetation that may affect operations will be marked and team personnel notified.

Team personnel are to ensure that a 6-inch ground clearance is maintained during removal operations. Those areas marked as hazards are to be avoided. The manner in which operations are accomplished will follow safe work practices and procedures. Areas of concern will be addressed to the SUXOS and/or UXO Quality Control Specialist (UXOQCS)/UXO Safety Officer (UXOSO) as needed. All MEC items encountered are marked and avoided. Notification of these items will be made to the appropriate personnel.

10. SUMMARY

EA personnel will conduct vegetation removal operations in a safe, efficient, and productive manner and will use this SOP and references, which include changes and revisions.

11. REFERENCES

- EA Corporate Safety and Health Program (CSHP)
- SSHP
- Occupational Safety and Health Administration (OSHA) Regulations
- USACE, Engineer Manual 385-1-1
- USACE Engineer Manual 385-1-97
- Operator's Manual(s) and Manufacturer's Publications.

Standard Operating Procedure No. 012
for
Munitions Debris Inspection

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
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Revision 01
Date: December 2015

STANDARD OPERATING PROCEDURE – SOP 12
MUNITIONS DEBRIS INSPECTION

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide the munitions potentially possessing explosive hazards procedures at EA Engineering, Science, and Technology, Inc., PBC (EA). This SOP is not meant to be all inclusive, nor is it applicable in all situations. This policy is not a standalone document; rather, it is to be used in conjunction with the applicable project-specific Quality Assurance Project Plan (QAPP); Site Safety and Health Plan (SSHP); applicable federal, state, and local regulations; contract restrictions; and guidance.

2.0 SCOPE

This SOP applies to all site personnel, including subcontractor personnel, involved in the conduct of operations on munitions response sites requiring munitions debris (MD) / non-munitions related debris (NMRD) (e.g., scrap) inspection and certification activities. This SOP is not intended to contain all of the requirements needed to ensure compliance. Consult the documents listed in the reference sections of the work plan or QAPP, as applicable, and SSHP.

3.0 MAINTENANCE

The Project Manager (PM), in collaboration with the Site Supervisor and or Senior Unexploded Ordnance Supervisor (SUXOS) is responsible for the maintenance of this procedure. Approval authority rests with the Program Quality Control Manager (PQCM).

4.0 MPPEH INSPECTION AND CERTIFICATION

EA MEC Projects will comply with the following procedures for collection, inspection, and certification and final disposal of Material Potentially Presenting an Explosive Hazard (MPPEH), MD, Range Related Debris (RRD) and NMRD.

MPPEH must be controlled and managed (e.g., sorted, segregated, stored, secured) from the time of recovery through the release from EA control to prevent its unauthorized use, transfer or release, and to protect personnel and property from uncontrolled exposures to potential explosive hazards. This must be accomplished by ensuring the chain-of-custody remains intact during the entire process from discovery to final disposition. See Attachment 1—Figure 1: MPPEH Process that depicts the flow of the MPPEH process from recovery to release from EA control.

4.1 ROLES AND RESPONSIBILITIES

The following outlined section, addresses the roles and responsibilities for each position normally involved in military munitions response (MMR) projects in regard to the planning, recovery, inspection process, handling, and storage of MPPEH, MD, RRD and NMRD on MMR projects.

4.1.1 Project Manager:

a. Ensure that current and thorough MPPEH Management procedures are contained in the project plans.

b. Ensure that the MPPEH Management, inspection and certification procedures are being followed in accordance with the Site-Specific work plan and SOP.

c. Coordinate final disposition of all Materials Documented as Safe (MDAS) with the EA approved recyclable facility.

4.1.2 Senior UXO Supervisor:

a. Responsible for ensuring work and QC plans specify the procedures and responsibilities for processing MPPEH for final disposition as MD, RRD and NMRD.

d. Ensure a requisition and turn-in document, DD Form 1348-1A is completed for all MD and RRD to be transferred for final disposition to an approved EA recycle facility.

b. Perform a daily inspection (with the UXO Quality Control Specialist [UXOQCS]) of all MPPEH collected (100%) and released by the UXOTIII to ensure no items with explosive hazards, engine fluids, illuminating dials and other visible liquid hazards, toxic or radiological waste (HTRW) materials are identified as MD, RRD or NMRD.

c. Maintain <u>one of two</u> keys to the lockable container.

d. Certify all MD and RRD is free of explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials.

e. Be responsible for ensuring that the daily inspected debris is secured in a closed, lockable container.

f. Maintain the MDAS Container Log (Attachment 2, Form 005) for all lockable containers of certified MDAS.

4.1.3 UXO Safety Officer (UXOSO):

a. The UXOSO ensures all procedures for processing MPPEH are being performed safely and consistent with applicable regulations the Site Specific Work Plan and associated guidance/planning documents.

4.1.4 UXO Quality Control Specialist:

a. Conduct daily audits of the procedures used by UXO personnel to assess whether the processes and procedures as stated in the Site Specific Work Plan and this SOP for MPPEH are being followed.

b. Perform a daily inspection (with the SUXOS) of all MPPEH collected (100%) and released by the UXOTIII to ensure no items with explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials are identified as munitions debris or range-related debris or NMRD.

c. Ensure that the daily inspected MD and RRD is placed in a closed lockable container. All NMRD is to be placed in a second closed lockable container.

d. Maintain one of two keys for each lockable container.

4.1.5 UXO Technician III (UXOTIII):

a. Performs a 100% daily re-inspection of all recovered items prior to departing the work area to determine if items are free of explosives hazards or other dangerous fillers and engine fluids, illuminating dials and other visible liquid HTRW materials.

b. Ensures that segregation is appropriate for all items not requiring demilitarization or venting from those items that do require demilitarization or venting.

c. Segregates all MD, NMRD, and RRD prior to the SUXOS and UXOQCS inspection at the MPPEH collection point.

d. If at any time an item is questionable, cannot be 100% identified, or its condition undetermined, it will remain at the location discovered prior to being transported to the MPPEH collection point, pending evaluation and disposition by the SUXOS, UXOQCS, UXOSO, and OESS (if present).

4.1.6 UXO Technician II (UXOTII):

a. Weigh each item and perform a 100% inspection of each item as it is discovered and determine the following:

(1) Whether the item is an UXO, MD, RRD or NMRD.

(2) Whether the item contains explosives hazards or other dangerous fillers.

(3) If the item is suspected to be unacceptable to move and requires detonation.

(4) Whether the item requires demilitarization or venting to expose dangerous fillers.

(5) Whether the item requires draining of engine fluids, illuminating dials and other visible liquid HTRW materials.

b. Segregate all items not requiring demilitarization or venting from those items that do require demilitarization or venting.

c. The SUXOS and UXOSO will be notified immediately if items are found to contain other dangerous fillers. Items will not be moved pending assessment by the SUXOS and UXOSO.

4.1.7 UXO Technician I:

UXO Technician I (UXOTI) can tentatively identify a located item as MPPEH, followed by a required confirmation by a UXOTII or UXOTIII.

4.1.8 Unexploded Ordnance Sweep Personnel:

Unexploded Ordnance Sweep Personnel (UXOSP) will only mark suspected items and will not be allowed to perform any assessment of suspect items to determine its status.

4.2 MUNITIONS DEBRIS CERTIFICATION AND VERIFICATION

The SUXOS will certify (prior to off-site release) that all MD and RRD is free of explosive hazards and the Ordnance and Explosive Safety Specialist (OESS) will verify the MPPEH inspection process has been followed. If an OESS is not on-site, the UXOQCS, or a similarly trained individual can be delegated to verify the MPPEH process.

DD Form 1348-1A (Attachment 2, Form 001) will be used as certification/verification documentation. All DD 1348-A forms must clearly show the type or printed names of the SUXOS and the OESS (if present), organization, signature, and EA home office and field office phone number(s) of the personnel certifying and verifying the debris as free of explosive hazards.

4.2.1 Data Elements for DD Form 1348-1A

In addition to the data elements required and any locally agreed to directives, the DD 1348-1A form must clearly indicate the following for NMRD:

a. Basic material content (Type of metal; e.g., steel or mixed)

b. Estimated weight

c. Unique identification of each of the containers and seals stated as being turned over

d. Location where munitions debris or range-related debris was obtained

e. Seal identification, if different from the unique identification of the sealed container.

4.2.2 Certification/Verification Statement (HTRW)

The following certification/verification will be entered on each DD 1348-1A for turnover of MD or RRD and will be signed by the SUXOS and the U.S. Army Corps of Engineers (USACE)

OESS (if present). This statement will be used on any ranges where RRD is being processed along with MD;

"This certifies that the material listed has been 100 present properly inspected and, to the best of our knowledge and behalf is free of explosive hazards, engine fluids, illumination dials and other visible liquid HTRW materials"

4.2.3 Certification/Verification Statement (MD only)

The following certification/verification will be entered on each DD 1348-1A for turnover of MD and will be signed by the SUXOS on properties where only MD is being processed:

"This certifies and verifies that the material listed has been 100 percent inspected and to the best of our knowledge and belief, is inert and/or free of explosives or related materials"

4.3 MAINTAINING THE CHAIN OF CUSTODY AND FINAL DISPOSITION

All certified and verified MDAS is no longer considered MPPEH as long as the chain of custody remains intact. The EA PM and SUXOS will arrange for maintaining the chain of custody of all MDAS while being transported offsite for final disposition. See Attachment 2, Form 002 for a copy of the MDAS chain of custody that is to be completed throughout the process. The certified and verified material will only be released to an organization approved by EA beforehand that agree to the following procedure:

a. Upon receiving the unopened labeled containers each with its unique identified and unbroken seal ensuring a continued chain of custody, and after reviewing and concurring with all the provided supporting documentation, sign for having received and agreeing with the provided documentation that the sealed containers contained no explosive hazards when received. This will be signed on company letterhead and stating that the contents of these sealed containers will not be sold, traded or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content. See Attachment 2, Form 003 as an example.

b. Send notification and supporting documentation to the EA PM documenting that the material in the sealed containers has been smelted and are now only identifiable by their basic content. See Attachment 2, Form 004 as an example.

This document will be incorporated by EA into the Final Report and maintained within the corporate office for a period of no less than three years as documentation supporting the final disposition of MDAS and RRD. A legible copy of inspection, re-inspection, and documentation must accompany the material through final disposition and be maintained for a period of three (3) years thereafter and incorporated by EA into any final action reports or the like.

4.3.1 Unsecured MDAS Container or Broken Seal on Container

If the MDAS container is discovered to be unsecured or if a Custody Seal has been applied and is discovered to be broken, the contents must undergo a second 100 % re-inspection. The re-inspection will be conducted and be documented to verify its explosives safety status (identified as either munitions debris or range-related debris).

A legible copy of the re-inspection, and documentation must accompany the material through final disposition and be maintained for a period of three (3) years thereafter.

Attachment 1

MPPEH Process

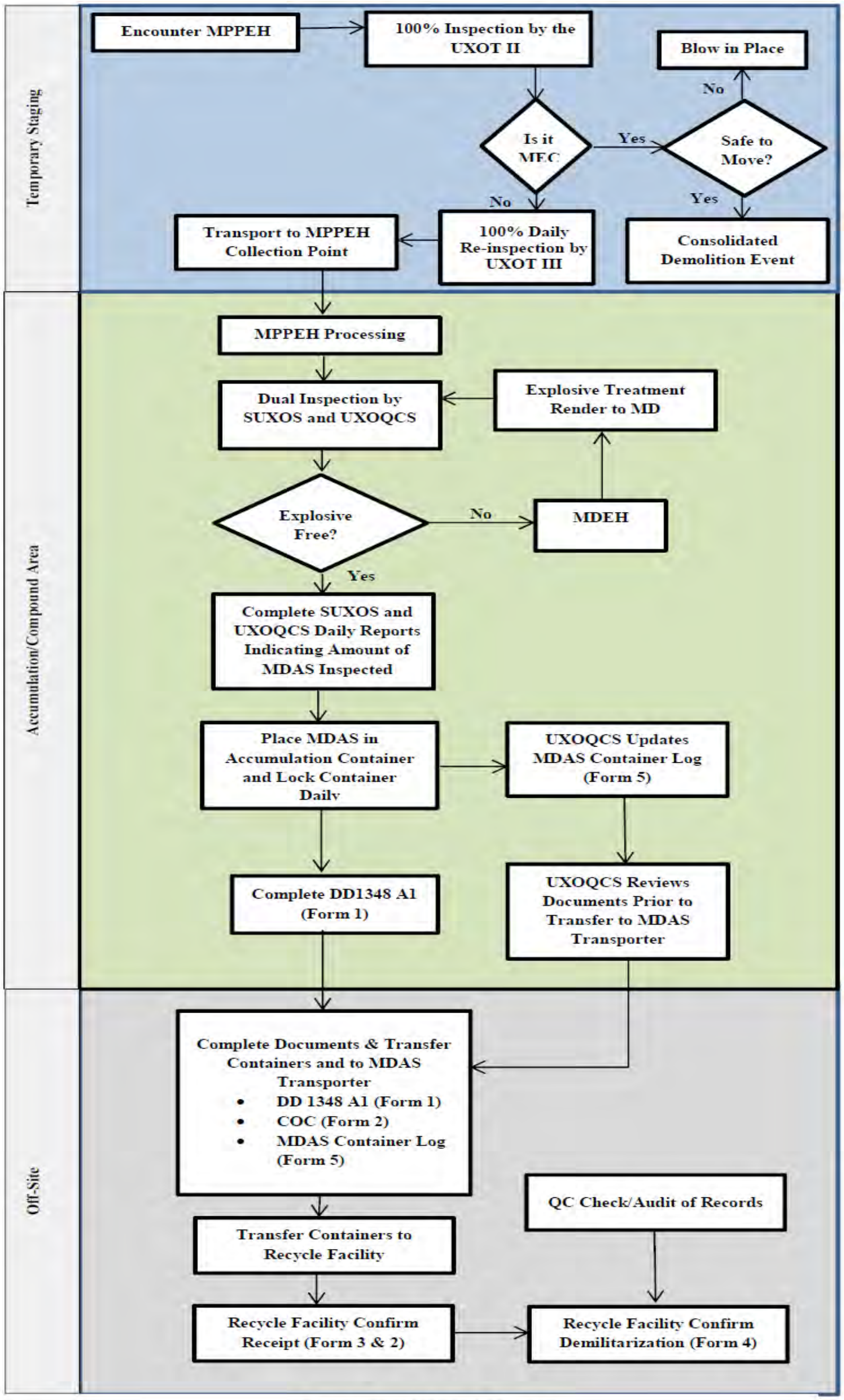


Figure 1: MPPEH Process

Attachment 2

Documentation Forms

Form 001 - DD 1348-1A

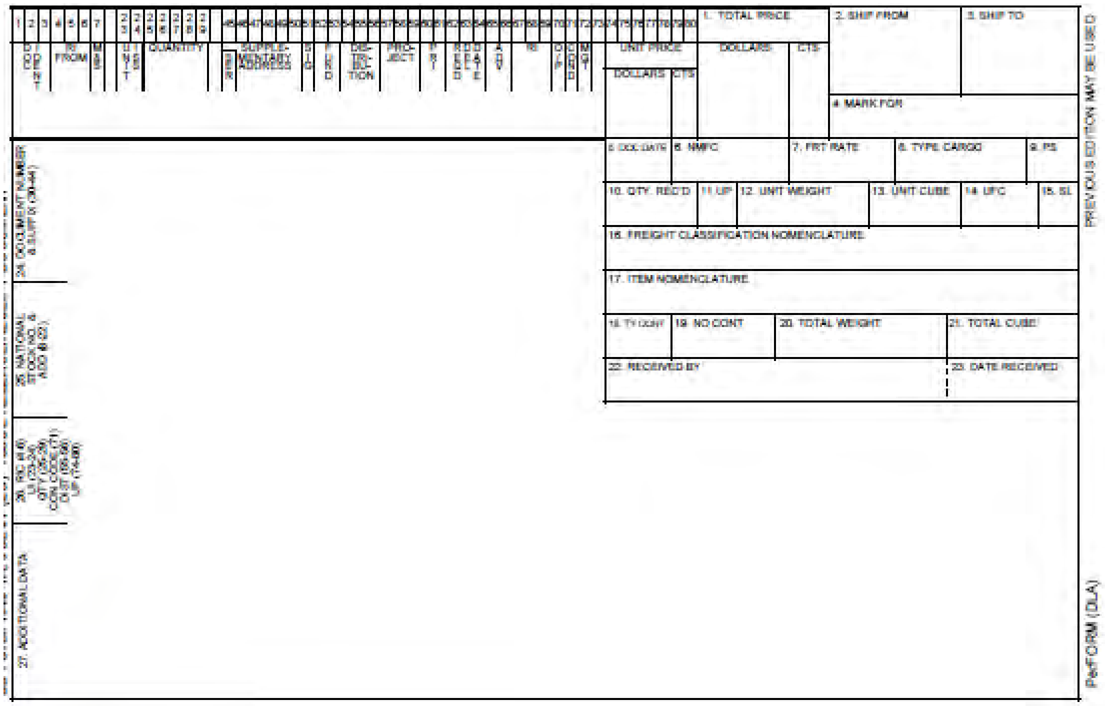
Form 002 - Material Documented as Safe (MDAS) Chain of Custody

Form 003 - Example Material Documented as Safe (MDAS) Receipt Form

Form 004 - Example Material Documented as Safe (MDAS) Disposal Confirmation Form

Form 005 - Material Documented as Safe (MDAS) Container Log

Form 001
DD 1348-1A



1. TOTAL PRICE
DOLLARS | CTS
UNIT PRICE
DOLLARS | CTS
2. SHIP FROM
3. SHIP TO
4. MARK FOR
5. DOC DATE
6. NMFC
7. FRT RATE
8. TYPE CARGO
9. PS
10. QTY. REC'D
11. UP
12. UNIT WEIGHT
13. UNIT CUBE
14. UFC
15. SL
16. FREIGHT CLASSIFICATION NOMENCLATURE
17. ITEM NOMENCLATURE
18. TY CONT
19. NO CONT
20. TOTAL WEIGHT
21. TOTAL CUBE
22. RECEIVED BY
23. DATE RECEIVED
24. DOCUMENT NUMBER & SUFFIX (30-44)
25. NATIONAL STOCK NO. & ADD (8-22)
26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)
27. ADDITIONAL DATA
DOC IDENT | RI FROM | M & S | UNIT | QUANTITY | SER | SUPPLEMENTARY ADDRESS | SIG | FUND | DISTRIBUTION | PROJECT | PRI | REQD DEL DATE | ADV | RI | O/P | COND | MGT
PREVIOUS EDITION MAY BE USED
PerFORM (DLA)

Form 002
Material Documented as Safe (MDAS) Chain of Custody

General	**Material Documented as Safe Certification Chain of Custody**			
	1. Generator's Name and Mailing Address			1.a Generator's Ph # ( )
	2. Project Location			2.a Project Ph # ( )
	3. MPPEH Contractor Name and Mailing Address			3.a MPPEH Contractor Ph# ( )
	4. Government Assigned Verification Name and Mailing Address (if used)			4.a Verifier Ph # ( )
	5. Transporter Name and Mailing Address			5.a Transporter Ph # ( )
	6. Recycler Name and Mailing Address			6.a Recycler Ph # ( )
	7. Container ID #	8. Security Seal #	9. Manifest #	10. Date
Explosives Safety Status / Certification and Verification	11. Description	12. Material	13. QTY	14. Unit (i.e., drum)
	15. MATERIAL DOCUMENTED AS SAFE CERTIFICATION: This certifies and verifies that the material listed has been 100 percent inspected and to the best of our knowledge and belief, is inert and/or free of explosives or related materials.			
	16. SUXOS Certification			
	Signature	Address	Date	
	Printed/Typed Name		Phone	
	17. OESS Verification			
	Signature	Address	Date	
	Printed/Typed Name	Phone		
Transporter	**18. Transporter Acknowledgement of Receipt of Materials** (Receiving Signature Verifies that Container was Received with Seal Intact)			
	Signature	Address	Date	
	Printed/Typed Name		Phone	
	19. EA Acknowledgement of Transfer of Materials (Signature verifies that Container was Transferred to Transporter with Seal Intact)			
	Signature	Address	Date	
	Printed/Typed Name		Phone	
	20. Discrepancy Indication Space			
	Signature	Address	Date	
	Printed/Typed Name		Phone	
	21. Recycler Acknowledgement of Receipt of Materials (Receiving Signature Verifies that Drums were Received with Seal Intact)			
	Signature	Address	Date	
	Printed/Typed Name		Phone	
Demil. and/or Recycle Facility	**22. DEMILITARIZATION/RECYCLING CONFIRMATION:** This certifies and verifies that each item or items contained have been demilitarized to the minimum requirements of DOD Instruction 4160.21-M-1, *Defense Demilitarization Manual*. (**To be signed by person performing the demilitarization – Recycler or UXO Technician**)			
	23. Recycler			
	Signature	Address	Date	
	Printed/Typed Name		Phone	
	24. Senior UXO Supervisor Verification			
	Signature	Address	Date	
	Printed/Typed Name		Phone	
	25. Final Disposition (If other than recycling)			

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Form 003
Example Material Documented as Safe (MDAS) Receipt Form

Company XXXX Recycles Letterhead

Date: *DDMMYY*

Dear *Mr/Ms:*

On *DDMMYY*, the contents of sealed container/*s #EA 000X, Seal Serial Number XXXX* were received from EA Engineering, Science and Technology, Inc., *SOMEWHERE* project site.

Company XXXX Recycles has received and inspected the sealed container/s and agree that the material received is MD and contains no explosive hazards.

The contents of the sealed container/s are to be processed in accordance with DoD 4160-21 M-1, and will not be sold, traded or otherwise given to another party until the contents have been smelted and only identifiable by their basic content.

Enclosed is the signed Chain of Custody that was received along with the containers.

Signed:

Name:

Point of Contact Information:

Form 004
Example Material Documented as Safe (MDAS) Disposal Confirmation Form

Company XXXX Recycles Letterhead

Date: *DDMMYY*

Dear *Mr/Ms:*

I certify that the contents of sealed container/*s #EA 000X, Seal Serial Number XXXX* received on *DDMMYY* from EA Engineering, Science, and Technology, Inc. from *SOMEWHERE* project site were demilitarized in accordance with guidelines in DoD 4160.21-lVI-l and have been smelted and are only identifiable by their basic content.

Signed:

Name:

Point of Contact Information:

Form 005
Material Documented as Safe (MDAS) Container Log

Date	MDAS Type (Steel, Iron…)	Quantity	Certifier	Verifier	Container ID	Seal Number	COC Number	Total Items

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Standard Operating Procedure No. 013
for
Collection of Monitoring Well Samples

Prepared by

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Revision 0
December 2014

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1. SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure is to delineate protocols for the collection of groundwater samples from monitoring wells.

2. MATERIALS

The following materials may be required:

0.45 μM filters	Polyvinyl chloride bailer (for purging only)
Bladder pump (dedicated to one well only)	Sample bottles and labels
Conductivity meter	Stainless steel bailer (for purging and sampling)
Dissolved oxygen meter	Submersible pump and hose (for purging only)
Generator	Thermometer (optional)[1]
Logbook or book of field parameter forms	Transparent bailer with a double check valve
Peristaltic pump with tubing for filtering samples	Turbidity meter
pH meter with oxidation-reduction potential probe	Tygon tubing
Photoionization detector organic vapor analyzer.	Variable speed, low flow submersible pump (e.g., Grundfos MP1 groundwater sampling pump) (for purging and sampling)
Plastic sheeting	Water level indicator
Polypropylene rope	
Polytetrafluoroethelyne (PTFE) bailer with PTFE-coated stainless steel cable, double check valve top, and controlled flow bottom discharge attachment[2] for volatile organic compound (VOC) sampling (40-mL vials), and top discharge attachment for collecting larger samples (1-L bottles) (for purging and sampling)	

3. PROCEDURE

3.1 GENERAL

Groundwater sampling will follow these general steps:

- Arrive onsite
- Set up apparatus (generators, pumps, etc.)
- Glove
- Organic vapor check, water level, and well depth measurements

1. Temperature compensation and measurement capabilities are generally available as integral functions of pH meters and conductivity meters. If this is the case, a separate thermometer is not required.
2. Although use of a controlled flow bottom discharge valve is historically preferred, use of such a device can cause aeration of the sample.

- Sample non-aqueous phase liquids (NAPLs) (as required)

- Begin purge procedure

  — If using bailer to purge and sample, see Section 3.6
  — If using pump to purge and bailer to sample, see Section 3.7
  — If using bladder or low-flow pump to purge and sample, see Section 3.8

- Decontaminate/reglove

- Take samples

  — If with bailer, see Section 3.6
  — If with bladder or low flow pumps, see Section 3.8

- Decontaminate/dispose of wastes, move equipment to next site.

3.2 GENERAL RULES FOR GROUNDWATER FIELD PARAMETER LOGBOOK

Use only one site or installation per logbook, and only one sampling location per page or form (if using pre-printed forms). The same book may be used for more than one sampling event. First five pages will be reserved for index, general notes, etc. Sign and date each entry. Last five pages will be reserved for recording calibration data for the pH, temperature, turbidity, oxidation-reduction potential, dissolved oxygen, and conductivity meters. Use the page number or a separately recorded "Cal Reference Number" to refer to each calibration. As appropriate, insert the cardboard flap under the form being filled out, so that writing does not go through to the pages below. As appropriate, fill in the forms from front to back of the logbook, tearing out the white copy for each sample when the sample has been collected. This copy goes in the cooler with the sample, directly to the laboratory. The original copy must be torn out before you write on the back of the duplicate form. As appropriate, duplicate copies, index pages, and calibration sheets remain intact.

3.3 GROUNDWATER SAMPLING GENERAL RULES

Groundwater samples will be collected from the least contaminated wells first, progressing to the most contaminated[3]. Upon arrival at the well site, immediately set up and organize the purging, sampling, and filtration equipment. If needed, due to muddy or contaminated ground, remoteness from sampling vehicle, and\or for placement of hose(s) and\or power cord if a pump is used, place clean plastic sheeting at, or around the well, to serve as a clean staging area for purging and sampling equipment, as conditions warrant. Care must be exercised not to step on plastic sheeting. If the well is remote from the sampling vehicle, set up the filtration equipment

3. First round samples are to be collected from upgradient wells first, moving to downgradient wells under the assumption that upgradient wells will be less contaminated than downgradient wells. Results of first round analysis may mandate a change in sampling sequence.

and place rope, wrapped bailer, and pre-labeled sample containers on the plastic sheet, from the well. When a pump is to be used, situate the portable generator on level ground approximately 15 ft away from and downwind from the well. All generator maintenance (oil and fueling) is to be performed offsite. If the hose(s) and/or power cord of the pump are not on a reel, place the pump with its hose and power cord on the plastic sheeting downhill from the well.

Check well headspace for organic vapor which may pose a health and safety hazard and indicate the presence of NAPL. Measure depth(s) to and thickness(es) of NAPL(s) as appropriate. Measure the depth to water and depth of well. From the water depth, well diameter, sand pack length, etc., calculate the equivalent volume (1 EV) of water in the well.

1 EV = volume in casing + volume in saturated sand pack. Therefore, if the water table lies below the top of the sandpack, use the following equation:

$$1\ EV = (\pi R_w^2 h_w) + (0.30\pi(R_s^2 - R_w^2)h_w) * (0.0043)$$

If the water table lies above the top of the sandpack use this equation:

$$1\ EV = [(\pi R_w^2 h_w) + (0.30\pi(R_s^2 - R_w^2)h_s)] * (0.0043)$$

where

R_s = Radius of sandpack in inches
R_w = Radius of well casing in inches
h_s = Height of sandpack in inches
h_w = Water depth in inches

0.0043 gal/in.^{3}
Assumed filter pack porosity = 30 percent.

Samples will always be collected in order of decreasing volatility (i.e., the samples to be analyzed for the volatile constituents should be collected first). Deliver the VOC sample to the vial by allowing the water to trickle down the inside wall of the vial at a rate no greater than approximately 100 ml/min. Other samples may be delivered at a faster rate. Sampling rates will at no time exceed 1 L/min. Procedures for each class of samples are contained in the site-specific Quality Assurance Project Plan.

When collecting samples for volatile analysis, care should be taken to prevent analyte loss by volatilization. The following procedures should be adhered to when collecting these samples:

- Avoid excessive aeration and agitation of sample.
- Fill vial so that a reverse meniscus is present by adjusting the flow rate from the sampling device.

- Place septum on vial so that the PTFE side is in contact with the sample. After the cap is on the bottle, check for air bubbles in the sample. If air bubbles are present, properly dispose of that sample and recollect the sample in the same vial.

- Make sure vial is labeled and immediately transfer the vial to the cooler with ice.

Filtered and unfiltered samples will be taken for inorganics (metals) analyses. The samples will be filtered through an in-line 0.45-µM filter (preferred method), or by gravity through a 0.45-µM membrane placed in a filter funnel. Use forceps to place the membrane into the funnel and pour sample through funnel until appropriate volumes have been filtered.

If necessary, due to slow filtering, a peristaltic pump may be used to filter the sample through an in-line filter. Connect the pump to the generator, attach tygon tubing to the bottom discharge valve on the bailer. Start pump and collect sample from the end of the in-line filter directly into the proper container, preserved, and placed in the cooler. Filtered samples will be preserved in the field with acid to a pH of less than 2. Make sure sample bottle is labeled and the cap is on tightly. Then place in cooler with ice immediately.

— OR —

If a low flow pump is used collect the samples, filtered samples will be taken by installing a 0.45-µM filter in-line and pumping the water through the filter. Collect sample from the end of the in-line filter directly into the proper container, preserved, and placed in the cooler. Filtered samples will be preserved in the field with acid to a pH of less than 2. Make sure sample bottle is labeled and the cap is on tightly. Then place in cooler with ice immediately.

Unfiltered samples will be collected by slowly pouring the sample water into the appropriate sample container, being careful not to agitate or cause bubbles to form. Do not overfill bottles. Make sure sample bottle is labeled and the cap is on tightly, then place the sample in cooler with ice immediately.

All samples will be delivered to the laboratory as soon as possible. If possible, samples will be shipped on the same day as they are collected. If samples must be retained due to weekend sampling (Friday through Sunday), the laboratory will be notified as to the time sensitive nature of the samples.

3.4 SAMPLING OF NON-AQUEOUS PHASE LIQUIDS

If NAPLs are detected in the well, a sample from all layers must be collected prior to any purging activities. NAPLs may be indicated by the presence of volatiles in the well headspace, and confirmed by the oil/water interface probe.

Collecting light non-aqueous phase liquid (LNAPL) will be accomplished using a transparent bailer with a double check valve. This bailer will be slowly lowered until the bottom of the bailer is 1-2 in. below the LNAPL-water interface, then slowly withdrawn. Verify that the interface was sampled by visual inspection of the bailer contents through the side of the bailer. Measure the thickness of the LNAPL in the bailer and note in the Field Logbook. Sample for laboratory analysis. An additional field verification may be performed by decanting the remainder of the contents of the bailer into a glass jar, adding a hydrophobic dye such as Sudan IV, or Redoil, shaking the sample and looking for coloration of NAPL. Alternate field tests are: examine the sample under ultraviolet light (many fluoresce), or allow the sample to stand overnight, and examine for interface and/or volatiles in the headspace the following day. Refer to following sections on purging and sample collection for setup and general operation.

Collecting dense non-aqueous phase liquids (DNAPLs) will be accomplished using a transparent bailer with a double check valve. The bailer must be lowered very slowly to the bottom of the well and raised slowly out of the well in a controlled fashion. Sample for analysis as above. The same field check described above may be employed for DNAPL. Refer to following sections on purging and sample collection for set up and general operation.

If NAPLs are present in the well, **and** a low-flow pump is to be used for purging and sampling, the well will be allowed to re-equilibrate prior to purging and sampling. This will be accomplished by allowing the well to stand undisturbed for at least 8 hours prior to purging and sample collection.

3.5 WELL PURGING GENERAL RULES

Water within the casing of a well will stagnate, degas, lose volatiles, possibly precipitate metals due to changes in redox potential, and may react with the screen and/or casing material. It is, therefore, necessary to purge a sufficient volume of this stagnant water from the well and/or casing to ensure that a representative sample of formation water can be obtained. Traditionally, the volume of water to be purged was arbitrarily set at 3-5 equivalent volumes. Recent advances in sampling technologies have caused a re-thinking of such arbitrary purge volumes. It is for this reason that monitoring of select chemical and physical properties of the sample medium will be used instead of strict volumes to determine when a representative sample may be taken from a well.

Acceptable purge/sampling devices include: bailers, high-discharge submersible pumps (purge only), and variable speed, low-flow pumps which include both submersible pumps (purge and sample) and dedicated bladder pumps (purge and sampling). It is recommended to purge and sample at similar rates with one type device per well. An acceptable exception to this general rule is to use a high-discharge submersible pump to purge a deep, fast-recharging well, and a bailer to sample the same well.

Peristaltic, gas-lift, and centrifugal pumps can cause volatilization, produce high pressure differentials, and can result in variability in the analysis of some analytes of interest.
These types of pumps will not be used to purge or sample wells.

To prevent groundwater from cascading down the sides of the screen into an open hole, thereby aerating the sample, purge rates will closely match recharge rates. If the static water level is within the casing, the initial purge rates may be set high enough to lower the water level to the top of the screen, then reduced to maintain that level.

Purging will be accomplished with either a submersible pump, a low-flow (submersible or bladder) pump, or bailer. The choice of bailer or pump will be based on depth to water table, volume to be purged, and permeability of the aquifer. If the well recharges rapidly and/or has greater than 20 gal (estimated EV) to be purged, water may be removed with a submersible pump or a low-flow pump. If the well recharges slowly and/or has less than 20 gal to be purged, water will be removed with a bailer or a low-flow pump.

Purging will be accomplished with as minimal disturbance to the surrounding formation as possible.

Purge water will be containerized onsite until analysis of samples is completed. Based on sample results, accumulated purge water will be properly disposed.

If the water level is within the screened interval and the well recharge rate is less than 0.1 L/min, purge the well using a low-flow pump as follows:

1. Draw the water down to within 1 ft of the top of the pump.

2. Allow the well to recover.

3. Check and record field parameters.

4. Repeat Steps 1 through 3 then collect samples for metals analysis only[4].

5. Note the event in the Field Logbook, and report the problem to the Project Manager. If this extremely low recharge problem consistently occurs in a given well, the well may be considered for re-development and/or replacement.

6. If adjacent wells have elevated VOC levels, additional soil gas surveys will be considered in the vicinity of the low recharge well to help determine the need for replacement.

3.6 PURGING AND SAMPLING WITH BAILERS

Bailers may be used for both purging and sampling wells if: (a) the well recharge rate is less than 4 L/min, (b) depth to the water table is less than 50 ft, and (c) less than 20 gal are to be purged (5 EV < 20 gal)[5].

---

4. Analyte losses due to volatilization in a drained well are too high for valid VOC sampling (McAlary and Barker 1987).

When purging with a bailer, either a polyvinyl chloride, PTFE, or stainless steel bailer may be used. The bailer will be attached to either a spool of PTFE-coated stainless steel cable or polypropylene rope. If using cable, attach it to the bailer using stainless steel cable clamps. Thoroughly decontaminate the cable after each use, prior to rewinding cable onto spool. Cable clamps and raw cable ends may serve to trap contamination. Exercise particular caution in decontaminating these areas. If using rope, attach the rope to the bailer using a bowline knot, dispense the needed length (a few feet more than the well depth) and cut the remainder away; then, at the end opposite the bailer, make a slip knot and place it around the well casing or protective posts to prevent losing the bailer and rope down the well. The polypropylene rope will be not reused; it will be properly disposed of. Either type of bailer will be repeatedly lowered gently into the well until it fills with water, removed, and the water will be discharged into an appropriate container until purging is complete. Care must be taken not to unduly agitate the water, as this tends to aerate the sample, increase turbidity, makes stabilization of required parameters difficult to achieve, and generally prolongs purging.

After purging 2 EV, obtain a sample of groundwater and measure the following stabilization parameters: temperature, conductivity, pH, turbidity, redox potential (Eh), and dissolved oxygen level at each successive half-well volume. When three of these stabilization parameters are in agreement within approximately 10 percent in three consecutive half-well volume samples, sufficient water has been purged from the well. The results of these tests should be recorded in the sampling logbook. Should these parameters not reach agreement, no more than five well volumes will be purged.

Immediately upon completion of purging, collect samples for laboratory analysis using a PTFE bailer on a PTFE-coated stainless steel cable. The bailer will be equipped with double check valve top and controlled flow bottom discharge attachments for VOC sampling (40-mL vials), and top discharge attachment for collecting larger samples (1-L bottles).

Slowly, so as not to agitate the water, lower the bailer into the well, using a spool of PTFE-coated cable. Allow bailer to fill, withdraw smoothly. Refill bailer as needed.

If the controlled flow bottom discharge attachment is used for VOC sampling, attach it to the bottom of the bailer. Using the stopcock valve on the bailer to control the flow, fill sample vials as described above in Section 3.3.

Remove check valve top and pour unfiltered sample into inorganics sample bottles.

Collect filtered samples as described in Section 3.3. Decontaminate bailer and cable.

5. These numbers are based on the following assumptions: (1) In purging, it is preferable to remove water at approximately the recharge rate; (2) 4 L/min is estimated as the approximate maximum rate at which water can be removed with a bailer from depths of 20-50 ft; and (3) 20 gal is estimated to be at the limit of the sampler's endurance, at which point fatigue and sloppiness of technique begin.

3.7 PURGING WITH PUMP, SAMPLING WITH BAILER

If the recharge rate of the well is greater than 30 L/min, or the water level is deeper than 50 ft, or more than 20 gal of purge water will be generated (5 EV > 20 gal), then purging and sampling may be accomplished using a submersible pump/bailer combination.

When purging with a pump, gradually lower the intake until it is submerged within the screened interval. Lower an electronic water level probe to the top of the screen (as determined from completion records) to the monitor water level, start pump, and slowly lower the pump as the water level continues to fall. Care should be exercised to lower the water column to the top of the screened interval (water level probe will stop beeping) but not below the top of the screen if possible. This will ensure that the stagnant layer has been removed, but should minimize the detrimental effects of over pumping the well. Secure hose(s) and/or power cord to casing and place discharge hose into the proper container, downhill and as far away from the well as possible. Determine and record the discharge rate.

Discharge rate = volume of container/time to fill container

The discharge rate will be established at approximately equal to or just greater than the well's recharge rate (determined from well development). If well development records are incomplete, recharge rate can be determined by monitoring the rise/fall of the water level within the casing as one purges the well. If the water level is static at a given pumping rate, but fluctuates up or down as pumping rate is decreased or increased, the pumping rate at which the water level is static is the recharge rate.

After purging 2 EV, obtain a sample of groundwater and measure the following stabilization parameters: temperature, conductivity, pH, turbidity, redox potential (Eh), and dissolved oxygen level at each successive half-well volume. When three of these stabilization parameters are in agreement within approximately 10 percent in three consecutive half-well volume samples, sufficient water has been purged from the well. The results of these tests should be recorded in the sampling logbook. Should these parameters not reach agreement, no more than five well volumes will be purged.

Immediately upon completion of purging, collect samples for laboratory analysis using a PTFE bailer on a PTFE-coated stainless steel cable. The bailer will be equipped with double check valve top and controlled flow bottom discharge attachments for VOC sampling (40-mL vials), and top discharge attachment for collecting larger samples (1-L bottles). Filtration of metals samples will be accomplished using either an in-line filter attached to the bottom of the bailer, or a funnel and appropriate filter (Section 3.3).

Slowly, so as not to agitate the water, lower the bailer into the well, using a spool of PTFE-coated cable. Allow bailer to fill, withdraw smoothly, fill sample containers as described in Section 3.6. Decontaminate bailer and cable in and decontaminate pump.

3.8 PURGING AND SAMPLING WITH LOW-FLOW PUMP

To obtain representative samples, subsurface disturbances should be kept to a minimum, thereby preventing sample alteration due to sampling actions. The reasoning behind the use of low-flow pumps to purge and sample monitoring wells is that these pumps minimize physical disturbance (turbulence) at the sampling point and chemical changes (aeration) in the medium. For these reasons, the low-flow pump is the preferred method for both purging and sampling in most cases. For the purposes of this SOP, "low-flow pumps" are defined as either dedicated bladder pumps or variable speed submersible pumps. Practical operational flow rates for these sampling devices range from 0.1 L/min to 30 L/min.

Low-flow pumps may be used for purging and sampling any well having recharge greater than 0.1 L/min, which is the practical lower limit of pump performance. Below that pumping rate, pump inefficiencies and/or overheating may alter the physical and chemical properties of the sample. If the pump is continuously operated at sampling rates higher than the well recharge rate, the water level will be lowered in the well, possibly allowing aeration of the sample which is unacceptable sampling procedure. Low-flow pumps are suitable for sampling wells with recharge rates lower than 0.1 L/min if precautions are taken to avoid aeration of the sample.

Low flow submersible pumps will be used as follows:

- Lower the pump into the well, slowly so as not to agitate the water, until the pump is at the mid-point of the screened interval or the mid-point of the water column if the static water table lies below the top of the screen[6]

- Attach the pump's umbilical cord (which will consist of power cord and sampling tubing) to the protective casing, or lock the cord spool so that the pump cannot move vertically in the well during sampling.

- Lower the water level probe into the well behind the pump until it just touches water. This will allow the sampler to monitor the water level while purging and sampling, and prevent the inadvertent drying of the well.

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6. This assumes a 10-ft screened interval. If the screened interval is greater than 10 ft, multiple samples should be taken as follows:
   - If the screen is 10-12 ft, sample the canter of the water column, as outlined above.
   - If the screen is longer than 12 ft, and the water column is 10 ft or less, sample the center of the water column.
   - If the screen is longer than 12 ft, and the water column fills the screen, or extends above the screen, sample at 1/3 and 2/3 the height of the water column, or about every 6 ft.

- Begin purging at the pump's lowest setting, then gradually increase rate[7] until the pumping rate matches the aquifer recharge rate. **If the water level is above the top of the screen**, the pumping rate may be allowed to slightly exceed recharge rate, lowering the water level to no less than 1 ft above the screen, then reduced until it matches recharge rate and purging continued. **If the water level is below the top of the screen**, always keep the purge rate lower than well's recharge rate.

- Monitor stabilization parameters listed in Section 3.6 beginning immediately, using an in-line monitoring system. Record parameters regularly, at a rate of one set of parameters per each 1-3 liters of water removed from the well. When these parameters stabilize to within 10 percent over three consecutive readings, reduce[8] flow rate to 0.1 L/min (if needed) and begin collecting VOC samples directly from the discharge line.

- If the well recharges at a rate less than 0.1 L/min, purge until the water level is even with the top of the screen, allow the well to recover, and sample immediately.

- Remove and decontaminate water level probe and pump.

4. MAINTENANCE

Refer to manufacturer's requirements for maintenance of pumps and generators.

5. PRECAUTIONS

Refer to the site-specific Health and Safety Plan for appropriate personal protective equipment.

6. REFERENCES

Garske, E.E. and M.R. Schock. 1986. An Inexpensive Flow-Through Cell and Measurement System for Monitoring Selected Chemical Parameters in Groundwater.

Gass, T.E., J.F. Barker, R. Dickhout, and J.S. Fyfe. 1991. Test Results of the Grundfos Groundwater Sampling Pump, in Proceedings of the Fifth National Symposium on Aquifer Restoration and Groundwater Monitoring.

7. Some sources indicate that the pumping rate should not exceed 1 L/min, with 0.5 L/min being preferable. The optimal purge rate is highly aquifer dependent, and may range from less than 0.5 L/min to greater than 10 L/min. The purge rate for a given well will, therefore, be a field decision, based on well development, purge, and sampling records rather than SOP mandate.
8. Sampling should occur at the same rate as purging as long as aeration of sample does not occur.

McAlary, T. A. and J.F. Barker. 1987. Volatilization Losses of Organics During Groundwater Sampling From Low Permeability Materials, in Groundwater Monitoring Review. Fall.

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Standard Operating Procedure No. 14
for
Data Management and Quality Control of Data

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Revision 01
Date: December 2015

STANDARD OPERATING PROCEDURE SOP 14
DATA MANAGEMENT AND QUALITY CONTROL OF FIELD DOCUMENTATION

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide EA Engineering, Science, and Technology, Inc., PBC (EA) employees and subcontractors with guidance for data management and quality control (QC) of field data collected during Remedial Investigations or Removal Actions. In the event that information is recorded using EA MR Digital data recording system (i.e., Tablets), all of the recorded information mandated in this SOP will be captured using the EA MR Digital data recording system. Consequently this SOP may be suspended from use.

2.0 SCOPE

This SOP provides procedures for the management and QC of intrusive investigation data (including munitions and explosives of concern [MEC], munitions debris [MD], non-munitions related debris [NMRD], range related debris (RRD), and items of potential archaeological interest). The SOP includes requirements for data entry into the project database, and internal QC functions to be performed, from the collection of the data to final submission of field documentation.

3.0 DOCUMENTATION

The following forms will be used to record and manage the intrusive data:

- **Dig Sheet** – This form is used in the field to record the findings made of the intrusive activities (i.e., depth of anomaly, type of item recovered, the person making contact, etc.). Dig Sheet. The Team Leader/Unexploded Ordnance Technician III (UXOTIII) manually completes a Dig Sheet for each grid using the information gathered by their field team.
- **Grid Tracker–** This form provides a dynamic updated completion record of the effort completed at each grid. It provides a summary of the dates digs, QC and QA are completed.
- **Team Leader Daily Log** – This form provides a daily summary of the intrusive activities completed by each field team on a given day on a per grid basis (i.e., number of anomalies marked in a grid, number of anomalies dug in a grid, pounds of MD identified, etc.). The Team Leader/UXOTIII completes this form by summing the data gathered in all of the Dig Sheets completed that day.
- **OE Log** –This form is used to provide a summary of the MEC, MD, and NMRD that has been recorded onsite for a given day and to date. The OE Log summarizes pertinent data from the Team Leader Daily Log (i.e., percent complete, pounds of MD identified, etc.).
- **SUXOS Daily Report** – This form is used to summarize the daily activities that occurred at the project site, including the personnel onsite, equipment used, work performed, QC inspections and tests, and safety inspections. The SUXOS Daily Report acts as a daily record for the SUXOS to document site activities.

A summary of the critical data elements for each of the above forms are shown on Table 3-1.

Table 3-1

Forms	Anomaly Details (location, etc.)	Anomaly Type and Description (MEC, MD, NMRD, Potential Archaeology Item of Interest, etc.)	Anomaly Description	Date Investigated	Dates QC'd (Post Dig and Geo)	Type of MEC	Pounds of MD	Pounds of NMRD	Personnel Hours	Other Daily Activities
Dig Sheet	✓	✓	✓	✓	✓	✓	✓	✓	-	-
Team Leader Daily Log	-	-	-	✓	-	✓	✓	✓	-	-
OE Log	-	-	-	✓	-	✓	✓	✓	-	-
Grid Tracker Log	✓			✓	✓					
SUXOS Daily Report	-	-	-	-	-	-	-	-	✓	✓

4.0 MAINTENANCE

It is the responsibility of all personnel to perform data management and/or QC of field documentation. The Project Manager (PM), in collaboration with the Site Supervisor or the Senior Unexploded Ordnance Supervisor (SUXOS) is responsible for the implementation and monitoring of these procedures. Approval authority rests with the Program Quality Control Manager (PQCM).

5.0 ROLES AND RESPONSIBILITIES

5.1 UXOTII

- During intrusive operations, the Unexploded Ordnance (UXO) Technician (UXOT) II will investigate anomalies with the assistance of a UXOTI or other qualified UXOT as part of a UXO dig team.
- The UXOTII is responsible for reporting to the UXOTIII the results of the investigation of the anomaly. As part of the dig team, the UXOTII provides the Team Leader/UXOTIII with the dig results (i.e., depth of anomaly, type of item recovered, archeological item of interest or not) for input in the data management process.

5.2 TEAM LEADER/UXOTIII

- The Team Leader/UXOTIII shall be responsible for gathering intrusive anomaly information (i.e., dig results) from the UXOTII.

- The Team Leader/UXOTIII will conduct a 100% re-inspection of all recovered items that the UXO dig team investigated and document the intrusive activities on the Dig Sheets (Attachment A) to ensure proper classification (i.e. MEC, MD, NMRD, , etc.).
- The Team Leader/UXOTIII summarizes all of the Dig Sheets in which work was completed that day on the Team Leader Daily Log (Attachment B).
- Prior to providing the Dig Sheets and the Team Leader Daily Log to the UXO QC Specialist (UXOQCS) at the end of each work day, the Team Leader/UXOT III will check their own work for consistency and completeness.

5.3 UXO QC SPECIALIST

- On a daily basis, the UXOQCS will inspect the manual copy of the Dig Sheets and the Team Leader Daily Log for consistency and completeness and sign the signature block of the form as being verified and check for completeness.
- On a daily basis, the UXOQCS will provide the QC'd forms (Dig Sheets and the Team Leader Daily Log) to the Data Specialist for entry into the electronic (MSExcel) OE Log and generation of the SUXOS Daily Report. The Data Specialist will also enter the field Dig Sheets into electronic format (MSExcel) on a daily basis.
- On a daily basis, after all data has been entered electronically by the Data Specialist and reviewed by the SUXOS, the UXOQCS will perform the following checks to ensure proper logging and documentation is complete:

  - ➢ Inspect the manually completed copy and electronic Dig Sheets
  - ➢ Inspect the Team Leader Daily Log and Dig Sheet entry into the OE Log
  - ➢ Review the SUXOS Daily Report

5.4 DATA SPECIALIST

- On a daily basis, the Data Specialist enters the pertinent information from the manually completed copy of the Dig Sheets and Team Leader Daily Logs into the electronic OE Log, SUXOS Daily Report, Grid Tracker (Attachment D), and Dig Sheets.
- On a daily basis, after all data has been entered electronically, the Data Specialist provides the electronic Dig Sheets, Grid Tracker, OE Log, and SUXOS Daily Report to the SUXOS for inspection.
- On a weekly basis, after review by UXOQCS and SUXOS, the Data Specialist sends completed electronic Dig Sheets to the Anomaly Database Manager for entry into the anomaly database (MSAccess).

5.5 ANOMALY DATABASE MANAGER

- On a weekly basis, the Anomaly Database Manager will load the Grid Sheets received from the Data Specialist into the anomaly database (MSAccess).

5.6 SENIOR UXO SUPERVISOR (SUXOS)

- The SUXOS will oversee the proper implementation of this SOP during field activities.

- On a daily basis, the SUXOS Daily Report (generated by Data Specialist) and OE Log will be reviewed by the SUXOS. The SUXOS will include any additional relevant information to the SUXOS Daily Report.

5.7 EA PROJECT MANAGER (PM)

- The EA PM has the overall responsibility for the implementation and execution of this SOP.
- The EA PM is responsible for ensuring the availability of the resources and materials needed to implement this SOP, ensuring that this SOP is incorporated into any future plans and procedures, and providing necessary and adequate training to all field personnel mentioned in this SOP prior to commencement of field operations, as well as any follow-up training deemed necessary.

6.0 PROCEDURE

Field personnel shall be familiar with the field and electronic forms/databases and the information to be collected for each form, which is outlined below. This will help to ensure proper collection of data, including internal QC of the data.

6.1 DATA MANAGEMENT PROCURES

The data management and QC process for the data collection, recording, and processing is detailed in Figure 6-1. Note: the process detailed on Figure 6-1 is for manual recording of field data; if electronic recording of field data is used a similar process will be followed. The data will be tracked through the QC process in accordance with the procedure outlined in this section of the SOP using the database maintained by the Anomaly Database Manager. All data will be turned over to the Data Specialist at the end of each working day. It is critical that data not be lost or compromised through improper handling or inconsistent reporting. Data must be entered into electronic format and verified and reconciled (if needed) as soon as possible.

- All dig results collected by the dig team will be recorded on the manually completed copy Dig Sheets daily by the Team Leader/UXOTIII. All of the critical data elements presented in Table 3-1 shall be included on the manually completed copy Dig Sheets.
- The Team Leader/UXOTIII will summarize all Dig Sheets completed in that day on a Team Leader Daily Log (including all critical data elements presented in Table 3-1), and submit the Team Leader Daily Log and the Dig Sheets to the UXOQCS each day.
- The UXOQCS will review the logs, initial any changes, and return a copy of the revised logs to the Team Leader/UXOTIII. The UXOQCS will require the Team Leader/UXOTIII to address any changes, inconsistencies, and/or omissions.
- The UXOQCS will provide the Data Specialist with the corrected Dig Sheets and/or Team Leader Daily Log to enter the data into the electronic OE Log. The Data Specialist will perform the initial QC inspection by reviewing his or her own work (i.e. before moving to the next record, the person will confirm that the data are correct). All entered data will be printed and checked against the original data sheets.

- SUXOS will compare the manually completed forms to the OE Log, electronic transferred Dig Sheets, and SUXOS Daily Report and check for completeness.
- The UXOQCS will inspect the manually completed copy and electronic Dig Sheets, SUXOS Daily Report, and OE Log.

6.2 INVESTIGATION DATABASE

Observations and measurements will be entered onto the manually completed copy Dig Sheet and Team Leader Daily Log and then entered into the electronic OE Log (MSExcel). The manually completed copy Dig Sheets will be entered into electronic Dig Sheet database (MSExcel) and ultimately into the overall Project Anomaly Database (MSAccess).

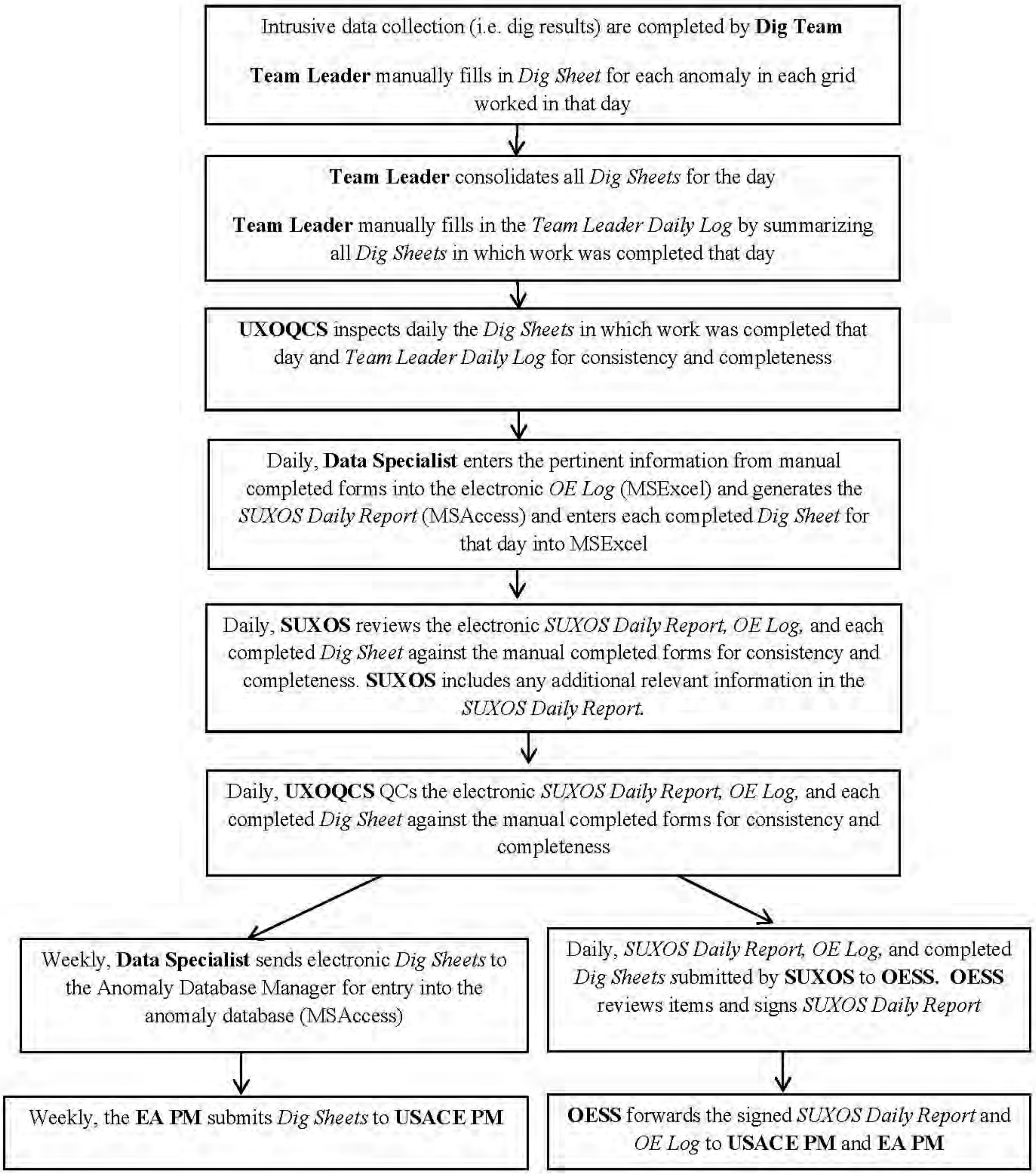
6.3 DATAFILE BACKUP

When field personal computers (PCs) are used for preparing forms or storing data, the electronic data will be uploaded weekly from the field PC to the project server.

7.0 ATTACHMENTS

- ATTACHMENT A – DIG SHEET (EXAMPLE)
- ATTACHMENT B – TEAM LEADER DAILY LOG (EXAMPLE)
- ATTACHMENT C – OE LOG (EXAMPLE)
- ATTACHMENT D – GRID TRACKER SHEET (EXAMPLE)

Figure 6-1 Data Management and QC



ATTACHMENT A – Dig Sheet (Example)

Grid:

Dig Sheet

Project Name:
Project Location:
Contractor:
Project Manager:

Coordinate System:
Survey Area ID:
Detection Equipment Used:

Name of Team Leader who dug the anomaly:
Name of UXOQCS that QC'ed 10% of digs:

Data entered by/Date:
QC data entry by/date:
CAR/948 Received:

	Dig Results										Post-Dig UXO QC Results (10%)						
Unique ID	Anomaly type - (MEC-UXO, MEC-DMM, MD, SAA, RRD, NC, NMRD, Seed, WT, ASP, A)	Anomaly Description	# of contacts in excavation	Approx. Length (in./ cm)	Depth to Center of Mass (in. /cm.)	Weight in pounds of all contacts	Digital Photo Filename (Grid #_1,2)	Post-Dig Signal Response	Post Dig Confirmation Check (Pass / Fail)	Date of Intrusive Investigation	Post-Dig Signal Response	UXO QCS Initials	Date QC'ed	Sample ID	Post BIP MC Sample ? (Y/N)	Comments on Sample (If Needed)	Samplers Initials
Total lbs NMRD:																	
Total lbs MD:																	
Total lbs MEC:																	

Note: 1. For ***Anomaly type*** , use MEC-UXO (Munitions & Explosives of Concern - Unexploded Ordnance), MEC-DMM (MEC-Discarded Military Munitions), MD (Munitions Debris), SAA (Small Arms Ammo), NC (No Contact), RRD (Range Related Debris), NMRD (Non-Munitions Related Debris), WT (Water Table - Excavation Not Complete), ASP (Asphalt- Excavation Not Complete), S (Seed), A (Potential Archaeological Item of Interest)

This is an example dig sheet that will be utilized going forward

ATTACHMENT B – Team Leader Daily Log (Example)

Team Leader's Daily Log

Date: Team Leader Team

Grid	Square feet Completed	Percent Completed	Anomalies Marked	Number of Digs	Number of MEC/ MPPEH	lbs. of MD	lbs. of OD	Mag Used	Work Performed
		Daily Totals							

UXO/MPPEH	Nomenclature	Grid	X	Y	Depth	GPS Coordinates	Disposition

Daily Summary

Team Leader's Signature

ATTACHMENT C – OE Log (Example)

ORDNANCE AND EXPLOSIVE LOG

Intrusive Operations on:
Data entered by:
Data checked by:

DATA SUMMARY:

Nomenclature	RA FINDINGS: MEC today (items)	RA FINDINGS: MD today (lbs)	RA FINDINGS: MEC to date (items)	RA FINDINGS: MD to date (lbs)	DEMILITARIZATION SUMMARY: MEC Vented/ Disposed/BIP today (items)	DEMILITARIZATION SUMMARY: MEC Vented/ Disposed/BIP to date (items)	DEMILITARIZATION SUMMARY: MD from Demil today (lbs)	DEMILITARIZATION SUMMARY: MD from Demil to date (lbs)
Total	**0**	**0.0**	**0**	**0.0**	**0**	**0**	**0**	**0**

GRID INFORMATION:

Grids Worked In Today	Digs today	MD today (lbs)	NMRD today (lbs)	Percent Complete	MEC Today and Nomenclature
Total	**0**	**0**	**0**	**0**	**0**

TALLY:

	Today	To date
MD total weight (lbs)	0	0
NMRD total weight (lbs)	0	0
Grids completed	0	0
Grids QC	0	0
Grids QA	0	0
Total Demo Operations	0	0
Digs Complete	0	0

NOTES:

For grids that are not complete for a given day, only the digs and MEC items for this day are tracked and the pounds of MD and NMRD are tracked on the day that the grid is intrusively complete.

ATTACHMENT D – Grid Tracking Log (Example)

GRID TRACKER SHEET

EA Engineering, Science, and Technology, Inc., PBC

Project Name:												
Data Interpretation				Intrusive Investigation								
Survey Area (Grid/Transect)	Date Interpreted	Interpreter	Interpretation Comments	Date Dig Package Sent to Dig Team	Re-aquire Date	Re-aquire Team	Date Intrusive Investigation Complete	Team	Date Data Quality Control (QC) Performed	QC Performed By	QC Reviewer Comments	Date Quality Assurance Performed	Date Dig Package Sent to Client

Grid:

Dig Sheet

Project Name:
Project Location:
Contractor:
Project Manager:

Coordinate System:
Survey Area ID:
Detection Equipment Used:

Name of Team Leader who dug the anomaly:
Name of UXOQCS that QC'ed 10% of digs:

Data entered by/Date:
QC data entry by/date:
CAR/948 Received:

	Dig Results										Post-Dig UXO QC Results (10%)						
Unique ID	Anomaly type - (MEC-UXO, MEC-DMM, MD, SAA, RRD, NC, NMRD, Seed, WT, ASP, A)	Anomaly Description	# of contacts in excavation	Approx. Length (in./ cm)	Depth to Center of Mass (in. /cm.)	Weight in pounds of all contacts	Digital Photo Filename (Grid #_1,2)	Post-Dig Signal Response	Post Dig Confirmation Check (Pass / Fail)	Date of Intrusive Investigation	Post-Dig Signal Response	UXO QCS Initials	Date QC'ed	Sample ID	Post BIP MC Sample ? (Y/N)	Comments on Sample (If Needed)	Samplers Initials
Total lbs NMRD:																	
Total lbs MD:																	
Total lbs MEC:																	

Note: 1. For ***Anomaly type*** , use MEC-UXO (Munitions & Explosives of Concern - Unexploded Ordnance), MEC-DMM (MEC-Discarded Military Munitions), MD (Munitions Debris), SAA (Small Arms Ammo), NC (No Contact), RRD (Range Related Debris), NMRD (Non-Munitions Related Debris), WT (Water Table - Excavation Not Complete), ASP (Asphalt- Excavation Not Complete), S (Seed), A (Potential Archaeological Item of Interest)

This is an example dig sheet that will be utilized going forward

Team Leader's Daily Log

Date: Team Leader Team

Grid	Square feet Completed	Percent Completed	Anomalies Marked	Number of Digs	Number of MEC/ MPPEH	lbs. of MD	lbs. of OD	Mag Used	Work Performed
Daily Totals									

UXO/MPPEH	Nomenclature	Grid	X	Y	Depth	GPS Coordinates	Disposition

Daily Summary

Team Leader's Signature

ORDNANCE AND EXPLOSIVE LOG

Intrusive Operations on:
Data entered by:
Data checked by:

DATA SUMMARY:	RA FINDINGS				DEMILITARIZATION SUMMARY			
Nomenclature	MEC today (items)	MD today (lbs)	MEC to date (items)	MD to date (lbs)	MEC Vented/ Disposed/BIP today (items)	MEC Vented/ Disposed/BIP to date (items)	MD from Demil today (lbs)	MD from Demil to date (lbs)
Total	**0**	**0.0**	**0**	**0.0**	**0**	**0**	**0**	**0**

GRID INFORMATION:

Grids Worked In Today	Digs today	MD today (lbs)	NMRD today (lbs)	Percent Complete	MEC Today and Nomenclature
Total	**0**	**0**	**0**	**0**	**0**

TALLY:

	Today	To date
MD total weight (lbs)	0	0
NMRD total weight (lbs)	0	0
Grids completed	0	0
Grids QC	0	0
Grids QA	0	0
Total Demo Operations	0	0
Digs Complete	0	0

NOTES:

For grids that are not complete for a given day, only the digs and MEC items for this day are tracked and the pounds of MD and NMRD are tracked on the day that the grid is intrusively complete.

EA Engineering, Science, and Technology, Inc., PBC

GRID TRACKER SHEET

Project Name:

Data Interpretation				Intrusive Investigation										
Survey Area (Grid/Transect)	Date Interpreted	Interpreter	Interpretation Comments	Date Dig Package Sent to Dig Team	Re-aquire Date	Re-aquire Team	Date Intrusive Investigation Complete	Team	Date Data Quality Control (QC) Performed	QC Performed By	QC Reviewer Comments	Date Quality Assurance Performed	Date Dig Package Sent to Client	

Standard Operating Procedure No. 019
for
Monitoring Well Installation

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Revision 0
December 2014

CONTENTS

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1. SCOPE AND APPLICATION

The installation of monitoring wells is contingent upon the existing conditions at the project site. The purpose of this Standard Operating Procedure is to delineate the quality control measures required to ensure the accurate installation of monitoring wells. The applicable Work Plan should be consulted for specific installation instructions. The term “monitoring wells,” as used herein, is defined to denote any environmental sampling well. An example well log form is provided in Appendix A. Alternate, equivalent forms are acceptable.

2. MATERIALS

2.1 DRILLING EQUIPMENT

The following drilling equipment may be required:

- Appropriately sized drill adequately equipped with augers, bits, drill stem, etc.
- Steam cleaner and water obtained from approved source for decontaminating drilling equipment.
- Photoionization Detector: Microtip HL-200 (or equivalent)
- Water level indicator
- Weighted steel tape measure
- Lower explosive limit – oxygen monitor
- Steel drums for intrusion derived wastes (drill cuttings, contaminated personal protective equipment, decontamination solutions, etc.)
- Source of approved water
- Heavy plastic sheeting
- Sorbent pads and/or log.

2.2 WELL INSTALLATION MATERIALS[1]

The following well installation materials may be required:

- Well screen:[2]

  — Polyvinyl chloride (PVC): JOHNSON (or equivalent); PVC 0.010 slot; Schedule 40; flush-threaded (leak-proof) joints; PVC complies with American Society for Testing and Materials (ASTM) D2665, ASTM D1784, and ASTM F480; free of ink markings; cleaned and prepackaged by manufacturer.

  — Stainless steel: JOHNSON (or equivalent); stainless steel 0.010 slot; 304 stainless steel[3]; ASTM F480 flush threads; cleaned, wrapped, and heat sealed by manufacturer.

- Riser pipe:

  — PVC: JOHNSON (or equivalent); STD; PVC; Schedule 40; flush-threaded (leak-proof) joints; PVC complies with ASTM D2665, ASTM D1784, and ASTM F480; free of ink markings; cleaned and prepackaged by manufacturer.

  — Stainless steel: JOHNSON (or equivalent); Schedule 5; 304 stainless steel; ASTM Type A312 material; 4-in. diameter; cleaned, wrapped, and heat sealed by manufacturer.

- Plugs/caps: JOHNSON (or equivalent); standard PVC or stainless steel.

- Filter pack: MORIE, 100 well gravel (or equivalent). NOTE: Final gradation may vary as a function of the gradation of the formation.[2]

- Fine Ottawa sand.

- Bentonite seal: BAROID, bentonite pellets (3/8-in. diameter)

- Cement: Type II Portland Cement (table below).

---

1. Technical information on all installed materials (screens, riser pipe, filter pack, bentonite, cement, etc.) and representative samples of the proposed filter pack, bentonite powder, and bentonite pellets will be supplied to the Project Manager.
2. Well screen slot size and filter pack gradation will be determined from sieve analysis of aquifer materials. Screen and casing material type will be determined based on field tests of groundwater chemistry and contaminants.
3. Unless the sum of Cl-, F-, and Br- is >1,000 ppm, in which case Type 316 should be used.

Cement Type	Special Characteristics	Recommended Usage
I	No special properties	General use as grout mix or cement plug (if sulfates <250 ppm), surface pad.
IA	Air-entraining Type I (Note that air entrainment properties can be achieved by chemical admixtures)	Air entrainment gives cement greater freeze-thaw resistance. Recommended for surface pads.
II	Moderate sulfate resistance, low heat of hydration	General use as grout mix or cement plug where groundwater sulfate >250 ppm and <1,500 ppm, surface pad.
IIA	Air-entraining Type II	See Type IA.
III	High early strength, high heat of hydration	Elevated temperature can damage well casing and fracture grout/cement plugs. NOT RECOMMENDED.
IIIA	Air-entraining Type III	NOT RECOMMENDED.
IV	Low heat of hydration	General use as grout mix or cement plug preferred type for well abandonment to ensure intact grout/cement plug.
V	High Sulfate resistance	Use when groundwater sulfate levels >1,500 ppm.

- Bentonite powder: BAROID, Aquagel Gold Seal.
- Steel protective casing: BRAINARD-KILMAN (or equivalent) zinc-plated steel, lockable, painted.[4]
- Geotextile: MIRAFI (or equivalent); GTF 130; non-woven; 4 oz.
- Coarse (blanket) gravel: Crushed stone aggregate.
- Containers for purged water, as required.
- Submersible pump or bailer of appropriate capacity, and surge block sized to fit well.
- Hach DREL 2000 portable laboratory (or equivalent).
- Conductivity, pH, oxidation-reduction potential (ORP), turbidity, dissolved oxygen, and temperature meters.
- Electric well sounder and measuring tape.
- Portland Type II cement (see previous table).
- Steel Posts (pickets), painted (see footnote).

4. All painted components (protector casing, steel pickets) will be painted high-visibility orange and allowed to dry completely prior to being brought onsite.

2.3 DOCUMENTATION

The following document may be provided:

- Copy of appropriate Work Plan
- Copy of approved Health and Safety Plan
- Copies of well and excavation permits
- Boring log forms
- Well completion diagram form
- Well development form.

2.4 GEOLOGIST'S PERSONAL EQUIPMENT

The following equipment may be required for the geologist:

- 10X handlens
- Unified Soil classification System chart
- Munsell color chart
- Sieve set (Keck model SS-81 or equivalent)
- Personal protective equipment as required by the Health and Safety Plan.

3. PROCEDURE

3.1 MATERIALS APPROVAL

Water sources for drilling, grouting, sealing, filter placement, well installation, and equipment decontamination must be approved by the Project Manager prior to arrival of the drilling equipment. Information required for the water source includes: water source, manufacturer/owner, address and telephone number, type of treatment and filtration prior to tap, time of access, cost per gallon (if applicable), dates and results associated with all available chemical analyses over the past 2 years, and the name and address of the analytical laboratory (if applicable).

Pure sodium bentonite with no additives (bentonite) will be the only drilling fluid additive allowed, and its use must be approved by the Project Manager prior to the arrival of the drilling equipment. The information required for evaluation includes: brand name, manufacturer, manufacturer's address and telephone number, product description, and intended use for the product.

Granular Filter Pack material must be approved by the Project Manager prior to drilling. A 1-pint representative sample must be supplied to the Project Manager. Information required includes: lithology, grain size distribution, brand name, source, processing method, and slot size of intended screen.

Portland Type II cement will be used for grout (see previous table).

3.2 DRILLING

The objective of the selected drilling technique is to ensure that the drilling method provides representative data while minimizing subsurface contamination, cross-contamination of aquifers, and drilling costs. The preferred drilling method is with a hollow-stem auger. Other drilling methods[5] are approved as conditions warrant, and will not require variances be issued by the U.S. Environmental Protection Agency. The method used at a specific site will be proposed in the work plan and evaluated by the Project Manager. Any drilling method not listed herein will require approval on a case by case basis by the U.S. Environmental Protection Agency.

A Site Geologist will be present during all well drilling and installation activities and will fully characterize all tasks performed in support of these activities into the monitoring well logbook. The Site Geologist will be responsible at only one operating rig for the logging of samples, monitoring of drilling operations, recording of water losses/gains and groundwater data, preparing the boring logs and well diagrams, and recording the well installation procedures of the rig. The Site Geologist will have onsite sufficient equipment in operable condition to perform efficiently his/her duties as outlined in the contractual documents. Items in the possession of each Site Geologist will include the approved Health and Safety Plan, this Standard Operating Procedure, a hand lens (10X), a standard color chart, grain-size chart, and a weighted (with steel or iron) steel tape long enough to measure the deepest well, heavy enough to reach that depth, and small enough to fit readily within the annulus between the well and drill casing. The Site Geologist will also have onsite, a water level measuring device, preferably electrical.

Only solid vegetable shortening (e.g., Crisco®) without flavoring or additives may be used on downhole drilling equipment. Additives containing either lead or copper will not be allowed. In addition, polychlorinated biphenyls will not be permitted in hydraulic fluids or other fluids used in the drilling rig, pumps, and field equipment/vehicles.

5. If the design depth of the well is <100 ft, open, hollow-stem augers will be used to drill the well unless "running sands" preclude the use of open augers. In that case, an inert "knockout" plug may be used in the bottom of the auger string. This plug will be driven out of the augers and left at the bottom of the hole when the well is installed.

   If the design depth of the well is >100 ft, rotary drilling methods may be used to install wells. The following drill fluids and methods are approved in the order listed: (1) rotary drilling with water from an approved source as drilling fluid (clays from the formations will tend thicken the fluid and coat the walls of the borehole and this is acceptable); (2) rotary drilling with water as a fluid, advancing a temporary casing with the bit to maintain an open hole; and (3) mud rotary using water with additives as drill fluid. Due to the potential for aquifer contamination and plugging, mud rotary drilling is not recommended for monitoring wells. If, however, "running sands" are encountered and the aquifer is expected to have a relatively high flow rate, then mud rotary is considered an approved method. Pure sodium bentonite is the only approved additive. Mud rotary drilling must be halted at the last aquitard above the target aquifer. Casing must be set, all bentonite-bearing fluids flushed from the hole and drill rig, and drilling may be resumed using water only as the drill fluid until the target depth is reached.

Surface runoff or other fluids will not be allowed to enter any boring or well during or after drilling/construction.

Antifreeze used to keep equipment from freezing will not contain rust inhibitors and sealants. Antifreeze is prohibited in areas in contact with drilling fluid. The ground surface at the well site will be protected from possible coolant, fuel, and hydraulic fluid spills and/or leakage by placement of plastic sheeting with raised edges, draining into a lined catch basin large enough to contain spills and/or leakage from motors, radiators, or vehicle tanks. Sorbent pillows will be placed to catch obvious leaks from the drill rig. Sorbent logs may be used instead of, or in conjunction with, a lined catch basin to contain spills.

An accurate measurement of the water level will be made upon encountering water in the borehole and later upon stabilization. Levels will be periodically checked throughout the course of drilling. Any unusual change in the water level in the hole, such as a sudden rise of a few inches may indicate artesian pressure in a confined aquifer, will be the basis for cessation of drilling. The geologist will immediately contact the Project Manager[6]. Particular attention for such water level changes will be given after penetrating any clay or silt bed, regardless of thickness, which has the potential to act as a confining layer.

Anticipated depths of wells are given in well specific work plans. In case the previously defined criteria have not been met before the depth range for a given hole is reached, the geologist will stop the drilling and confer with the Project Manager. The current boring conditions (depth, nature of the stratigraphic unit, and water table depth) will be compared to those of other wells nearby to decide to continue drilling or to terminate and complete the well.

If the well is to be installed in the surficial aquifer, drilling will be terminated before penetrating the basal aquitard. The basal aquitard is defined as the first 2 ft-thick clay below the water table, or below 5 ft in the case of a shallow aquifer.

If the well is to be installed in a lower, confined aquifer:

- Penetrations of aquifers located lower than the water table aquifer will be limited to avoid cross-contamination.

- Placement of new upper confined aquifer wells will be initially limited to those areas where contamination has been confirmed.

- The location of upper confined aquifer wells will be based upon the findings of the water table aquifer investigation. Areas of known contamination will be targeted for installing upper confined aquifer wells for the purposes of delineating vertical contamination.

6. The contract technical oversight will also be contacted for guidance.

- Where possible, upper-confined aquifer wells will be located such that they afford triangulation with other wells within the same aquifer to allow for a determination of groundwater flow direction.

- Some upper-confined aquifer wells will be installed approximately 10-15 ft from water table wells to enable the accurate assessment of vertical hydraulic gradients. If the direction of groundwater flow is known, wells within a group will be located sidegradient of each other.

- The boring will be advanced until the base of the surficial aquifer is reached (Section 3.2).

- An outer, surface casing will be set 2-5 ft into the confining layer to minimize the potential for cross-contamination from the unconfined aquifer during drilling activities.

- The surface casing will be driven into the confining bed and grouted into place. Grout will be tremied into the annulus around the outside of the casing to within 5 ft of the ground surface. A grout plug at least 2 ft thick will be tremied into the bottom of the surface casing. The grout will be permitted to cure for 24 hours. All drilling fluids within the surface calling will then be removed, and the casing will be flushed with clean potable water.

- The drilling equipment will be decontaminated, a smaller bit or auger selected, and the hole will be continued through the grout plug into the confined aquifer.

- If deeper aquifers are to be screened, repeat preceding steps until total depth is reached.

If dense non-aqueous phase liquid (DNAPL) contamination is detected during drilling, the well will be terminated and completed at the base of the aquifer. Drilling will not continue through the confining unit.

Stainless steel screens will be used in DNAPL wells. Screen size selection will be according to criteria set forth in Section 3.4. The formation grain size will be multiplied by the higher factor (6) to determine filter pack grain size. This will ensure that the filter pack is sufficiently coarse to permit DNAPL to pass freely from the formation into the coarser filter pack, then into the open well (Cohen and Mercer 1993).

DNAPL sampling cups are prohibited. The well screen will be capped, and set 0.3 ft (0.5 ft max.) into the top of the confining bed and rest on the bottom of the hole or bentonite backfill (if used). No sand will be placed below the screen. The remainder of the well installation and completion will be accomplished according to Section 3.4.

3.3 LOGGING

All borings for monitoring wells will be logged by a geologist. Logs will be recorded in a field logbook and/or a boring log. If the information is recorded in a logbook, it will be transferred to Boring Log Forms on a daily basis. Field notes are to include, as a minimum:

- Boring number
- Material description (as discussed below)
- Weather conditions
- Evidence of contamination
- Water conditions (including measured water levels)
- Daily drilling footage and quantities (for billing purposes)
- Notations on man-placed materials
- Drilling method and borehole diameter
- Any deviations from established field plans
- Blow counts for standard penetration tests
- Core and split-spoon recoveries.

Material description for soil samples must include:

- Classification
- Unified Soil Classification symbol
- Secondary components and estimated percentages
- Color
- Plasticity
- Consistency
- Density
- Moisture content
- Texture/fabric/bedding and orientation
- Grain angularity
- Depositional environment and formation
- Incidental odors
- Photoionization detector reading(s)
- Staining.

Material description for rock samples must include:

- Classification
- Lithologic characteristics
- Bedding/banding characteristics
- Color
- Hardness
- Degree of cementation
- Texture
- Structure and orientation

- Degree of weathering
- Solution or void conditions
- Primary and secondary permeability
- Sample recovery
- Incidental odors
- Photoionization detector reading(s)
- Staining.

3.4 WELL CONSTRUCTION AND INSTALLATION

After the hole is drilled and logged, backfill hole as required for proper screen placement. The integrity of the aquitard will be restored by placing a bentonite plug of an appropriate thickness, either to the top of the aquitard (normal well installation) or to within 0.3 ft of the top of the aquitard (DNAPL well). Aquifer fill will be clean filter pack.

Normal screen placement for the water table (surficial) aquifer will be within 2 ft of the screen extending above the static water level. The bottom of the screen will rest no more than 6 in. from the bottom of the hole or backfill material, whichever is applicable.

NOTE: The end cap in DNAPL wells will rest on the bottom of the bottom of the hole, or bentonite backfill if applicable (Section 3.2).

Screen placement for a confined aquifer well will normally be at the top of the confined aquifer.

Screen lengths will not normally exceed 10 ft. If it appears advantageous in a given situation (e.g., to screen an entire aquifer which is thicker than 10 ft), approval must be sought on a case-by-case basis from the appropriate regulatory agency. Otherwise, wells will be screened as follows:

Thickness of Aquifer	Action
<10 ft	Screen entire aquifer
>10 ft <30 ft	Screen top 10 ft consider vertically nested well cluster
>30 ft	Install vertically nested well cluster

The installation of monitoring wells in uncased or partially cased holes will begin within 12 hours of completion of drilling, or if the hole is to be logged, within 12 hours of well logging, and within 48 hours for holes fully cased with temporary drill casings. Once installation has begun, work will continue until the well has been grouted and the drill casing has been removed.

Well screens, casings, and fittings will conform to National Sanitation Foundation Standard 14 or ASTM equivalent for potable water usage. These materials will bear the appropriate rating logo. If the logos are not present, a written statement from the manufacturer/supplier stating that the materials contain the appropriate rating must be obtained. Material used will be new and essentially chemically inert to the site environment.

Well screen and casing should be inert with respect to the groundwater; therefore, the selection of screen and casing material will be based on select field tests of aquifer chemistry and potential contaminants. The screen will be capped without sediment trap or DNAPL sampling cup, and lowered into the hole. The well casing will be pre-cut to extend 2-2.5 ft above ground surface. Prior to placement of the last piece of well casing, a notch or other permanent reference point will be cut, filed, or scribed into the top edge of the casing.

Screen slot size will be appropriately sized to retain 90-100 percent of the filter pack material, the size of which will be determined by sieve analysis of formational material (Section 3.4).

The tops of all well casing will be capped with covers composed of materials compatible with the products used in the well installation. Caps may either be vented, or a telescopic fit, constructed to preclude binding to the well casing caused by tightness of fit, unclean surfaces, or weather conditions. In either case, it should be secure enough to preclude the introduction of foreign material into the well, yet allow pressure equalization between the well and the atmosphere.

Filter pack material will be placed, lightly tamped, and leveled. Filter pack will extend from the bottom of the hole to a height of 1-2 ft above the top of the screen. The filter pack will be capped with a minimum of 1 ft of fine (Ottawa) sand to prevent the bentonite seal from infiltrating the filter pack. If the bentonite seal is placed as a slurry, a minimum of 2 ft of fine sand will be required.

If the hole is less than 20-ft deep, the filter pack may be poured into the annulus directly. If the hole is deeper than 20 ft, the filter pack must be tremied into place.

Granular filter packs will be chemically and texturally clean, inert, and siliceous.

Filter pack grain size will be based on formation grain-size analysis. The D30 (70 percent retained) sieve size multiplied by a factor of not less than 3 nor greater than 6 will be used to determine the appropriate grain size.

Calculations regarding filter pack volumes will be entered into the Field Logbook along with any discrepancies between calculated and actual volumes used. If a discrepancy of greater than 10 percent exists between calculated and actual volumes exists, an explanation for the discrepancy will also be entered in the Field Logbook.

Bentonite seals will be no less than 2-ft thick nor more than 5-ft thick as measured immediately after placement. The normal installation will include a 5-ft seal. Thinner seals may be used in special cases. The final depth to the top of the bentonite seal will be measured and recorded.

3.4.1 Grout

Grout used in construction will be composed by weight of:

- 20 parts cement (Portland cement, type II) (see previous table)
- 0.4-1 part (maximum) (2-5 percent) bentonite
- 8-gal (maximum) approved water per 94-lb bag of cement.

Neither additives nor borehole cuttings will be mixed with the grout. Bentonite will be added after the required amount of cement is mixed with the water.

All grout material will be combined in an aboveground container and mechanically blended to produce a thick, lump-free mixture. The mixed grout will be recirculated through the grout pump prior to placement. Grout placement will be performed using a commercially available grout pump and a rigid, side discharge tremie pipe.

The following will be noted in the Field Logbook: (1) calculations of predicted grout volumes; (2) exact amounts of cement, bentonite, and water used in mixing grout; (3) actual volume of grout placed in the hole; and (4) any discrepancies between calculated and actual volumes used. If a discrepancy of greater than 10 percent exists between calculated and actual volumes exists, an explanation for the discrepancy will also be entered in the Field Logbook.

Well protective casings will be installed around all monitoring wells on the following day as the initial grout placement around the well. Any annulus formed between the outside of the protective casing and the borehole will be filled to ground surface with cement.

The construction of each well will be depicted as built in a well construction diagram. The diagram will be attached to the boring log and will graphically denote:

- Screen location, length
- Joint location
- Granular filter pack
- Seal
- Grout
- Cave-in
- Centralizers
- Height of riser
- Protective casing detail.

3.5 MONITORING WELL COMPLETION

Assemble appropriate decontaminated lengths of pipe and screen. Make sure these are clean and free of grease, soil, and residue. Lower each section of pipe and screen into the borehole, one at a time, screwing each section securely into the section below it. No grease, lubricant, polytetrafluoroethelyne tape, or glue may be used in joining the pipe and screen sections.

If a well extends below 50 ft, centralizers will be installed at 50 ft and every 50 ft thereafter except within screened interval and bentonite seal. Centralizer material will be PVC, polytetrafluoroethelyne, or stainless steel. Determination of centralizer material will be based on the same criteria as screen and calling selection.

Cut the riser with a pipe cutter approximately 2-2.5 ft above grade. All pipe cuts MUST be square to ensure that the elevation between the highest and lowest point of the well casing is less than or equal to 0.02 ft Notch, file, or otherwise permanently scribe a permanent reference point on the top of the casing.

Torches and saws may not be used to cut the riser. Care must be taken that all filings or trimmings cut from the reference point fall outside the riser rather than into the well. **Under no circumstances will a permanent marker or paint pencil be used to mark the reference point**.

In some locations, safety requirements may mandate that a well be flush-mounted with no stick-up. If a flush-mounted well is required at a given location, an internal pressure cap must be used instead of a vented cap to ensure that rainwater cannot pool around the wellhead and enter the well through the cap.

When the well is set to the bottom of the hole, temporarily place a cap on top of the pipe to keep the well interior clean.

Place the appropriate filter pack (Section 3.4). Monitor the rise annulus with a weighted tape to assure that bridging is not occurring.

After the pack is in place, wait 3-5 minutes for the material to settle, tamp and level a capped PVC pipe, and check its depth weighted steel tape.

Add a 1-2 ft cap of fine-grained (Ottawa) sand to prevent infiltration of the filter pack by overlying bentonite seal. See Section 3.4 for guidance on appropriate thickness of fine sand layer.

Install the bentonite seal (2- to 5-ft thick) by dropping bentonite pellets into the hole gradually. If the well is deeper than 30 ft, a tremie pipe will be used to place either bentonite pellets or slurry. Tamp and level pellets. If the well is 30 ft, tamp with a capped PVC pipe, if >30 ft, tamping bay be accomplished with the weighted end of the tape. In either case, check the depth to the top of the seal with a weighted tape as above.

If the bentonite pellets are of poor quality, they may have a tendency to hydrate and swell inside the tremie pipe and bridge. This situation may be solved by the following procedure:

1. Use a different brand of pellets. Different brands may have longer hydration times.

2. Freeze the pellets[7]. Note that this will require a longer wait time to allow proper hydration after the pellets thaw.

3. Place the bentonite seal as a slurry using a side-discharge tremie pipe as though installing grout. Note (Section 3.4) this will require that a minimum of 2 ft of fine sand be placed as a cap on top of the filter pack material.

Wait for the pellets to hydrate and swell. Hydration times will be determined by field test or by manufacturer's instructions. Normally this will be 30-60 minutes. Document the hydration time in the field notebook. If the pellets are above the water level in the hole, add several buckets of clean water to the boring. Document the amount of water added to the hole.

Mix an appropriate cement-bentonite slurry (Section 3.4). Be sure the mixture is thoroughly mixed and as thick as is practicable.

Lower a side discharge tremie pipe into the annulus to the level of the pellet seal.

Pump the grout slurry into the annulus while withdrawing the tremie pipe and temporary casing.

Stop the grout fill at 5 ft below the ground surface. Allow to cure for not less than 12 hours. If grout settles more than 6 in., add grout to bring level back up to within 5 ft of ground surface. Place approximately 2 ft of bentonite pellets (minimum 0.5 ft) in annulus. Seat the protective casing in the bentonite seal, allowing no more than 0.2 ft between the top of the well casing and the bottom of the protective casing cap. Fill inner annulus (between well casing and protective casing) with bentonite pellets to the level of the ground surface. Cover bentonite pellets with 1 ft of clean granular material (coarse sand or pea gravel filter pack). Fill the outer annulus (between the protective casing and the borehole) with neat cement. Allow the cement to mound above ground level and finish to slope away from the casing. Lock the cap.

— OR —

Continue the grout fill to the ground surface. Seat the protective casing in the grout, allowing no more than 0.2 ft between the top of the well casing and the bottom of the protective casing cap. Lock the cap.

— AND —

Allow the grout slurry to set overnight.

7. Bentonite pellets may be "flash-frozen" by brief immersion in liquid nitrogen (LN2). This can be accomplished by pouring LN2 over a small quantity (0.25-0.5 bucket) of pellets, allowing the LN2 to boil off, then pouring the pellets into the tremie pipe. **NOTE:** Use of LN2 is an additional jobsite hazard and must be addressed in the contractor's Health and Safety Plan. This contingency must be covered before drilling starts in order to avoid delays in well installation.

Fill the outer annulus (between the casing and the borehole) with neat cement. Allow the cement to mound above ground level and finish to slope away from the casing.

Slope the ground surface away from the casing for a distance of 2 ft, at a rate of no less than 1 in. in 2 ft. Surface this sloping pad with a geotextile mat covered by 3 in. of coarse gravel.

— OR —

Frame and pour a 4-ft square × 6-in. thick (4 ft × 4 ft × 6 in.) concrete pad centered around the protective casing.

— AND —

Set pre-painted protective steel pickets (3 or 4) evenly around and 4 ft out from well. These pickets will be set into 2 ft deep holes, the holes will then be filled with concrete; and if the pickets are not capped, they will also be filled with concrete.

3.6 WELL DEVELOPMENT

Well development is the process by which drilling fluids, solids, and other mobile particulates within the vicinity of the newly installed monitoring well have been removed while restoring the aquifer hydraulic conductivity. Development corrects any damage to or clogging of the aquifer caused by drilling, increases the porosity of the aquifer in the vicinity of the well, and stabilizes the formation and filter pack sands around the well screen.

Well development will be initiated after 48 consecutive hours but no longer than 7 calendar days following grouting and/or placement of surface protection.

Two well development techniques, over pumping and surging, will be employed in tandem. Over pumping is simply pumping the well at a rate higher than recharge. Surging is the operation of a plunger up and down within the well casing similar to a piston in a cylinder.

3.6.1 Materials Required

The following materials will be required for well development:

- Well Development Form
- Boring Log and Well Completion Diagram for the well
- Submersible pump or bailer of appropriate capacity, and surge block
- Conductivity, pH, ORP, turbidity, dissolved oxygen, and temperature meters
- Electric well sounder and measuring tape
- Containers for purged water, if required.

3.6.2 Summary of Procedures and Data Requirements

Pump or bail the well to ensure that water flows into it, and to remove some of the fine materials from the well. Removal of a minimum of one equivalent volume is recommended at this point. The rate of removal should be high enough to stress the well by lowering the water level to approximately half its original level. If well recharge exceeds 15 gpm, the requirement to lower the head will be waived.

Slowly lower a close-fitting surge block into the well until it rests below the static water level, but above the screened interval. (NOTE: This latter is not required in the case of a light non-aqueous phase liquid well.)

Begin a gentle surging motion which will allow any material blocking the screen to break up, go into suspension, and move into the well. Continue surging for 5-10 minutes, remove surge block, and pump or bail the well, rapidly removing at least one equivalent volume.

Repeat previous step at successively lower levels within the well screen until the bottom of the well is reached. Note that development should always begin above, or at the top of, the screen and move progressively downward to prevent the surge block from becoming sand locked in the well casing. As development progresses, successive surging can be more vigorous and of longer duration as long as the amount of sediment in the screen is kept to a minimum.

Development is expected to take at least 2 hours in a small well installed in a clean sand, and may last several days in large wells, or in wells set in silts with low permeabilities.

Development will continue until little or no sediment can be pulled into the well, and target values for parameters listed below are met.

At a minimum, development will remove 3-5 well volumes of water. One development volume (DV) is defined as (1) equivalent volume, plus (1) the amount of fluid lost during drilling, plus (1) the volume of water used in filter pack placement.

1. Monitor water quality parameters before beginning development procedures, and after removing 2, 2.5, and 3 well volumes of water.

2. If these parameters have stabilized over the three readings, the well will be considered developed.

3. If the parameters have not stabilized after these three readings, continue pumping the well to develop, but stop surging. Monitor the stabilization parameters every half DV.

4. When the parameters have stabilized over three consecutive readings at half DV intervals, the well will be considered developed.

All water removed must be disposed of as directed by the Work Plan.

Record all data as required on a Well Development Record Form (Appendix A), which is made a part of the complete Well Record. These data include:

- Depths and dimensions of the well, casing, and screen obtained from the well diagram.
- Water losses and uses during drilling, obtained from the boring log for the well.
- Measurements of the following indicator parameters: turbidity, pH, conductivity, ORP potential, dissolved oxygen, and temperature.
- Target values for the indicator parameters listed above are as follows: pH – stabilize, conductivity – stabilize, ORP – stabilize, dissolved oxygen –- stabilize, temperature – stabilize, turbidity – 5 nephelometric turbidity units or stabilize. A value is considered to have stabilized when three consecutive readings taken at half DV intervals are within 10 percent of each other.
- Notes on characteristics of the development water.
- Data on the equipment and technique used for development.
- Estimated recharge rate and rate/quantity of water removal during development.

4. MAINTENANCE

Not applicable.

5. PRECAUTIONS

Refer to the site-specific Health and Safety Plan for discussion of hazards and preventive measures during well development activities.

6. REFERENCES

Aller, L. et al. 1989. Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells, National Water Well Association.

American Society for Testing and Materials (ASTM). D2487-92 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

———. D5092-90 Standard Practice for Design and Installation of Groundwater Monitoring Wells in Aquifers.

Cohen, R.M. and J.W. Mercer. 1993. DNAPL Site Evaluation, CRC Press, Inc.

Nielsen, D.M. 1993. Correct Well Design Improves Monitoring, in *Environmental Protection*, Vol.4, No.7. July.

U.S. Army Toxic and Hazardous Materials Agency. 1987. Geotechnical Requirements for Drilling, Monitoring Wells, Data Acquisition and Reports. March.

U.S. Environmental Protection Agency. 1989. Groundwater Handbook.

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Appendix A

Field Record of Well Development Form

FIELD RECORD OF WELL DEVELOPMENT

Project Name:	Project No:	Date:
EA Personnel:	Development Method:	
Weather/Temperature/Barometric Pressure:		Time:

Well No.:	Well Condition:
Well Diameter:	Measurement Reference:
Well Volume Calculations	
A. Depth To Water (ft):	D. Well Volume/ft:
B. Total Well Depth (ft):	E. Total Well Volume (gal)[C*D]:
C. Water Column Height (ft):	F. Five Well Volumes (gal):

Parameter	Beginning	1 Volume	2 Volumes	3 Volumes	4 Volumes	5 Volumes
Time (min)						
Depth to Water (ft)						
Purge Rate (gpm)						
Volume Purged (gal)						
pH						
Temperature (°F)						
Conductivity (µmhos/cm)						
Dissolved Oxygen						
Turbidity (NTU)						
ORP (mV)						
Parameter	**6 Volumes**	**7 Volumes**	**8 Volumes**	**9 Volumes**	**10 Volumes**	**End**
Time (min)						
Depth to Water (ft)						
Purge Rate (gpm)						
Volume Purged (gal)						
pH						
Temperature (°F)						
Conductivity (µmhos/cm)						
Dissolved Oxygen						
Turbidity (NTU)						
ORP (mV)						

NOTE: NTU = Nephelometric turbidity unit.
ORP = Oxidation-reduction potential.

COMMENTS AND OBSERVATIONS: ______________________________

FIELD RECORD OF WELL DEVELOPMENT

Project Name:	Project No:	Date:
EA Personnel:	Development Method:	
Weather/Temperature/Barometric Pressure:		Time:

Well No.:	Well Condition:
Well Diameter:	Measurement Reference:

Parameter	Beginning	1 Volume	2 Volumes	3 Volumes	4 Volumes	5 Volumes
Time (min)						
Depth to Water (ft)						
Purge Rate (gpm)						
Volume Purged (gal)						
pH						
Temperature (°F)						
Conductivity (µmhos/cm)						
Dissolved Oxygen						
Turbidity (NTU)						
ORP (mV)						

Parameter	6 Volumes	7 Volumes	8 Volumes	9 Volumes	10 Volumes	End
Time (min)						
Depth to Water (ft)						
Purge Rate (gpm)						
Volume Purged (gal)						
pH						
Temperature (°F)						
Conductivity (µmhos/cm)						
Dissolved Oxygen						
Turbidity (NTU)						
ORP (mV)						

Standard Operating Procedure No. 025
for
Soil Sampling

Prepared by

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Revision 0
December 2014

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CONTENTS

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1. SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure is to delineate protocols for sampling surface and subsurface soils. Soil samples give an indication of the area and depth of site contamination, so a representative sample is very important.

2. MATERIALS

The following materials may be required:

Bucket auger or push tube sampler	Split-spoon, Shelby tube, or core barrel sampler
Drill rig and associated equipment	Stainless steel bowl
Personal protective equipment as required by the Health and Safety Plan	Stainless steel spoon, trowel, knife, spatula (as needed)

3. PROCEDURE

3.1 SUBSURFACE SAMPLES

Don personal protective equipment. Collect split-spoon, core barrel, or Shelby Tube samples during drilling. Upon opening sampler, or extruding sample, immediately screen soil for volatile organic compounds using either a photoionization detector or flame ionization detector. If sampling for volatile organic compounds, determining the area of highest concentration, use a stainless steel knife, trowel, or laboratory spatula to peel and sample this area. Log the sample in the Field Logbook while it is still in the sampler. Peel and transfer the remaining sample in a decontaminated stainless steel bowl. Mix thoroughly with a decontaminated stainless steel spoon or trowel. Place the sample into the required number of sample jars. Preserve samples as required. Discard any remaining sample into the drums being used for collection of cuttings. Decon sampling implements. All borings will be abandoned.

NOTE: If sample recoveries are poor, it may be necessary to composite samples before placing them in jars. In this case, the procedure will be the same, except that two split-spoon samples will be mixed together. The Field Logbook should clearly state that the samples have been composited, which samples were composited, and why the compositing was done.

Samples taken for geotechnical analysis will be undisturbed samples, collected using a thin-walled (Shelby tube) sampler.

3.2 SURFICIAL SOIL SAMPLES

Don personal protective equipment. Remove vegetative mat. Collect a sample from under the vegetative mat with a stainless steel trowel, push tube sampler, or bucket auger. If a representative sample is desired over the depth of a shallow hole or if several shallow samples are to be taken to represent an area, composite as follows:

- As each sample is collected, place a standard volume in a stainless steel bowl.
- After all samples from each hole or area are in the bucket, homogenize the sample thoroughly with a decontaminated stainless steel spoon or spatula.

If no compositing is to occur, place sample directly into the sample jars. Place the leftover soil in the auger borings and holes left by sampling. If necessary, add clean sand to bring the subsampling areas back to original grade. Replace the vegetative mat over the disturbed areas. Samples for volatile organic compounds will not be composited. A separate sample will be taken from a central location of the area being composited and transferred directly from the sampler to the sample container. Preserve samples as required. Decon sampling implements.

4. MAINTENANCE

Not applicable.

5. PRECAUTIONS

Refer to the Health and Safety Plan.

Soil samples will not include vegetative matter, rocks, or pebbles, unless the latter are part of the overall soil matrix.

6. REFERENCES

ASTM International. Method D1586-84, Penetration Test and Split-Barrel Sampling of Soils.

———. Method D1587-83, Thin Walled Sampling of Soils.

Department of the Army, Office of the Chief of Engineers. 1972. Engineer Manual 1110-2-1907 Soil Sampling. 31 March.

Standard Operating Procedure No. 65
for
Geophysical Sensor Verification Program

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Revision 01
Date: December 2015

CONTENTS

1. SCOPE AND APPLICATION

1.1 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide general procedures for implementing a geophysical sensor verification (GSV) program on military munitions response (MMR) projects. The objective of a MMR digital geophysical mapping (DGM) survey is to detect subsurface munitions and explosives of concern (MEC) and other munitions related items. The GSV is a more rigorous physics-based alternative to geophysical prove-outs used to verify that a geophysical system is operating properly and to monitor ongoing production work. Within this process, an instrument verification strip (IVS) is used to verify the proper functioning of the EM61-MK2 units used during the project. The IVS is an area containing buried "industry standard objects" (ISOs) that are used to determine specific signal strength data that can be compared to expected responses. The second part of the GSV process is a blind seeding program using ISOs to provide monitoring of geophysical data collection, data processing, and target selection procedures in the production areas.

1.2 LIMITATIONS

This SOP is specific to the Geonics Limited EM61-MK2 instrument but may be applicable to other digital geophysical instruments as well. These procedures will be conducted in conjunction with project specific Work Plans and Site Safety and Health Plans. This procedure shall not override any site-specific or contractual procedures that take precedent.

1.3 SCOPE

This SOP applies to the verification of data collected using a Geonics Limited EM61-MK2 metal detector. This procedure is based on the industry accepted process presented in "*Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response (ESTCP 2009)*". The major elements of this procedure are IVS design, IVS installation, IVS data collection and evaluation, and blind seeding. This procedure is to be used in conjunction with SOP No. 066 EM61-MK2 Person-Portable Geophysical Data Acquisition and SOP No. 067 DGM Data Processing.

2. MATERIALS

2.1 EQUIPMENT

The following is a list of equipment that will be necessary to complete a GSV program:

- All DGM equipment needed for geophysical data acquisition and processing (see SOPs No. 66 and No. 67)
- Hand-held metal detector
- Industry Standard Objects (e.g., pipe nipples)
- Real-time kinematics (RTK) global positioning system (GPS)
- Shovel

- Tape measure
- Field logbook and pen
- Digital camera
- Personal protective equipment (no steel toes/shanks).

3. METHODOLOGY AND PROCEDURES

The DGM teams will utilize the IVS to demonstrate that all aspects of the geophysical data acquisition, processing, and interpretation systems can meet the project objectives, and the overall process and results are acceptable. The following procedures are divided into IVS design, IVS construction, IVS data collection, IVS data evaluation and reporting, and blind seeding.

3.1 IVS DESIGN

The area selected for the IVS should be approximately 25 feet (ft) by 100 ft and representative of the soil composition, terrain, and vegetation anticipated at the project site. It should also be located where it is easily accessible by the DGM teams. It is sometimes advantageous to install multiple IVSs if the project site is large or has variable site conditions.

Industry Standard Objects (ISOs)—The ISOs to be used in the IVS are typically 1-inch (in.) by 4-in., 2-in. by 8-in., and 4-in. by 12-in steel pipe nipples, depending on project requirements. ISOs are organized in a straight line and separated by approximately 3 to 4 meters (m), or as necessary to prevent anomaly signatures from interfering with one another. An example IVS layout is presented in **Figure 3-1**.

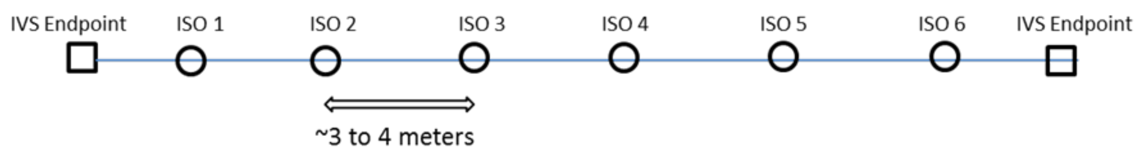

Figure 3-1 Example IVS Layout

The specific ISOs emplaced in the IVS are determined during the planning process and are based on the munitions expected at the project site. Actual instrument responses collected over buried ISOs at the IVS will be compared to standard instrument response curves developed for each ISO during testing performed by the Naval Research Laboratory (NRL) (NRL 2009). The highest peak amplitude response occurs when the ISO is oriented vertically and the lowest peak amplitude response occurs when the ISO is oriented horizontally.

The ISOs will be placed at depths that provide signals above the sensors' noise level but deep enough that the dipole approximation is valid, which is three to seven times the targets diameter (NRL 2009). Prior to burial, the ISOs will be painted orange and labeled with a unique identifier.

Inert munitions of the type anticipated at the project site often are also included in the IVS for the purpose of determining minimum instrument responses of expected munitions. Inert munitions buried in the IVS will be painted blue and labeled with a unique identifier. A table with an example IVS list of test items including ISOs, burial depths, orientations, locations, and NRL-predicted responses are presented in **Table 3-1**.

Table 3-1 Example IVS Seed Items

Item ID	Description	Depth to Center (in.)	Orientation	Distance along IVS (m)	Predicted Response Sum Channel (mV)
IVS-01	Small ISO	3	Horizontal-In Line	2	45
IVS-02	Small ISO	6	Vertical	5	288
IVS-03	Small ISO	9	Horizontal-Cross Line	8	16
IVS-04	Medium ISO	7	Horizontal-In Line	12	250
IVS-05	Medium ISO	12	Vertical	16	744
IVS-06	Medium ISO	17	Horizontal-Cross Line	20	53

3.2 BACKGROUND SURVEY

Prior to the installation of the IVS, a unexploded ordnance (UXO) team will perform a detector-aided visual surface sweep with hand-held detectors over the proposed IVS area to detect and remove surface metal that could interfere with the DGM survey. Following the surface sweep, the DGM team will perform a background survey over the IVS with an EM61-MK2 to detect pre-existing subsurface anomalies that could potentially affect the design of the IVS. The data will be acquired, processed, and interpreted in accordance with SOP No. 066 and SOP No. 067, and must meet the performance metrics identified in the project specific Work Plan. Any anomalies identified during the background survey will either be removed by qualified UXO technicians in accordance with the project specific Work Plan and all appropriate SOPs, or the IVS design will be modified to account for the anomalies (e.g., test items will be located such that the pre-existing anomalies don't interfere with the test item responses).

3.3 IVS CONSTRUCTION

The items in the IVS will be buried at the depths specified in the project specific Work Plan. Depending on site conditions such as bedrock, it may not be possible to bury items at the proposed depths. If a seed item cannot be buried at the proposed depth, it will either be buried as deep as possible or moved to a location within the test plot where the bedrock may be deeper (based on other seed excavations). Items will be organized in a straight line and separated by approximately 3 to 4 m, or as necessary to prevent anomaly signatures from interfering with one another. The background survey data and anomaly avoidance procedures will be used to ensure that the ISOs and IVS end stakes are not placed on top of or near existing anomalies. DGM or UXO personnel will emplace the ISOs in the hole, and the center of each ISO as well as the IVS endpoints will be surveyed with an RTK GPS to an accuracy of less than 5 centimeters (cm) (x,y,z). Photographs will be taken of each object prior to burial, and in the open hole. The holes will be backfilled and non-metallic flags placed directly over the ISO location so that the instrument operator can transport the geophysical instruments directly over the ISOs. IVS construction data including item identifications (IDs), coordinates, and actual depths, orientations, and azimuths will be transcribed onto a spreadsheet for use during the project.

3.4 IVS DATA ACQUISITION

Geophysical data will be collected over the IVS using the same equipment, configuration, and procedures that will be used for the production data. Each DGM team will collect data directly along the centerline of the IVS as well as on adjacent paths parallel to the IVS at offset distances of ±0.5 m, ±1.0 m, and +3.0 m (**Figure 3-2**). ISO responses from the centerline transect will be compared against the NRL-predicted responses and will be used to determine dynamic performance criteria for the daily tests. The offset line paths will assist the geophysicists in the determination of EM signal fall off with distance, and noise levels. The offset data will be used for determining dynamic performance criteria for blind seed items.

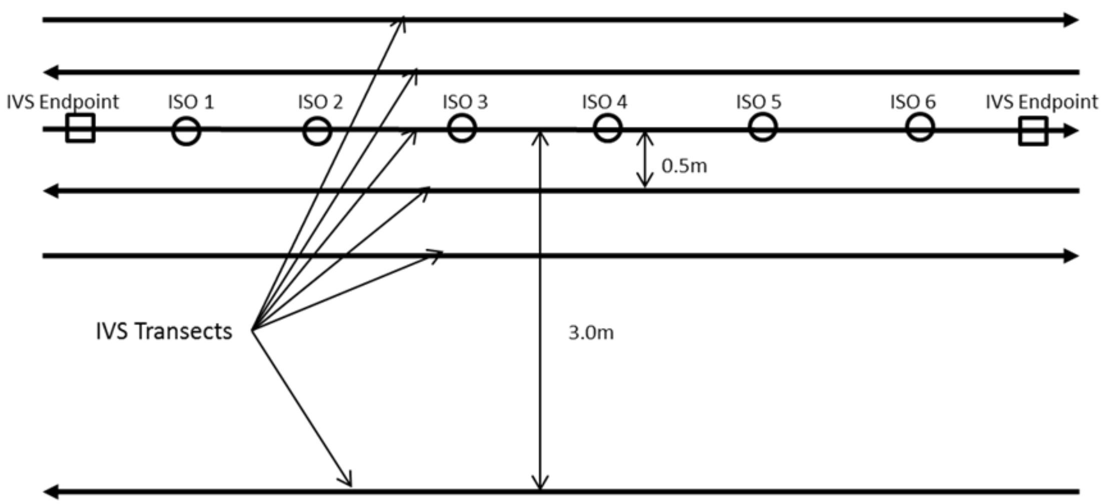

Figure 3-2 IVS Data Acquisition Layout

3.5 IVS DATA PROCESSING, EVALUATION, AND REPORTING

The IVS data will be processed in accordance with SOP No. 067 for each DGM team and evaluated to determine whether the selected geophysical system meets the IVS performance requirements as described in the project specific Work Plan. Results will be recorded on an IVS QC sheet (Attachment A)

If the system does not meet the performance requirements, a root-cause analysis will be performed to determine the cause of the failure, and actions taken to correct the failure. If it is determined that the failure cannot be corrected (e.g., due to geologic noise and not due to equipment or acquisition/processing procedures), the Senior Geophysicist will consult with the project delivery team technical representative (e.g., USACE Geophysicist) to determine a solution (e.g., new performance criteria).

Results of the IVS data evaluation will be summarized in a letter report. The IVS letter report will include as-built, pictures of seed items; geophysical data maps; summary of results; anomaly identification and dig criteria; and QC performance requirements. After the geophysical survey of the IVS has been completed, an abbreviated GSV Letter Report will be prepared and will include the following:

- As-built drawing of the IVS plot with surveyed locations of seed items
- Dimensions and pictures of the seed items
- Table with seed item locations, orientations, burial depths, and control point coordinates
- All raw and processed geophysics data
- Table showing IVS results (e.g., target anomaly offsets, instrument responses)
- Color-coded maps of EM61-MK2 IVS response
- Summary of the IVS results, and
- Recommendations for project specific QC performance metrics.

3.6 BLIND SEEDING PROGRAM

As part of the GSV process, a blind seeding program will be implemented. The main purpose of the blind seed program is to provide ongoing verification that known objects produce signals that are expected during the course of the production survey. During the production survey, the ISOs used in the IVS will be used as blind seeds in the production area to verify that the geophysical systems are functioning properly and that the performance requirements for detection and positioning are being met continuously throughout the duration of the project.

3.6.1 Seed Placement

The blind seeds will be placed in grids or along transects that are to be surveyed with the intent that each geophysical team will encounter at least one blind seed per day. Production rates and the mapping of seeds will be monitored, and if the geophysical crews are not encountering seeds on a daily basis, additional seeds will be emplaced. Most blind seeds will be placed (if possible) at similar depths and orientations as those placed in the IVS. These depths (3-7 times the ISO diameter) have been selected to achieve a high enough signal-to-noise ratio to compare the measured response values with known ISO response values. Burial depths may vary if rock is encountered shallower than planned depths. Upon placement, the specific depth and orientation of the ISO seeds will be recorded. The location of each item will then be surveyed using an RTK GPS and then covered up. The location of the blind QC seeds will not be shared with personnel performing DGM surveys or data processing tasks until these respective tasks have been completed.

For the placement of seeds along transects, two flags separated by approximately 7 m will be placed along the transect with the seed item buried somewhere in a straight line between the two flags. In addition to the seed item, the two flags will also be surveyed using RTK DGPS. The purpose of the two flags is to ensure the geophysical team passes directly over the seed item without knowing exactly where the seed item is so that the dynamic performance QC metrics can be calculated.

3.6.2 Blind Seed Evaluation

After each dig package is completed, the QC Geophysicist will review the dig package and compare the data against the blind seeds to verify that the detection and positioning performance requirements are being met. Should a performance requirement not be met or a trend indicate a future failure, a root-cause analysis will be performed and a corrective action determined per the corrective action process described in the project specific Work Plan. Blind seed results should be tracked in a MS Excel spreadsheet or in the project database.

3.7 DAILY FIELD DATA MANAGEMENT

Typically, several files are generated each day during the geophysical survey. These data files are stored on the data logger or camera during data acquisition activities. At the end of each day, the data collected by the field team will be provided to the data manager via memory thumb drive, Bluetooth, memory card, cable or other appropriate file transfer method. Data management is discussed in more detail in SOP No. 067 DGM Data Processing.

3.8 QUALITY CONTROL (QC)

Quality control for DGM surveys is project specific and will be performed in accordance with the project specific Work Plan.

4. MAINTENANCE

All equipment (e.g., EM61-MK2, data logger, GPS, RTS, etc.) will be used within the manufacturer’s specifications. Maintenance activities for the specific equipment used for the project will be performed in accordance with the manufacturer’s operations manual. General maintenance activities also include the daily visual inspection of instrument cables and connections for damage, cuts and/or exposed wiring, and for damage to the EM61-MK2 coils or electronics.

5. PRECAUTIONS

General precautions for GSV procedures include that for any MMR sites, intrusive operations (e.g., burial of seeds) should be performed in accordance with appropriate site safety and health plan procedures using qualified UXO technicians. Additionally, if the site is known or suspected to contain munitions with electromagnetic sensitive fuzing, the EM61-MK2 should not be operated closer to the ground than the instrument standard 40 cm. This includes during instrument warm-up when the instrument coil is often placed on the ground during this period. Stand-offs or test stands should be utilized to keep the coils off the ground during instrument warm-up.

6. REFERENCES

Environmental Security Technology Certification Program [ESTCP]. 2009. *Final Geophysical System Verification (GSV): A Physics-Based Alternative to Geophysical Prove-Outs for Munitions Response*.

Naval Research Laboratory. 2009. *EM61-MK2 Response of Three Munitions Surrogates. NRL/MR/6110--09-9183*. March.

EA Engineering, Science, and Technology, Inc., PBC

DGM Field Data Quality Control Sheet

Date:													
Project:													
AM/PM:													
Filename:													
Team:													
Processor:													
Static Response													
Static Standard Dev. (<=2mv C2)													
Static Background (C2)													
Static Response (C2)													
Static Difference													
Expected Static Difference (mV)													
Expected - Calculated Static Difference (%)													
Static QC status (pass/fail)													
Static Response Comment													
Static Position													
Control Point ID (Stake ID)													
Control Point Easting													
Control Point Northing													
Interpreted Easting													
Interpreted Northing													
Offset													
Allowable offset													
Position QC Status (pass/fail)													
Static Position Comment													
% sample interval < 25cm													
Dynamic Response													
Control Point Response (mV)													
Expected Control Point Response (mV)													
Expected - Calculated Static Difference (%)													
Control Point QC Status (pass/fail)													
Dynamic Response Comment													
Dynamic Position													
Control Point ID (Stake ID)													
Control Point Easting													
Control Point Northing													
Interpreted Easting													
Interpreted Northing													
Offset													
Allowable offset													
Position QC Status (pass/fail)													
Dynamic Position Comment													

Note:

NPR = No Position Recorded

Project-specific parameters for pass/fail criteria can be found in the project work plan.

EA Engineering, Science, and Technology, Inc., PBC

DGM Field Data Quality Control Sheet

Date:													
Project:													
AM/PM:													
Filename:													
Team:													
Processor:													
Static Response													
Static Standard Dev. (<=2mv C2)													
Static Background (C2)													
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Control Point ID (Stake ID)													
Control Point Easting													
Control Point Northing													
Interpreted Easting													
Interpreted Northing													
Offset													
Allowable offset													
Position QC Status (pass/fail)													
Static Position Comment													
% sample interval < 25cm													
Dynamic Response													
Control Point Response (mV)													
Expected Control Point Response (mV)													
Expected - Calculated Static Difference (%)													
Control Point QC Status (pass/fail)													
Dynamic Response Comment													
Dynamic Position													
Control Point ID (Stake ID)													
Control Point Easting													
Control Point Northing													
Interpreted Easting													
Interpreted Northing													
Offset													
Allowable offset													
Position QC Status (pass/fail)													
Dynamic Position Comment													

Note:

NPR = No Position Recorded

Project-specific parameters for pass/fail criteria can be found in the project work plan.

Standard Operating Procedure No. 66
for
EM61-MK2 Person-Portable Geophysical Data Acquisition

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
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Hunt Valley, Maryland 21031

Revision 01
Date: December 2015

CONTENTS

1. SCOPE AND APPLICATION

1.1 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide general procedures for digital geophysical mapping (DGM) data collection using a Geonics Limited EM61-MK2 metal detector configured for person-portable mode (versus a vehicle towed array configuration). The objective of a digital geophysical mapping (DGM) survey using an EM61-MK2 is to detect subsurface metallic objects such as underground storage tanks, utilities, disposal pit or landfill material, and munitions and explosives of concern (MEC).

1.2 LIMITATIONS

This SOP is specific to the Geonics Limited EM61-MK2 instrument but may be applicable to other geophysical instruments as well. These procedures will be conducted in conjunction with project specific Work Plan and Site Safety and Health Plans. This procedure shall not override any site-specific or contractual procedures that take precedent.

1.3 SCOPE

This SOP applies to the collection of EM61-MK2 geophysical and associated positional data. The major elements of this procedure are equipment and equipment set up, data collection procedures, data transfer, and quality control. Typically, a Global Positioning System (GPS) will be coupled with the geophysical instruments to record the positional x and y coordinates for the collected geophysical data. Project accuracy requirements may require the GPS be configured for real-time kinematic (RTK) corrections. Depending on site conditions and project objectives and requirements, other positional methods may be employed such as robotic total station (RTS) and fiducial. In general, cost-effective technologies applicable to the detection of subsurface metal include, but are not limited to, electromagnetic induction (time or frequency domain), and magnetics, used on a person-portable platform.

2. MATERIALS

1.1 EQUIPMENT

The following is a list of equipment that will be necessary to complete a DGM survey:

- EM61-MK2 metal detector
- Data logger (e.g., Juniper Systems Allegro or Archer)
- EM61-MK2 platform (e.g., cart, harness, litter, etc.)
- Positioning system such as a GPS or RTS
- Sufficient batteries for daily operation of all equipment
- Tape measures, cones, plastic pin flags, and spray paint as needed
- Field data logbook and ink pen
- Digital camera as needed
- Personal protective equipment (no steel toes/shanks).

Geonics Limited EM61-MK2—The EM61-MK2 is a time-domain metal detector that detects both ferrous and nonferrous metals. The system operates by generating a pulsed primary electromagnetic field in the earth, which induces eddy currents in metallic objects located in the ground. These eddy currents decay over time, producing a secondary electromagnetic field which is measured by a receiver coil. Depending on project requirements, different coils configurations may be assembled, as needed, and are discussed further in the operating manual for the EM61-MK2. Data are digitally collected at a rate of approximately 10 to 15 hertz, and real-time positioning is typically provided by a high-resolution DGPS system although positioning can also be provided by a lower resolution GPS system, a RTS, or semi-manually using tape measures and flags or cones (fiducial method).

Global Positioning System (GPS)—The GPS receives satellite signals with an antenna centered above the axis of the EM61-MK2 coils, or at a known offset. The accuracy of the GPS position is dependent on several factors that include the type of GPS (e.g., survey grade versus mapping grade), number of satellites, relative position of satellites in the sky, obstructions to the sky (e.g., trees and buildings), and type of real-time corrections. The types of real-time corrections include high accuracy RTK corrections (~2 centimeters [cm]) provided by a base station GPS via radio transmission, or a virtual reference station (VRS) via cell phone transmission. Other less accurate real-time corrections include satellite correction services and wide area augmentation systems that typically provide accuracies between 10 cm and 3 meters. The project accuracy requirements and site conditions will determine the type of GPS utilized for the project.

The GPS data (National Marine Electronics Association [NMEA] GGL format) are streamed from the GPS at a rate of 1 Hz to the EM61-MK2 data logger (e.g., Juniper Systems Allegro or Archer) and are merged with the EM61-MK2 data in real time during field operations. The merged data is processed and analyzed using a combination of software developed by Geonics and Geosoft (Oasis Montaj™), which is covered in SOP No. 067.

Robotic Total Station (RTS)—RTS is a laser based positioning system that automatically tracks and records the position of a prism located over the EM61-MK2 coils. RTS equipment can be used in areas with tree cover, but little vegetation within 2 to 3 meters of the ground surface, to provide accuracy similar to RTK GPS. Line of sight from the RTS tripod to the entire survey area is necessary for the system to function correctly although the RTS has the ability to continue tracking if the prism goes behind a tree for a short period of time (2 to 3 seconds). Similar to a GPS, the RTS equipment is able to export a NMEA GGL string to the EM61-MK2 data logger.

Fiducial Positioning—If GPS signal is not achievable and the underbrush/trees are too dense for RTS operation, then EM61-MK2 data can be collected in wheel/fiducial mode using a local coordinate system. Fiducially positioned data can be collected between two points with known relative coordinates. Areas are typically surveyed with fiducial positioning by laying tape measures out parallel to each other between known points (i.e. grid corners) and walking a series of parallel transects from one tape measure to the other. Extensive and accurate note keeping of the line numbers, start and end points and any intermediate fiducial markings is necessary for accurate fiducial data collection. Specialized training is required for wheel/fiducial mode data acquisition. Data collected using local coordinates will be translated to the project coordinate system, if required, during data processing.

3. METHODOLOGY AND PROCEDURES

The following procedures are divided into system setup, data collection, field data management, and quality control.

1.2 SYSTEM SET UP PROCEDURES

1. Set up GPS/RTS systems.

   - If using a GPS base station for RTK corrections, erect GPS base station over approved survey control point and ensure it is operating and configured properly (e.g., correct coordinate system, transmitting corrections).

   - If using an RTS system, place RTS tripod and set up RTS in accordance with operations manual in a location that is perpendicular to the anticipated direction of data acquisition lines to minimize the amount of time the prism is behind any given tree.

   - Center and place rover GPS antenna (or RTS prism) over EM61-MK2 coil(s) (tolerance ± 1 inch).

   - Turn on and ensure rover GPS (or RTS) is operating and configured properly (e.g., correct coordinate system, receiving base station (or other) corrections, exporting NMEA GGL or GGA data string).

2. Set up EM61-MK2.

   - Ensure EM61-MK2 backpack switch is in “D” mode if using top coil or “4” mode if not using top coil, and cables from the EM61-MK2 data logger and GPS (or RTS) are connected as designed. Synchronize EM61-MK2 data logger time to GPS (or RTS) time.

   - Set EM61-MK2 sensor away from large metallic items and above ground at operating height before power is applied.

   - Turn on EM61-MK2 and data logger and allow to warm up for a minimum of 5 minutes.

   - Ensure EM61-MK2 data logging program (e.g., EM61MK2, NAV61MK2) is configured correctly (e.g., logging rate, GPS port, filename, etc.)

   - Ensure person carrying EM61-MK2 coils removes all metal objects (coins, jewelry, metal timepieces, knives, etc.). No boots with steel toes or shanks are allowed—check shoes with metal detector prior to field investigation.

1.3 GEOPHYSICAL DATA COLLECTION PROCEDURES

The following set of general procedures should be followed for each field day:

1. Tailgate meeting.
2. Pull batteries off chargers and set up equipment.

3. Perform morning QC tests at instrument verification strip (IVS) in accordance with site specific Work Plan QC procedures (if required).
4. Field team mobilizes to work area.
5. If necessary, mark data acquisition lanes with nonmetallic pin flags or spray paint (or moveable waypoints such as traffic cones) at intervals consistent with terrain and vegetation to ensure 100% coverage of the survey area at the required project specific line spacing.
6. Collect DGM data along each survey lane and at least 5 feet beyond the grid edge prior to turning around and setting up for the next lane to ensure complete coverage at the grid edges.
7. Continue DGM data collection until 100% of the area is covered, the batteries need replacing, or a break is needed.
8. Continually monitor the data logger (every 5 minutes or less) for logging rate, track path (if displayed), sensor signal intensity, battery strength (EM61-MK2, data logger, and GPS/RTS), positional quality (GPS or RTS), and data logger memory capacity.
9. The field team lead will be responsible for maintaining the logbook. Record the following information in the logbook:
   - Names and roles of team members
   - Weather conditions
   - Equipment serial numbers
   - Transect or Grid identification (ID)
   - File names for the digitally recorded data
   - Time survey started
   - Time survey completed
   - Battery levels
   - Daily QC results
   - Site sketch documenting survey area, grid corners, north direction, survey direction, and surface features such as steep slopes, water hazards, obstacles, buildings, roads, signs, surface metal, vegetation, and any other features of note that may affect the DGM data quality or interpretation.
   - Field observations such as equipment issues, site visitors, changes in weather, etc.
   - Each page of the logbook will be dated and sequentially numbered; all entries will be signed.
10. End of the day:
   - Perform afternoon QC tests at IVS (if required).
   - All equipment is returned to storage, secured, and the batteries are placed on charge.
   - DGM data is transferred from data logger to data manager.

1.1.1 Deviations from Planned Geophysical Survey

Deviation from the planned geophysical survey due to inaccessible or rough areas that result in data gaps or line spacing irregularities will be determined and documented in the field log book by the field team lead. These inaccessible areas may be the result of surface features such as rock out crops, steep slopes, boulders, trees, buildings, other structures, or water. Photos may be taken to further document deviation causes. Photo ID should be noted in log book or on the geophysical field sheet.

1.4 DAILY FIELD DATA MANAGEMENT

Typically, several files are generated each day during the geophysical survey. These data files are stored on the data logger or camera during data acquisition activities. At the end of each day, the data collected by the field team will be provided to the data manager via memory thumb drive, Bluetooth, memory card, cable or other appropriate file transfer method. Data management is discussed in more detail in SOP No. 067 DGM Data Processing.

1.5 QUALITY CONTROL (QC)

Quality control for DGM surveys is project specific and will be performed in accordance with the project Work Plan.

4. MAINTENANCE

All equipment (e.g., EM61-MK2, data logger, GPS, RTS, etc.) will be used within the manufacturer's specifications. Maintenance activities for the specific equipment used for the project will be performed in accordance with the manufacturer's operations manual. General maintenance activities also include the daily visual inspection of instrument cables and connections for damage, cuts and/or exposed wiring, and for damage to the EM61-MK2 coils or electronics.

5. PRECAUTIONS

If the site is known or suspected to contain munitions with electromagnetic sensitive fuzing, the EM61-MK2 should not be operated closer to the ground than the instrument standard 40 cm. This includes during instrument warm-up when the instrument coil is often placed on the ground during this period. Stand-offs or test stands should be utilized to keep the coils off the ground during instrument warm-up. At military munitions response sites, a surface sweep to remove metal debris and munitions and explosives of concern (MEC) should be performed prior to any DGM activities.

6. REFERENCES

Geonics Limited. *EM 61-MK2 and EM61-MK2HP 4 Channel High Sensitivity Metals Detectors Operating Manual*.

Standard Operating Procedure No. 67
for
Digital Geophysical Mapping Data Processing

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
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Revision 01
Date: December 2015

CONTENTS

1. SCOPE AND APPLICATION

1.1 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide general procedures for geophysical data processing and interpretation of data collected using a Geonics Limited EM61-MK2 metal detector. The objective of a geophysical survey using an EM61-MK2 is to detect subsurface metallic objects such as underground storage tanks, utilities, disposal pit or landfill material, and munitions and explosives of concern (MEC). This procedure provides guidelines for processing and interpreting geophysical data using off-the-shelf, industry standard geophysical software that provides a graphical and tabular presentation of geophysical data.

1.2 LIMITATIONS

These procedures will be conducted in conjunction with project specific Work Plans. This procedure shall not override any site-specific or contractual procedures that take precedent.

1.3 SCOPE

This procedure provides general guidance for the processing and interpretation of geophysical data collected using an EM61-MK2. The major elements of this procedure are equipment, electronic data transfer and tracking, data processing and interpretation, and data archiving.

2. MATERIALS

2.1 EQUIPMENT

The equipment needed to process and interpret EM61-MK2 geophysical data includes:

- Computer – higher end quality with current operating system. A geographical information system (GIS) level computer and computer screen is desirable, but not required.
- Software – Geonics Limited DAT61MK2 or Geomar Software Inc. TrackMaker61MK2, Geosoft Oasis montaj, Microsoft Office Suite, and ArcGIS.

3. METHODOLOGY AND PROCEDURES

The data transfer and tracking, data processing, data interpretation, and data management, steps must flow smoothly and clear communication must occur. The steps required for this include 1) transfer of field data and data tracking, 2) data processing, 3) target selection, 4) dig sheet development, and 5) geophysical data archiving, as discussed below.

3.1 TRANSFER OF FIELD DATA AND DATA TRACKING

Several files are generated by the geophysical and positioning systems for each site surveyed. The files are stored on the data logger and positioning system receiver during data acquisition activities. At the end of the day, the data collected by each field team will be turned over to the data manager. These files are uploaded to the data management server. The following file types are generated for each survey:

- Raw geophysical data file with signal intensity measurements
- Positioning system data file(s) (if recorded)
- Digital photo files (*.jpg, if needed).

All EM61-MK2 data files will be electronically logged by the data manager upon receipt (Attachment A). The following items will be recorded on the Geophysical Data Tracking Log for each EM61-MK2 file collected:

- Grid Number(s)
- Geophysical Team Identification (e.g., Geo1)
- Date Collected
- EM61-MK2 file name
- Positioning System File Name
- Data Acquisition Team Comments.

Once the position data and the EM61-MK2 data from the digital geophysical mapping (DGM) system are processed, the following items will be added to the electronic data tracking sheet:

- Date Data File Processed
- Processor Initials
- Processing Comments.

Interpretation will be performed and will include establishment of selected target of interest (TOI) locations as needed. Selection will be in accordance with the data quality objectives presented in the project specific Work Plan, and will consider the most probable munitions at the site. The TOI information (e.g., ID, location, EM-61 readings, estimated depth, comments, etc.) will be incorporated into the project database. The following items will be added to the electronic data tracking sheet:

- Date Interpreted (dig package completed)
- Interpreter's Initials

- Interpreter's Comments
- Date QC Review
- QC Initials
- QC Comments.

3.2 DATA PROCESSING

The EM61-MK2 data and the real-time kinematic (RTK) differential global positioning system (DGPS) data are recorded and merged in real-time in the Juniper Systems Allegro data logger using Geonics logging program EM61-MK2. The output from the logging software is a binary file that is converted to ASCII format using the Geonics DAT61MK2 program. Positions are also assigned to each EM61-MK2 reading in DAT61MK2.

These data are imported into a Geosoft Oasis montaj™ project and predefined digital scripts (i.e., command sequences) are used in Oasis Montage to ensure consistency and repeatability of the processing sequence. Processing parameters for specific processing algorithms such as coordinate transformation, instrument latency correction, instrument drift filter length, grid cell size and blanking distance, grid image color scale will be determined during evaluation of IVS data. The following is a generalized flow of the data processing:

- Data downloaded to personal computer (PC)
- Data converted to x, y, z format file using DAT61MK2 or TrackMaker61 and exported as an ASCII xyz file
- The ASCII xyz file is imported into Oasis montaj software
- Coordinates are translated to project specific coordinate system if different than ASCII xyz coordinates
- Editing of GPS fliers
- Apply latency/lag corrections (non-linear filter)
- Apply sensor drift removal
- Gridding of sensor data using minimum curvature algorithm
- A color-coded image map produced of the gridded data
- Line path posted on the map along with any features noted by field crew in log book or geophysical field sheet (e.g., buildings, trees, roads, steep slopes, etc.)
- Check data quality per site project specific Work Plan.

It is not anticipated that advanced processing such as noise reduction filtering will be required. If advanced processing is required, it will be noted on the data tracking sheet. Oasis montaj log files will be utilized to record and document all processing steps (including parameters) performed on each EM61-MK2 file.

3.3 TARGET SELECTION

Upon completion of processing, high-resolution color-coded image maps depicting geophysical anomalies will be generated for the survey area using Oasis montaj. For military munitions response projects, TOI selection will be performed by utilizing a threshold based selection tool in Oasis montaj. Targets will then be evaluated, and during this process some targets may be manually added and others removed due to the algorithm selecting multiple targets on one source. Depending on project specific objectives, further analysis may be performed by calculating and reviewing several target parameters that include EM time constants (Tau), signal to noise ratios, signal strength, and target size.

3.4 DIG SHEET DEVELOPMENT

Maps showing the color-coded image of the sensor data, TOIs, and features noted in field log books will be constructed by the processing geophysicist or GIS technician. A comma separated ASCII file (csv) will be exported from Oasis montaj that includes project specific TOI information such as unique target ID, target coordinates, signal amplitude, interpretation comments, and other target characteristics. These files can be imported to the project GIS and project database.

3.5 GEOPHYSICAL DATA ARCHIVING

All geophysical data will be archived daily. Files will be copied from the processing computer to alternate digital media such as CDs, DVDs, or company servers.

4. MAINTENANCE

Maintenance of backup data will be verified by the QC Geophysicist.

5. REFERENCES

Geonics Limited. 2005. Computer Program Manual (Survey Data Reduction Manual) DAT61MK2 Version 2.20. February.

Geomar Software Inc. 2006. TrackMaker61MK2 Version 1.6.1.

Geosoft. 2013. Oasis Montaj How-To Guide Complete Workflow for Oasis montaj.

ATTACHMENT A

GEOPHYSICAL DATA PROCESSING TRACKING SHEETS

GEOPHYSICAL DATA TRACKING LOG

EA Engineering, Science, and Technology, Inc., PBC

Project Name:

Data Acquisition					Data Processing			
Survey Area (Grid/Transect)	**Geo Team**	**Date Collected**	**EM61 File Name**	**Comments**	**Date Processed**	**Processor**	**Processing Comments**	**Date Data Package Sent to Client**

GEOPHYSICAL DATA TRACKING LOG

EA Engineering, Science, and Technology, Inc., PBC

Project Name:

Data Acquisition					Data Processing			
Survey Area (Grid/Transect)	Geo Team	Date Collected	EM61 File Name	Comments	Date Processed	Processor	Processing Comments	Date Data Package Sent to Client

Standard Operating Procedure No. 68
for
Digital Geophysical Mapping Target Reacquisition

Prepared by

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Revision 01
Date: December 2015

CONTENTS

1. SCOPE AND APPLICATION

1.1 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to provide general procedures for the reacquisition of targets identified during military munitions response (MMR) digital geophysical mapping (DGM) surveys. The objective of an MMR geophysical survey is to detect subsurface metallic objects that may be related to military munitions such munitions and explosives of concern (MEC). The reacquisition of targets identified during the DGM survey is required for the follow on intrusive investigation to determine the nature of the targets.

1.2 LIMITATIONS

These procedures will be conducted in conjunction with project specific Work Plans and Site Safety and Health Plans. This procedure shall not override any site-specific or contractual procedures that take precedent.

1.3 SCOPE

This SOP applies to the reacquisition of targets identified from the interpretation of geophysical sensor data. These guidelines will be used to locate targets identified as potential munitions and explosives of concern (MEC) and material potentially presenting an explosive hazard (MPPEH) through interpretation of the geophysical data. The major elements of this SOP are 1) system setup, 2) navigation/occupation of desired coordinates, 3) sensor interrogation, and 4) demarcation of coordinates.

Typically, a real-time kinematic (RTK) Global Positioning System (GPS) will be used with a geophysical instrument to locate and pin-point the positional x and y coordinates of a target previously identified during a DGM survey. Depending on site conditions and project objectives and requirements, other positional methods may be employed such as a robotic total station (RTS) or tape measures.

2. MATERIALS

2.1 EQUIPMENT

The following is a list of equipment that will be necessary to complete target reacquisition activities:

- Positioning system (e.g., RTK GPS, RTS, or tape measures)
- Geophysical detector (e.g., EM61-MK2, digital magnetometer, or hand-held detector)
- Logbook
- Color-coded sensor map and target list (e.g., dig package)
- Non-metallic pin flags or other means of demarcation
- Permanent marker (e.g., Sharpie)
- Spray Paint
- Clipboard

3. METHODOLOGY AND PROCEDURES

The general procedures for target reacquisition consist of system setup, navigation to desired coordinates, sensor interrogation (if required), and demarcation of target location.

3.1 SYSTEM SETUP

1. Set up positioning and detector equipment in accordance with equipment specific operating manual and SOP No. 16 EM61-MK2 Person-Portable Geophysical Data Acquisition.
2. Upload target coordinate information into positioning system.
3. Reacquire a minimum of one "known" control point (e.g., grid corner, survey monument) prior to reacquisition of targets to ensure positioning system is functioning properly.

3.2 NAVIGATION/OCCUPATION OF COORDINATES

1. Coordinates should be sorted as necessary to expedite reacquisition as much as possible.
2. Use instrument stake-out mode to interactively navigate to coordinates of target.
3. Monitor coordinates in real time to ensure target location is reacquired in accordance with the performance requirements of the project specific Work Plan.
4. Place positioning system over target location and observe coordinates and ensure they are within tolerance.

3.3 SENSOR INTERROGATION

1. If required in the project specific Work Plan, check the area within the specified distance of the flag with the geophysical instrument for anomalies and locate the peak response location. The project specific Work Plan may require that all anomalies within a specified distance be flagged.
2. If an item cannot be pinpointed due to ambiguity with the reacquire detector, the flag will be placed at the surveyed location. If an item cannot be detected with the reacquire detector, the flag will be placed at the surveyed location for investigation by the intrusive team. At the time of intrusive investigation, the team leader will also note any offset from the marked location on the dig sheet.
3. Record all required project specific data on the reacquisition form (e.g., paper or digital dig sheet). Required data may include distance from interpreted location (> 1 feet), direction, and peak instrument response. Also record additional comments, e.g. surface metal, next to fence, next to building, second anomaly, 2 feet north, etc.

3.4 DEMARCATION OF COORDINATES

1. Mark the reacquired location with a nonmetallic pin flag or by other approved means.
2. Ensure that the marker (i.e., pin flag) is pushed into the ground at least 3 to 4 inches. On hard surfaces, use another pre-approved method such as spray paint or metal pin flags.
3. Ensure that the target ID number from the database is written on the pin flag. Each marked target location within the each grid requires a unique number.
4. Continue to the next target location until all targets on the dig sheet are flagged.

4. MAINTENANCE

All equipment (e.g., geophysical detector, data logger, GPS, RTS, etc.) will be used within the manufactures specifications. Maintenance activities for the specific equipment used for the project will be performed in accordance with the manufactures operations manual. General maintenance activities also include the visual inspection of any device cables and connections for cuts and/or exposed wiring, and for damage to the EM61-MK2 coils.

Attachment 4

Additional Field Forms

(electronic on CD only)

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LIST OF FORMS

Preparatory Phase Inspection Checklist
Initial Phase Inspection Checklist
Follow-On Phase Inspection Checklist
Daily SUXOS Report
Daily Safety Form
Corrective Action Request
Non-Conformance Report
Root Cause Analysis
Document Review Form

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PREPARATORY PHASE INSPECTION CHECKLIST

(Part I)

Project : Former York Naval Ordnance Plant Date: __________

TITLE AND NO. OF TECHNICAL SECTION: __________

Work Plan Reference : __________

A. Planned Attendants:

	Name	**Position**	Company
1)			
2)			
3)			
4)			
5)			
6)			
7)			
8)			
9)			
10)			
11)			

B. Submittals required to begin work:

	Item	Submittal No.	Action Code
1)			
2)			
3)			
4)			
5)			
6)			
7)			
8)			

(continued):

PREPARATORY PHASE INSPECTION CHECKLIST
(Part II)

Project : Former York Naval Ordnance Plant Date: 4-28-2015

C. Equipment to be used in executing work:

1) ______
2) ______
3) ______
4) ______
5) ______

D. Work areas examined to ascertain that all preliminary work has been completed:

FNYOP

______

E. Methods and procedures for performing Quality Control, including specific testing requirements:

Visual inspection and observations

______

F. Persons in attendance: (include or attach Meeting Attendance Sheet)

______
______
______
______
______

The above methods and procedures have been identified from the project plans and will be performed as specified for the Definable Feature of Work.

______

______
Project QC Specialist

INITIAL PHASE INSPECTION CHECKLIST

Project.: Former York Naval Ordnance Plant Date: ____________________

Title and No. of SSWP Section: ____________________

____

____

Description and Location of Work Inspected: ____________________

A. Key Personnel Present:

Name	Position	Company

B. Materials being used are in strict compliance with the contract plans and specifications: ☐Yes ☐No
If not, explain: ____________________

____

C. Procedures and/or work methods witnessed are in strict compliance with the contract specifications: ☐Yes ☐No
If not, explain: ____________________

____

D. Workmanship is acceptable: ☐Yes ☐No
State where improvement is needed: ____________________

____

E. Workmanship is free of safety violations: ☐Yes ☐No
If no, corrective action taken: ____________________

____

____
Project Quality Control Specialist

FOLLOW-UP PHASE INSPECTION CHECKLIST

CONTRACTOR QUALITY CONTROL DAILY REPORT CONTINUATION SHEET
(ATTACH ADDITIONAL SHEETS IF NECESSARY)

Date: ______________________

Contractor: ______________________

Project: Former York Naval Ordnance Plant York, Pennsylvania

Y=YES; N=NO; SEE REMARKS BLANK=NOT APPLICABLE	
WORK COMPLIES WITH WORK PLAN AS APPROVED IN INITIAL PHASE	

IDENTIFY DEFINABLE FEATURE OF WORK, LOCATION, AND LIST PERSONNEL PRESENT	
Features of Work	
Staff	

INSPECTIONS PERFORMED & WHO PERFORMED TEST

______________________ ______________________

Project QC Specialist Date

E A ENGINEERING, SCIENCE, AND TECHNOLOGY, INC., PBC
DAILY QUALITY CONTROL REPORT
FOR
YORK FORMER NAVAL ORDNANCE PLANT (HARLEY-DAVIDSON)

Project No. 6292101______ **Day/Date** ____ **Report No.** ____
Project Title & Location:
Weather: Clear ___Partly Cloudy ____ Cloudy _____ Rainfall__0__(% of workday)
Temperature During Workday: High___ Low______Humidity___%

1. WORK PERFORMED BY CONTRACTORS/SUBCONTRACTORS

Contractor	Crafts	Hours	Description of Work
EA Engineering Site Personnel			
SUBCONTRACTORS			

2. OPERATING EQUIPMENT DATA (Not hand tools)

Equipment Owned or Rented	Date of Arrival / Departure	Hours Used/idle	Hours of Rep./Main

3. WORK PERFORMED TODAY (Indicate location and description of work performed by prime and/or subcontractors).

4. QUALITY CONTROL INSPECTIONS AND RESULTS (Include a description of preparatory, initial or follow-up inspections/meetings; check of subcontractors work, materials delivered to site, comments on proper storage of materials, include comments on corrective actions to be taken).

5. QUALITY CONTROL TESTING AND RESULTS **(Comment on tests and equipment checks)**

6. DAILY SAFETY INSPECTIONS (Include comments on new hazards to be added to Hazard Analysis and corrective action of any safety issues).

7. REMARKS (Include conversations with or instructions from the Government representatives; delays of any kind that impact the job; conflicts in the contract documents; comments on change orders; and environmental considerations; etc.).

8. CONTRACTOR'S VERIFICATION: I certify that to the best of my knowledge the above report is complete and correct. All material, equipment used, and work performed during this reporting period is in compliance with the contract plans and specifications except as noted above.

SIGNATURE:

EA Engineering Science and Technology Inc., PBC

EA Engineering, Science and Technology, Inc. PBC

Safety Inspection Form For MEC Operations

DATE:	**TIME:**	**LOG NO.:**
PROJECT NO:	**TASK ORDER NO:**	
SITE NAME AND LOCATION:		
TEAM OR NAME OF INSPECTED:		
INSPECTED ITEMS OR OPERATIONS: (List by task, item or other specific identifier)		

II. INSPECTION RESULTS

Item Description	Pass	Item Description	Pass
1. PPE	Y / N	9. MEC/UXO Disposal Operations:	Y / N
2. Compliance with Approved SOP's	Y / N	10. Motor Vehicles / MHE Inspections	Y / N
3. Compliance with Approved Safety Plans	Y / N	11. First Aid / Trauma Kit:	Y / N
4. Safety / Support Equipment	Y / N	12. Other (list):	Y / N
5. On and Off Site Communications	Y / N	13. Other (list):	Y / N
6. Explosives / Ordnance Reference Material	Y / N	14 Other (list):	Y / N
7. MSDSs and Container Labeling per APP or SOP	Y / N	15. Other (list):	Y / N
8 MEC/UXO Precautions Observed	Y / N	16. Other (list):	Y / N

SUMMARY OF DEFICIENCIES NOTED: (If any)

CORRECTIVE ACTIONS RECOMMENDED: (If any)

REINSPECTION RESULTS: (If required)

VI. SIGNATURES:

I acknowledge that I have been briefed on the results of this inspection and will take corrective actions (if necessary).

______________________________	______________________________
UXOSO / UXOQC	SUXOS

Note: Safety Inspections are to be conducted each day and documented on this form. This form will also be used to document the present status of the site/site operations, personnel, and will also be used to note the current status of deficiencies noted during daily inspections. Any daily inspection forms where deficiencies have been noted will be forwarded to the Project Manager, Project SUXOS and the Corporate Safety and Health Manager.

CORRECTIVE ACTION REQUEST (CAR)

PART A: TO BE COMPLETED BY PROJECT MANAGER OR DESIGNEE

(1) PROJECT:		
(2) PROJECT MGR:	**(3) QC MGR/STAFF:**	
(4) CAR NO (S)AND DATE (S) ISSUED		
(5) DEFICIENCY DESCRIPTION AND LOCATION		
(6) PLANNED ACTIONS	**(7) ASSIGNED RESPONSIBILITY**	**(8) COMPLETION DUE DATE**
(9) PROJECT MANAGER SIGNATURE:	**DATE:**	

PART B TO BE COMPLETED BY QCS SYSTEM MANGER OR DESIGNEE

(10) CAP REVIEWED BY	**DATE**
(11) REVIEWER COMMENTS	
(12) CAP DISPOSITION: (CHECK ONLY ONE AND EXPLAIN STIPULATIONS, IF ANY. ☐ **APPROVED WITHOUT STIPULATIONS** ☐ **APPROVED WITH STIPULATIONS** ☐ **APPROVED DELAYED, FURTHER PLANNING REQUIRED** **COMMENTS:**	
(13) QC MANAGER SIGNATURE	**DATE**

EA Engineering, Science, and Technology, Inc., PBC

CORRECTIVE ACTION REQUEST (CAR) INSTRUCTION SHEET

(1) QC Manager: Verify that the total number of pages includes all attachments.

(2) QC Manager: Fill in CAR number from CAR log.

(3) CQC System Manager: Fill in appropriate priority category. High priority indicates resolution of deficiency requires expediting corrective action plan and correction of deficient conditions noted in the CAR and extraordinary resources may be required due to the deficiencies impact on continuing operations. Normal priority indicates that the deficiency resolution process may be accomplished without further impacting continuing operations.

(4) CAR Requestor: Fill in date CAR is initiated.

(5) CAR Requestor: Identify project name, number, CTO, and WAD.

(6) CAR Requestor: Identify Project Manager

(7) CAR Requestor: Identify CQC System Manager.

(8) CAR Requestor: Identify project organization, group, or discrete work environment where deficiency was first discovered.

(9) CAR Requestor: Identify line manager responsible for work unit where deficiency was discovered.

(10) QC Manager: Identify responsible manager designated to resolve deficiency (this may not be work unit manager).

(11) CAR Requestor: Identify source of requirement violated in contract, work planning document, procedure, instruction, etc; use exact reference to page and, when applicable, paragraph.

(12) CAR Requestor: Identify problem as it relates to requirement previously stated. Identify location of work activities impacted by deficiency.

(13) QC Manager: Identify if Corrective Action Plan (CAP) is required. CAP is typically required where one or more of the following conditions apply: CAR priority is High; deficiency requires a rigorous corrective action planning process to identify similar work product or activities affected by the deficiency; or deficiency requires extensive resources and planning to correct the deficiency and to prevent future recurrence.

(14) QC Manager: Identify date by which proposed corrective action is due to QC for concurrence.

(15) QC Manager: Sign and date CAR and forward to responsible manager identified in (10) above.

(16) Responsible Manager: Initial to acknowledge receipt of CAR.

(17) Responsible Manager: Complete corrective action plan and identify date of correction. Typical corrective action response will include statement regarding how the condition occurred, what the extent of the problem is (if not readily apparent by the problem description statement in [12]), methods to be used to correct the condition, and actions to be taken to prevent the condition from recurring. If a CAP is required, refer to CAP only in this section.

(18) Responsible Manager: Sign and date corrective action response.

(19) QC Manager: Initial to identify concurrence with corrective action response from responsible manager.

(20) QC Manager: Check appropriate block to identify if corrective action process is complete so that CAR may be closed. Add close-out comments relevant to block checked.

(21) QC Manager: Indicate document closeout by signing and dating.

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NON-CONFORMANCE REPORT

PROJECT:	**NCR NO.**	**DATE:**
TO:		
ORIGINAL TO EA CORPORATE QC MANAGER		

ITEM: ____

WORK PLAN REFERENCE

REQUIREMENT:____

NONCONFORMANCE:

ISSUED BY: NAME:	**TITLE:**	**ORGANIZATION:**

DATE:

DISPOSITION: _________**ACCEPT** ________**REJECT**

DISPOSITION APPROVALS:

UXOQCS DATE	FCR REQUIRED? ☐ YES ☐ NO
PROJECT MANAGER DATE	DISTRIBUTION

REMARKS:

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EA Engineering, Science, and Technology, Inc.

ROOT CAUSE ANALYSIS FORM

ROOT CAUSE ANALYSIS (RCA)

Root Cause Categories (RCC): Select the RCC numbered below that applies for the root cause (RC) and/or contributing factor (CF) in the first column, then describe the specific root cause and corrective actions in each column.

1. Lack of skill or knowledge
2. Lack of or inadequate operational procedures or work standards
3. Inadequate communication of expectations regarding procedures or work standards
4. Inadequate tools or equipment
5. Correct way takes more time and/or requires more effort
6. Short-cutting standard procedures is positively reinforced or tolerated

Person thinks there is no personal benefit to always doing the job according to standards

RCC #	ROOT CAUSE(S)	CORRECTIVE ACTIONS	(1) RC	(2) CF	DUE DATE	DATE COMPETED	DATE VERIFIED

NOTES (1) RC =ROOT CAUSE; (2) CF=CONTRIBUTING FACTORS

INVESTIGATION TEAM MEMBERS

NAME	JOB TITLE	DATE

RESULTS OF SOLUTION VERIFICATION AND VALIDATION:

REVIEWED BY:

NAME	JOB TITLE	DATE

Determination of Root Cause(s)

For minor losses or near losses the information may be gathered by the supervisor or other personnel immediately following the loss. Based on the complexity of the situation, this information may be all that is necessary to enable the investigation team to analyze the loss, to determine the root cause, and to develop recommendations. More complex situations may require the investigation team to revisit the loss site or re-interview key witnesses to obtain answers to questions that may arise during the investigation process.

Photographs or videotapes of the scene and damaged equipment should be taken from all sides and from various distances. This point is especially important when the investigation team will not be able to review the loss scene.

The investigation team must use the Root Cause Analysis Flow Chart to assist in identifying the root cause(s) of a loss. Any loss may have one or more "root causes" and "contributing factors". The "root cause" is the primary or immediate cause of the incident, while a "contributing factor" is a condition or event that contributes to the incident happening, but is not the primary cause of the incident. Root causes and contributing factors that relate to the *person* involved in the loss, his or her peers, or the supervisor should be referred to as "personal factors". Causes that pertain to the *system* within which the loss or injury occurred should be referred to as "job factors".

<u>Personal Factors</u>

- Lack of skill of knowledge
- Correct way takes more time and/or requires more effort
- Short-cutting standard procedures is positively reinforced or tolerated
- Person thinks that there is no personal benefit to always doing the job according to standards

<u>Job Factors</u>

- Lack of or inadequate operational procedures or work standards.
- Inadequate communication of expectations regarding procedures or standards
- Inadequate tools or equipment

The root cause(s) could be any one or a combination of these seven possibilities or some other "uncontrollable factor". In the vast majority of losses, the root cause is very much related to one or more of these seven factors. Uncontrollable factors should be used rarely and only after a thorough review eliminates "all" seven other factors.

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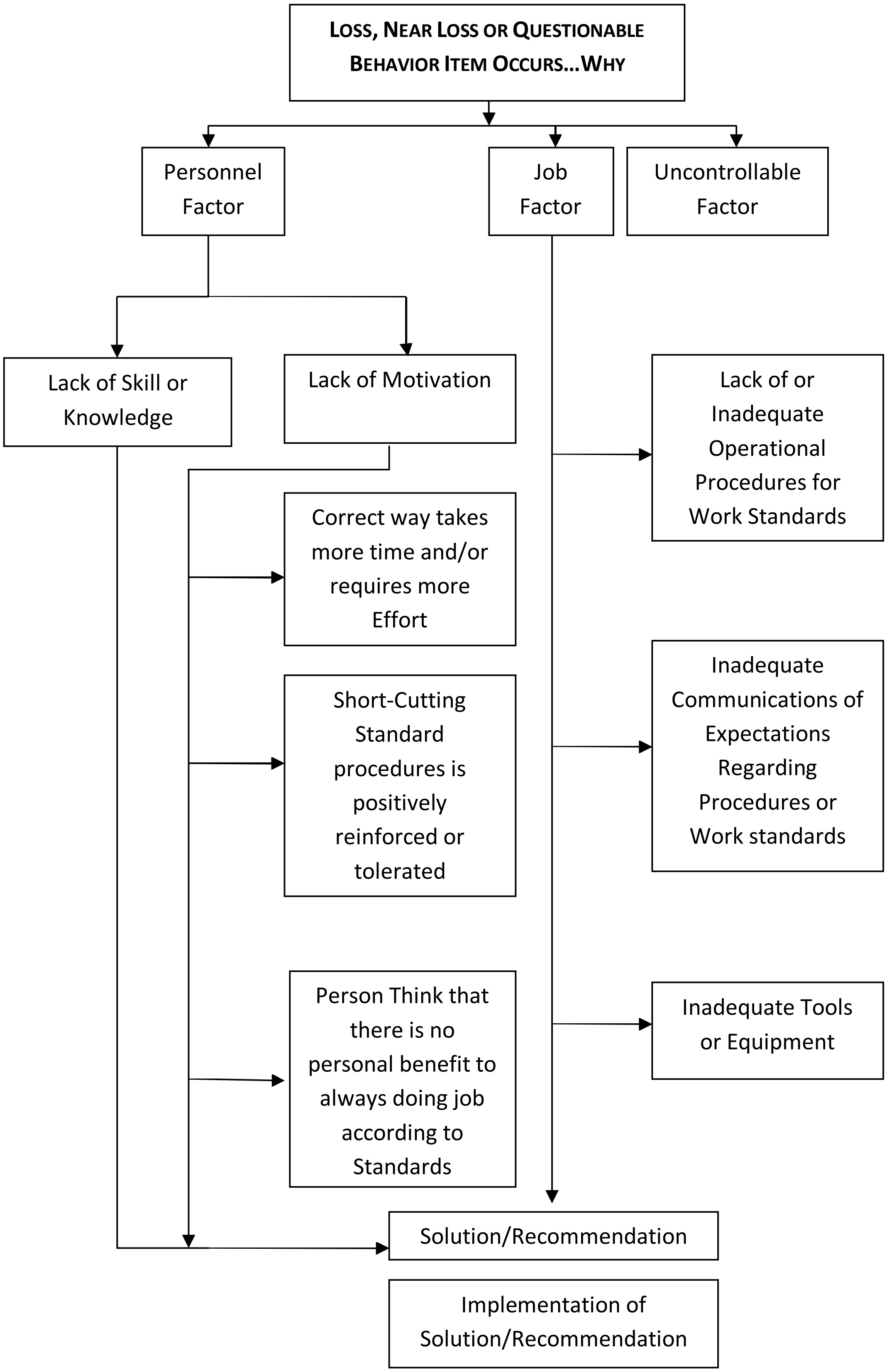
ROOT CAUSE ANALYSIS FLOW CHART



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DOCUMENT REVIEW FORM

Project Name: York Former Naval Ordnance Plant	Client/Contract:Harley-Davidson/Project no. 6292101	
Type: Plan / Report / Letter / Memo	Title: Work Plan Addendum for the RI of the MRAs at the Former York Naval Ordnance Plant, York Pennsylvania	
Personnel Name	**Date**	**Signature**

Attachment 5

Pennsylvania Natural Diversity Inventory (PNDI) Coordination

(electronic on CD only)

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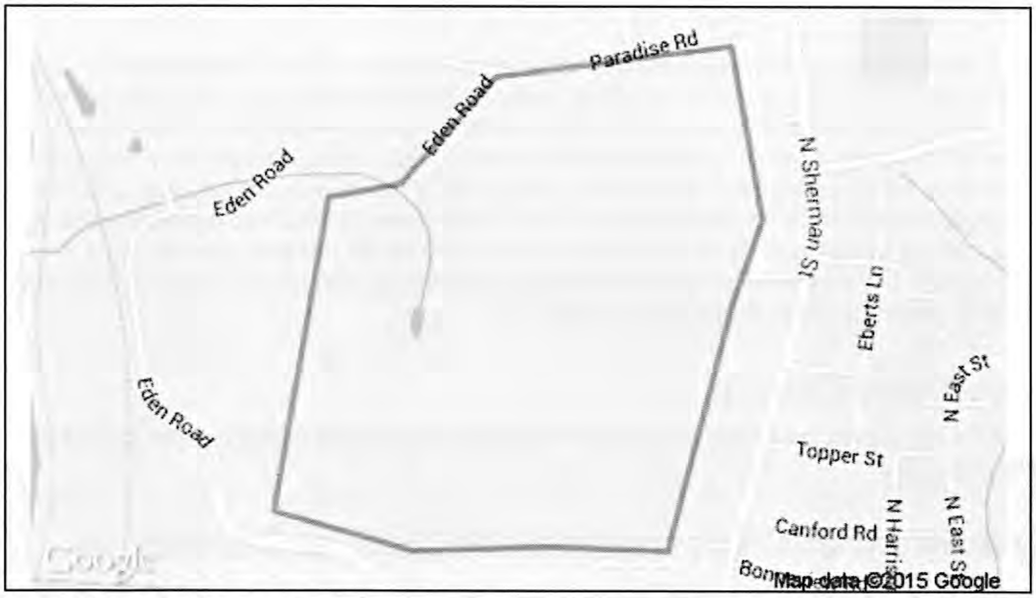
1. PROJECT INFORMATION

Project Name: **Harley**
Date of review: **7/21/2015 5:53:45 PM**
Project Category: **Hazardous Waste Clean-up, Site Remediation, and Reclamation,Other**
Project Area: **161.2** acres
County: **York** Township/Municipality: **Springettsbury**
Quadrangle Name: **YORK** ~ ZIP Code: **17402**
Decimal Degrees: **39.988300 N, -76.707482 W**
Degrees Minutes Seconds: **39° 59' 17.9" N, -76° 42' 26.9" W**



2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate no known impacts to threatened and endangered species and/or special concern species and resources within the project area. Therefore, based on the information you provided, no further coordination is required with the jurisdictional agencies. This response does not reflect potential agency concerns regarding impacts to other ecological resources, such as wetlands.

Note that regardless of PNDI search results, projects requiring a Chapter 105 DEP individual permit or GP 5, 6, 7, 8, 9 or 11 in certain counties (Adams, Berks, Bucks, Carbon, Chester, Cumberland, Delaware, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Schuylkill and York) must comply with the bog turtle habitat screening requirements of the PASPGP.

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for two years** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission

RESPONSE: No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE: No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

U.S. Fish and Wildlife Service
Pennsylvania Field Office
110 Radnor Rd; Suite 101, State College, PA 16801
NO Faxes Please.

PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

7. PROJECT CONTACT INFORMATION

Name:______________________________
Company/Business Name:____________________
Address:____________________________
City, State, Zip:_______________________
Phone:(____)______________Fax:(____)__________
Email:_____________________________

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

______________________________ __________________
applicant/project proponent signature date