

N00174.AR.000751
NSWC INDIAN HEAD
5090.3a

FINAL MUNITIONS INVESTIGATION WORK PLAN AT UXO 6, 11, 20, 30 AND 27 NSWC
INDIAN HEAD MD
1/1/2010
CH2MHILL

Final

**Munitions Investigation Work Plan
for
Land Sites UXO 6, UXO 9, UXO 11, UXO 20, and UXO
30; and Water Site UXO 27**

**Naval Support Facility Indian Head
Indian Head, Maryland**

Contract Task Order 0012

January 2010

Prepared for

**Department of the Navy
Naval Facilities Engineering Command
Washington**

Under the

**NAVFAC CLEAN 1000 Program
Contract N62470-08-D-1000**

Prepared by



Chantilly, Virginia

Executive Summary

Naval Support Facility Indian Head is in the process of investigating closed ranges following the Comprehensive Environmental Response, Compensation and Liability Act investigation process. As part of this process, a Preliminary Assessment (PA) was completed by Malcolm Pirnie in 2005. The next step in the investigation process is to conduct a Site Inspection (SI), based on the recommendations in the PA. This document was prepared under the U.S. Department of the Navy, Naval Facilities Engineering Command Washington Comprehensive Long-term Environmental Action, Navy Contract Number N62470-08-D-1000, Contract Task Order 0012.

This SI consists of a munitions investigation for the following land and water sites:

Land Sites

- Nitroglycerin Slums Burning Ground (Unexploded Ordnance [UXO] 6)
- Single Base Propellant Grains Spill Area (UXO 9)
- The Valley (UXO 11)
- Safety Thermal Treatment Point (UXO 20)
- Gate 3 Burning Ground (UXO 30)

Water Site

- Sonar Training Area (UXO 27)

The general objective of the SI is to determine the presence or absence of munitions at each site. The results of this munitions investigation will be presented in a report for use by the Indian Head Installation Restoration Team to make a management decision about the path forward for each site. The three possible management decisions are as follows: (1) perform a removal action, which could be a time-critical removal action or non-time-critical removal action, based on the types of munitions and explosives of concern (MEC) present to remove from the site; (2) perform a remedial investigation and/or other investigation as warranted, based on the presence of MEC and munitions constituents (MC); and (3) remove the site from further study and recommend no further action, based on the absence of geophysical anomalies or MC.

Contents

Executive Summary	iii
Abbreviations and Acronyms	vii
1 Introduction	1-1
1.1 Base Setting.....	1-1
1.2 Project Organization.....	1-2
1.3 Work Plan Organization	1-2
1.4 Munitions/ Material Potentially Presenting an Explosive Hazard Management and Contingency Plan.....	1-3
1.5 General Field Activities and Procedures	1-3
1.5.1 UXO Personnel.....	1-3
1.5.2 Mobilization and Demobilization.....	1-3
1.5.3 DGM Equipment and Procedures	1-4
1.5.4 Documentation.....	1-4
1.6 Project Schedule	1-4
2 UXO 6 Investigation Activities	2-1
2.1 Background Information.....	2-1
2.2 Objective.....	2-1
2.3 DQOs	2-2
2.4 Data Evaluation.....	2-3
3 UXO 9 Investigation Activities	3-1
3.1 Background Information.....	3-1
3.2 Objective.....	3-2
3.3 Field Activities.....	3-2
3.3.1 Mobilization/Demobilization	3-2
3.3.2 Propellant Grains Inspection and Documentation.....	3-2
3.4 DQOs	3-2
3.5 Data Evaluation.....	3-4
4 UXO 11 Investigation Activities	4-1
4.1 Background Information.....	4-1
4.2 Objective.....	4-2
4.3 Field Activities.....	4-2
4.3.1 Fieldwork	4-2
4.3.2 DGM Survey	4-2
4.4 DQOs	4-3
4.5 Data Evaluation.....	4-4
5 UXO 20 Investigation Activities	5-1
5.1 Background Information.....	5-1
5.2 Objective.....	5-2
5.3 Field Activities.....	5-2
5.3.1 Field Work	5-2

5.3.2	DGM Survey	5-3
5.4	DQOs.....	5-3
5.5	Data Evaluation	5-4
6	UXO 30 Investigation Activities	6-1
6.1	Background Information	6-1
6.2	Objective	6-1
6.3	Field Activities	6-1
6.3.1	Field Work.....	6-1
6.3.2	DGM Survey	6-2
6.4	DQOs.....	6-2
6.5	Data Evaluation	6-3
7	UXO 27 Investigation Activities	7-1
7.1	Background Information	7-1
7.2	Objective	7-1
7.3	Field Activities	7-1
7.3.1	Field Work.....	7-1
7.3.2	DGM Survey	7-2
7.4	DQOs.....	7-2
7.5	Data Evaluation	7-3
8	References.....	8-1

Appendices

- A Accident Prevention Plan
- B Geophysical Investigation Plan
- C Quality Control Plan
- D Health and Safety Plan
- E Standard Operating Procedures

Figures (located at the end of each section)

- 1-1 Facility Location
- 1-2 Project Organization Chart
- 2-1 UXO 6 Proposed Investigation Area
- 3-1 UXO 9 Proposed Investigation Area
- 4-1 UXO 11 Proposed Investigation Area
- 4-2 UXO 11 Historical Firing Points
- 4-3 UXO 11 DGM Survey Areas
- 5-1 UXO 20 Proposed Investigation Area
- 5-2 UXO 20 DGM Survey Area
- 6-1 UXO 30 Proposed Investigation Area
- 6-2 UXO 30 DGM Survey Area
- 7-1 UXO 27 Proposed Investigation Area
- 7-2 UXO 27 DGM Survey Area

Abbreviations and Acronyms

DGM	digital geophysical mapping
DQO	data quality objective
EOD	explosive ordnance disposal
EPA	U.S. Environmental Protection Agency
GPS	global positioning system
IAS	Initial Assessment Study
IHIRT	Indian Head Installation Restoration Team
MC	munitions constituents
MDE	Maryland Department of the Environment
MEC	munitions and explosives of concern
MPPEH	material potentially presenting an explosive hazard
MR	munitions response
msl	mean sea level
NAVFAC	Naval Facilities Engineering Command
Navy	U.S. Department of the Navy
NFA	no further action
NG	nitroglycerin
NSF-IH	Naval Support Facility Indian Head
OB	open burning
OB/OD	open burning/open detonation
PA	Preliminary Assessment
PDA	portable data assistant
RCRA	Resource Conservation and Recovery Act
RPM	Remedial Project Manager
SI	Site Inspection
STTP	Safety Thermal Treatment Point
UXO	unexploded ordnance

SECTION 1

Introduction

This Work Plan presents the objectives, scope, and procedures for conducting a munitions investigation as part of a site inspection (SI) at six munitions response (MR) sites at the Naval Support Facility, Indian Head (NSF-IH) in Indian Head, Maryland (Figure 1-1). This investigation is not intended to characterize the nature and extent of munitions at each site, but rather to provide data sufficient to determine the presence or absence of munitions for future MR actions. This document was prepared under the U.S. Department of the Navy (Navy), Naval Facilities Engineering Command (NAVFAC) Washington Comprehensive Long-term Environmental Action, Navy; Contract Number N62470-08-D-1000, Contract Task Order 0012.

The following sites are covered under this Work Plan:

Land Sites

- Unexploded Ordnance (UXO) 6 - Nitroglycerin (NG) Slums Burning Ground
- UXO 9 - Single Base Propellant Grains Spill Area
- UXO 11 - The Valley
- UXO 20 - Safety Thermal Treatment Point (STTP)
- UXO 30 - Gate 3 Burning Ground

Water Site

- UXO 27 - Sonar Training Area

This Work Plan was developed using background information contained in the following reports:

- Land Sites: *Final Preliminary Assessment, Main Installation, Naval District Washington, Indian Head, Maryland* (Malcolm Pirnie, 2005a)
- Water Site: *Final Water Area Munitions Study, Naval District Washington, Indian Head, Maryland* (Malcolm Pirnie, 2005b)

This Work Plan incorporates by reference the *Final Master Sampling and Analysis Plan* (TTNUS, Inc., 2009) (hereafter referred to as the Master Plans).

1.1 Base Setting

NSF-IH is a Navy facility in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington, DC. The facility consists of two tracts of land: the Main Installation on the Cornwallis Neck Peninsula, and the Stump Neck Annex, across Mattawoman Creek (Figure 1-1).

The Main Installation contains approximately 2,500 acres and is bounded by the Potomac River to the northwest, west, and south; Mattawoman Creek to the south and east; and the town of Indian Head to the northeast. Included as part of the Main Installation are Marsh

Island and Thoroughfare Island, located in Mattawoman Creek. Elevations range from sea level to approximately 125 feet above mean sea level (msl).

The Stump Neck Annex contains approximately 1,084 acres and is bounded by Mattawoman Creek to the northeast, the Potomac River to the northwest, and Chicamuxen Creek to the south-southwest. Elevations range from sea level to approximately 10 feet above msl.

Both the Main Installation (Cornwallis Neck Peninsula) and the Stump Neck Annex are on the National Priorities List. The Main Installation and Stump Neck Annex are separated by Mattawoman Creek (noncontiguous), have separate U.S. Environmental Protection Agency (EPA) identification numbers, and perform dissimilar operations.

1.2 Project Organization

CH2M HILL will perform the SI with support from the Navy. The project organization chart is shown as [Figure 1-2](#). The Navy Remedial Project Manager (RPM) at NAVFAC Washington will be Mr. Joe Rail.

Mr. Joe Rail

Washington Navy Yard, Building 212
1314 Harwood Street, SE
Washington Navy Yard, DC 20374-5018
Phone: (202) 685-3105
Fax: (202) 433-6193
E-mail: joseph.rail@navy.mil

The secondary contact at NAVFAC Washington will be Mr. Nathan DeLong.

Mr. Nathan DeLong

Washington Navy Yard, Building 212
1314 Harwood Street, SE
Washington Navy Yard, DC 20374-5018
Phone: (202) 685-3279
Fax: (202) 433-6193
E-mail: nathan.delong@navy.mil

The CH2M HILL project manager will be Dr. Margaret Kasim.

Dr. Margaret Kasim

15010 Conference Center Drive, Suite 200
Chantilly, VA 20151
Phone: (703) 376-5154
Fax: (703) 376-5654
E-mail: margaret.kasim@ch2m.com

1.3 Work Plan Organization

The remainder of this Work Plan is divided into the following sections:

- Section 2 – UXO 6 Investigation Activities
- Section 3 – UXO 9 Investigation Activities

- Section 4 – UXO 11 Investigation Activities
- Section 5 – UXO 20 Investigation Activities
- Section 6 – UXO 30 Investigation Activities
- Section 7 – UXO 27 Investigation Activities
- Section 8 – References

Activities for each site are described in their respective sections. Figures are provided at the end of each section. Appendices follow the References section. Several plans have been prepared in support of this scope and are provided as [Appendix A](#) (Accident Prevention Plan), [Appendix B](#) (Geophysical Investigation Plan) and [Appendix C](#) (Quality Control Plan). CH2M HILL has prepared a Health and Safety Plan specific to this investigation that will be followed during the field activities ([Appendix D](#)). Field methods will be performed in accordance with the Master Plans, CH2M HILL's standard operating procedures ([Appendix E](#)), and subcontractors' recommended best practices.

1.4 Munitions/ Material Potentially Presenting an Explosive Hazard Management and Contingency Plan

CH2M HILL will use visual and electronically aided munitions avoidance procedures during field activities. If a munitions item is encountered, the contingency plan will be to recognize, retreat, and report the item to the Navy RPM identified in Section 1.2. It will be the Navy RPM's responsibility to contact U.S. Navy Explosive Ordnance Disposal (EOD) Mobile Unit II, Detachment Officer-in-Charge for proper handling and disposal. CH2M HILL's UXO technicians will not handle any material potentially presenting an explosive hazard (MPPEH) observed at the site.

1.5 General Field Activities and Procedures

General field activities and procedures for the munitions investigation are described in this section. Unless stated otherwise, field activities will be performed in accordance with the Master Plans. Site-specific field activities are described in Sections 2 through 7 of this Work Plan.

1.5.1 UXO Personnel

UXO personnel assigned to this project will be qualified and certified in accordance with NAVSEAINST 8020.9B, *Ammunition and Explosives Personnel Qualification and Certification Program*; terms outlined by the U.S. Department of Labor Employment Standards Administration Wage Hour Division for UXO Personnel; and DDESB TP-18, *Minimum Qualifications for UXO Technicians and Personnel*.

1.5.2 Mobilization and Demobilization

Before mobilization, CH2M HILL field personnel will review this Work Plan to ensure that the scope is executed and health and safety protocols are adhered to as outlined herein. Mobilization includes coordination with the Navy, stakeout of investigative areas, and site orientation for field staff. Utility clearance will not be performed because the munitions

investigation activities do not entail intrusive activities. Demobilization will consist of ensuring that each site is left in the same condition as it was prior to mobilization, except for the vegetation removed during preparation for digital geophysical mapping (DGM) activities.

1.5.3 DGM Equipment and Procedures

DGM will be performed at UXOs 11, 20, 30, and 27 in accordance with the survey procedures provided in the Geophysical Investigation Plan ([Appendix B](#)). Before conducting the DGM survey at each site (except at UXO 27, which is a water site), the investigative area will be marked based on pre-determined boundaries. Vegetation will be removed to prepare the areas for DGM operations. Vegetation removal will consist of clearing brush and removing trees smaller than 6 inches in diameter. All cleared vegetation will be removed and disposed offsite.

1.5.4 Documentation

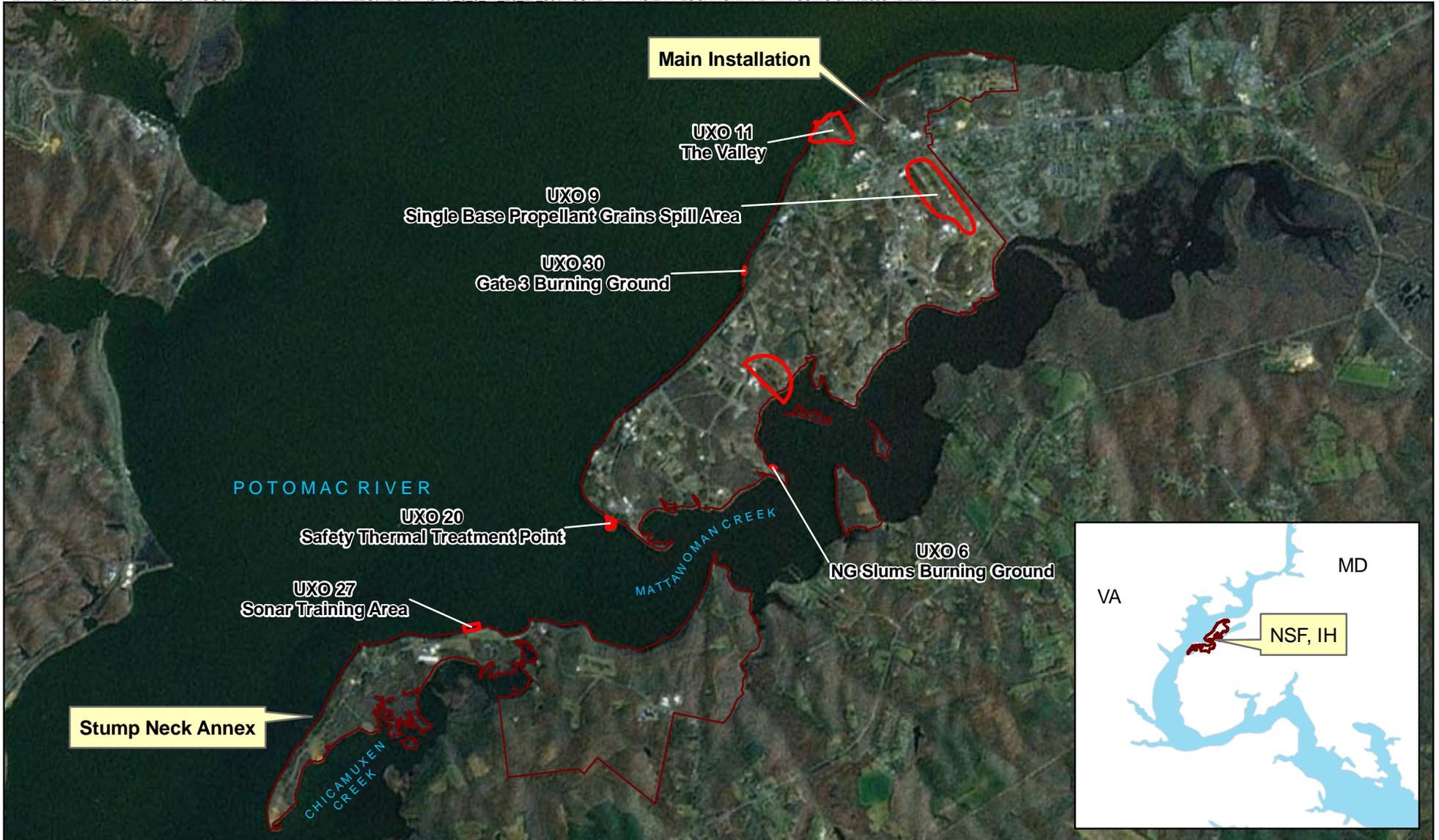
All field information will be documented in handheld portable data assistant (PDA) devices and/or field notebooks in accordance with the standard operating procedure, *Preparing Field Log Books*, provided in [Appendix E](#). The PDA device will be loaded with the NAVFAC MR database software. Entered data will be downloaded on a daily basis and uploaded into each site's NAVFAC MR database.

The NAVFAC MR database is a cradle-to-grave data management system designed to track and easily query all data for MR projects. It digitally captures, tracks, and creates automated reports on:

- Project information, such as the names of field personnel, safety meetings held, grid identifications, and locations of the geophysical survey areas
- DGM and UXO field team notes, such as grids, files, personnel, methods, instruments, and munitions items found
- DGM data processing notes and delivery data, such as file names, processing performed, quality control of data, and delivery dates
- Grid/transect status, such as activities performed by grid and by acre, percents and quantities complete or remaining
- Demolition tracking, noting all munitions items needing demolition or demilitarization, tracked from initial discovery to final disposition)
- Quality control on notes, processing, data, comparison of DGM results to intrusive investigation results, and field activities

1.6 Project Schedule

The investigations are anticipated to start and end in December 2009, and should take about 2 weeks of fieldwork.



- Legend**
- UXO Site Boundaries
 - Installation Boundary

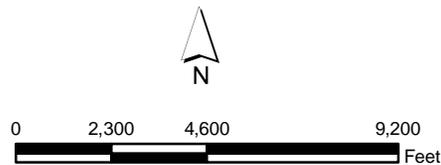


Figure 1-1
Facility Location
Munitions Investigation Work Plan for Land Sites
UXOs 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland

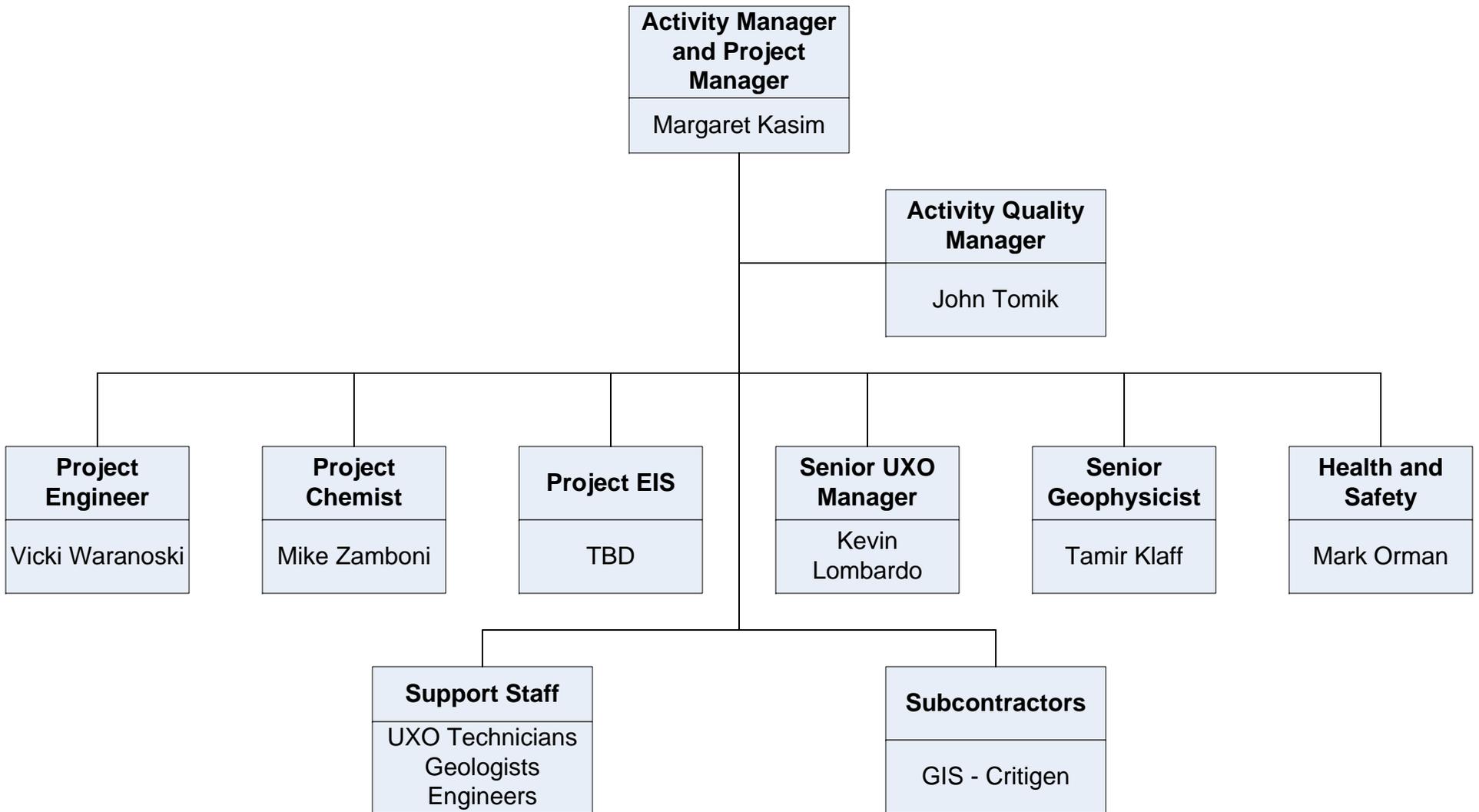


Figure 1-2
 Project Organization Chart
 Munitions Investigation Work Plan for Land Sites
 UXOs 6, 9, 11, 20, and 30, and Water Site UXO 27
 NSF-IH, Indian Head, Maryland

UXO 6 Investigation Activities

This section presents the site background information, the objective of the investigation, and data quality objectives (DQOs) for UXO 6, NG Slums Burning Ground.

2.1 Background Information

UXO 6 is a 0.3-acre site along the shoreline of the Potomac River ([Figure 2-1](#)). UXO 6 was initially Installation Restoration Site 22. The site is on the southeastern shore of the Main Installation adjacent to Mattawoman Creek. Building 1216 is adjacent to the site. The site is reported to have been used as an open burning (OB) ground for NG slums (a production disposal by-product, created when excess NG from the NG production facility was mixed with sawdust for stabilization before disposal, making the NG easier and safer to handle and transport). UXO 6 was operated from the late 1940s to approximately 1953. The types and quantities of accelerants used to burn the NG slums, if any, are unknown.

The general topography is relatively flat, with an elevation of 5 feet above msl. The Preliminary Assessment (PA) noted that if NG was used at the site, the potential for MPPEH, including munitions constituents (MC) exist. With the historical practice of burning NG slums, any contaminant released would have likely been released at the surface. The potential exists that NG, a miscible liquid, may have migrated through the soil column to the shallow groundwater through infiltration. If NG was present, it may have adhered to soil particles in the soil column (surface soil and subsurface soil) as well as reached the surficial groundwater table. Human and ecological receptors may contact NG in surface soil (mainly from handling and treading underfoot). NG in subsurface soil is an incomplete pathway (from intrusive activities).

On November 25, 2008, the Navy and CH2M HILL conducted a site visit, but could not determine the exact location of the site. No bare areas, charred areas, or stressed vegetation were observed at the top of the road. The same observation was made during the CH2M HILL site visit on April 22, 2009 with the Navy, EPA, and Maryland Department of the Environment (MDE). The Navy is requesting an SI for MPPEH because of the use of NG.

2.2 Objective

The objective for this site is to perform an aerial photographic analysis to identify bare or denuded areas in historical photographs that could be used to place locations for sampling MC. Because munitions are not suspected to be present at the site and NG is not associated with any metallic items, investigation using DGM will not be performed.

2.3 DQOs

DQOs are pre-established goals that help monitor and assess the progress of the project. They provide the benchmarks against which the quality of fieldwork and the quality of resulting analytical data are evaluated.

DQOs specify the data type, quality, quantity, and how data are used to support project decisions. The site-specific DQOs presented below were developed following the seven-step process outlined in EPA's *Data Quality Objectives Process for Hazardous Waste Site Investigations* (EPA, 2000).

Step 1: State the Problem

Facility operations may have resulted in the use of the site as an OB ground for NG slum.

Step 2: Identify the Decision

The objective of the aerial photographic analysis is to review historical photographs to verify the location of the burning ground. The information will be used by the Navy, EPA, and MDE to select locations for MC sampling.

Step 3: Identify Inputs to the Decision

Current information on the site consists of data collected during the PA and site visits conducted in November 2008 and April 22, 2009. The information from the photographic analysis will be used to define the area on land where burning may have occurred.

Step 4: Define the Boundaries of the Study

Figure 2-1 shows the x (175 feet), y (75 feet) boundaries of the proposed investigation area, which is consistent with the approximate site boundary in the PA. The actual extent of the area to be investigated will be determined by analyzing the aerial photographs.

Step 5: Develop a Decision Rule

Following the collection of information during the SI, the following decisions will be made:

- If a burn area is identified from the aerial photograph analysis, the MC samples will be collected from this area.
- If a burn (bare) area cannot be located from the aerial photographs, the MC samples will be collected from the area identified in the PA.

Step 6: Specify Limits on Decision Errors

Decision errors are nonexistent because the investigation is limited to a review of aerial photographs to assess if there is a bare area that might be the burn area.

Step 7: Optimize the Design

This investigation is part of an overall phased approach to data collection that is designed to ensure that all appropriate data are collected for management decisions by the Indian Head Installation Restoration Team (IHIRT). The data collection and evaluation process presented in this Work Plan are part of the optimization process.

2.4 Data Evaluation

Information interpreted from the aerial photographic analysis will be used to identify the locations for MC sampling in the next phase of investigation at this site.



NOTES:
 1. One surface soil, two subsurface soil, and one in situ groundwater sample will be taken at each location.
 2. MC sample locations may be modified, biased on the results of the Phase I MEC Investigation results

Legend
 [Red Polygon] UXO 6 - NG Slums Burning Ground

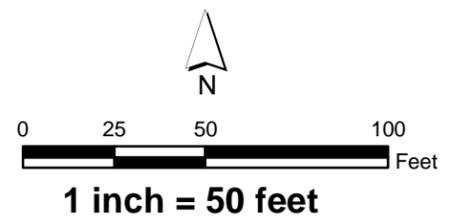


Figure 2-1
 UXO 6 - Proposed Investigation Area
 Munitions Investigation Work Plan for Land Sites
 UXOs 6, 9, 11, 20, and 30; and Water Site UXO 27
 NSF-IH, Indian Head, Maryland

UXO 9 Investigation Activities

This section presents the site background information, the objective of the investigation, field activities, and DQOs for UXO 9, Single Base Propellant Grains Spill Area.

3.1 Background Information

UXO 9 is a 52-acre site located in the northeastern portion of the Indian Head peninsula at the Main Installation ([Figure 3-1](#)). The site was investigated in a 1983 Initial Assessment Study (IAS) (Fred C. Hart Associates Inc., 1983) under the Installation Restoration Program as Site 10. The report recommended no further action (NFA) because of a low risk to human health and the environment from nitrocellulose. The Navy has moved the site to the Munitions Response Program because MC is known to be present at the site.

As reported in the PA, the site consists of an area where single base propellant grains were spilled during transportation of the propellant by rail at the installation. Transportation of the grains started between 1927 and 1942 and ended in the late 1980s; the railroad line was abandoned in the late 1980s. Single base propellant grains were observed on the ground surface outside Building 188 during the PA.

Single base propellant grains consist mostly of nitrocellulose (formed from the reaction between cellulose and nitric acid). These grains are not soluble and, based on their size, are not considered transportable through the soil column. However, grains could be transported by overland flow during periods of high precipitation and released in surface water. Direct contact at the ground surface is considered the most likely exposure scenario. MC, which includes nitrates and diphenylamine, could infiltrate to subsurface soil. Precipitation infiltration may also provide contaminant mobility through the subsurface to the shallow or surficial groundwater aquifer, which is assumed to be connected to nearby surface water bodies. Shallow groundwater is considered a potential exposure medium.

Currently, the site is an open, grassy area along the abandoned railroad tracks formerly used to transport propellants to numerous buildings. Human and ecological receptors may contact the propellant grains in surface soil (primarily from handling and treading underfoot). Contact with the propellant grains in subsurface soil is an incomplete pathway (from intrusive activities). During the April 22, 2009 site visit, a propellant grain was observed on the ground near the northwest corner of Building 188, and a metal canister was observed near the north corner of the building. The Navy historian, Mr. James Dolph, pointed out that the propellant grains could have been packed in this type of canister for transportation; the canisters are typically zinc-plated to prevent sparks.

Based on subsequent e-mail correspondence with Mr. Thomas Wright of NSF-IH after the April 22, 2009 site visit, CH2M HILL was informed that the buildings along the railroad tracks were, in general, used as dry powder houses. The term "dry powder house" was used to identify buildings to "dry" the powder (or grains) that were produced in varying sizes, depending on the guns for which they were manufactured. The grains (or green powder)

were transported by rail to the dry powder houses, where they were left to dry for 5 to 6 weeks. They were then treated with graphite and mixed in a blending tower. The powder was then placed in metal cans and stored in magazines before being shipped from the installation.

3.2 Objective

Because of the observation of a propellant grain during the April 22, 2009 site visit, the presence of munitions has been confirmed and the objective is to assess the spatial distribution of propellant grains through visual inspection along the railroad tracks and around the buildings along the tracks. An aerial photographic analysis also will be performed to identify past activities (such as loading of trains) around buildings.

3.3 Field Activities

3.3.1 Mobilization/Demobilization

Mobilization will be coordinated with the Navy and will include staking out the area for identifying propellant grains, which is approximately a swath of 15 feet across the railroad tracks (5 feet on either side of the railroad track edges) and around buildings up to 15 feet outward from the footprint of the building (Figure 3-1).

3.3.2 Propellant Grains Inspection and Documentation

Before beginning the identification and documentation of the propellant grains, the UXO technicians will validate the global positioning system (GPS) equipment at a location with a known coordinate to ensure that it is functioning as designed. The UXO technicians will inspect any observed propellant grains. Specific tasks for this scope of work are as follows:

- Visually inspect an area of approximately 15 feet by approximately 5,200 feet along the railroad tracks.
- Visually inspect up to 15 feet outward from the footprint of buildings and under buildings (if possible).
- Identify, if possible, the condition of propellant grains and flag the locations.
- Obtain the horizontal location (northing and easting coordinates) for each grain with a portable GPS unit with an accuracy of about 3 meters (9.8 feet).
- Photograph each item observed and maintain a photographic log.

3.4 DQOs

Step 1: State the Problem

This site was used to load and transport single base propellant grains from the former production area. This resulted in the release of grains around buildings where the grains were handled and loaded, and along the tracks. Because facility operations may have

resulted in munitions being released into the environment, an SI will be performed to aid in site management decisions by the IHIRT.

Step 2: Identify the Decision

The objective of this investigation is to assess the spatial distribution of propellant grains through visual inspection along the railroad tracks and around the buildings along the tracks. One propellant grain was observed during the PA and the April 22, 2009 site visit, so the presence of the grains has been confirmed. A thorough site walkthrough will be conducted to identify areas where grains are present for a possible removal action. The collected information will be used by the Navy, EPA, and MDE to evaluate current site conditions and assess future action alternatives.

Step 3: Identify Inputs to the Decision

Current information on the site consists of data collected during the PA and site visits conducted on November 25, 2008 and April 22, 2009. The information from the aerial photographic analysis will be used to identify past activities (such as loading of trains) around the buildings.

Step 4: Define the Boundaries of the Study

In the PA, the site boundary was noted as approximately 52 acres. The investigation, however, will focus on areas where the single base propellant grains would have been handled and transported. [Figure 3-1](#) shows the x (2,500 feet) and y (950 feet) boundaries of the proposed investigation area, which is biased around the railroad tracks and the buildings. The area around the railroad tracks is 15 feet wide by 5,200 feet long. The area around the buildings will include up to 15 feet from the edges of the building footprint and under the buildings, as possible.

Step 5: Develop a Decision Rule

Because a propellant grain has been observed at the site, the information collected during the SI will be used to approximate the spatial distribution of propellant grains within the investigation areas, which consist of the railroad tracks and buildings. The information will be used by the IHIRT to make a decision on the nature and extent of the propellant grains and a possible removal action.

Step 6: Specify Limits on Decision Errors

Decision errors are minimal because the investigation consists of the identification and documentation of propellant grains, which are approximately 2 inches long. The locations of items will be recorded with a handheld GPS and documented in a field notebook and/or a PDA. In addition, the areas proposed for visual inspection have been narrowed down to the railroad tracks and around buildings where propellant grains would have been handled and transported. This will reduce errors in the conceptual site model and current site understanding.

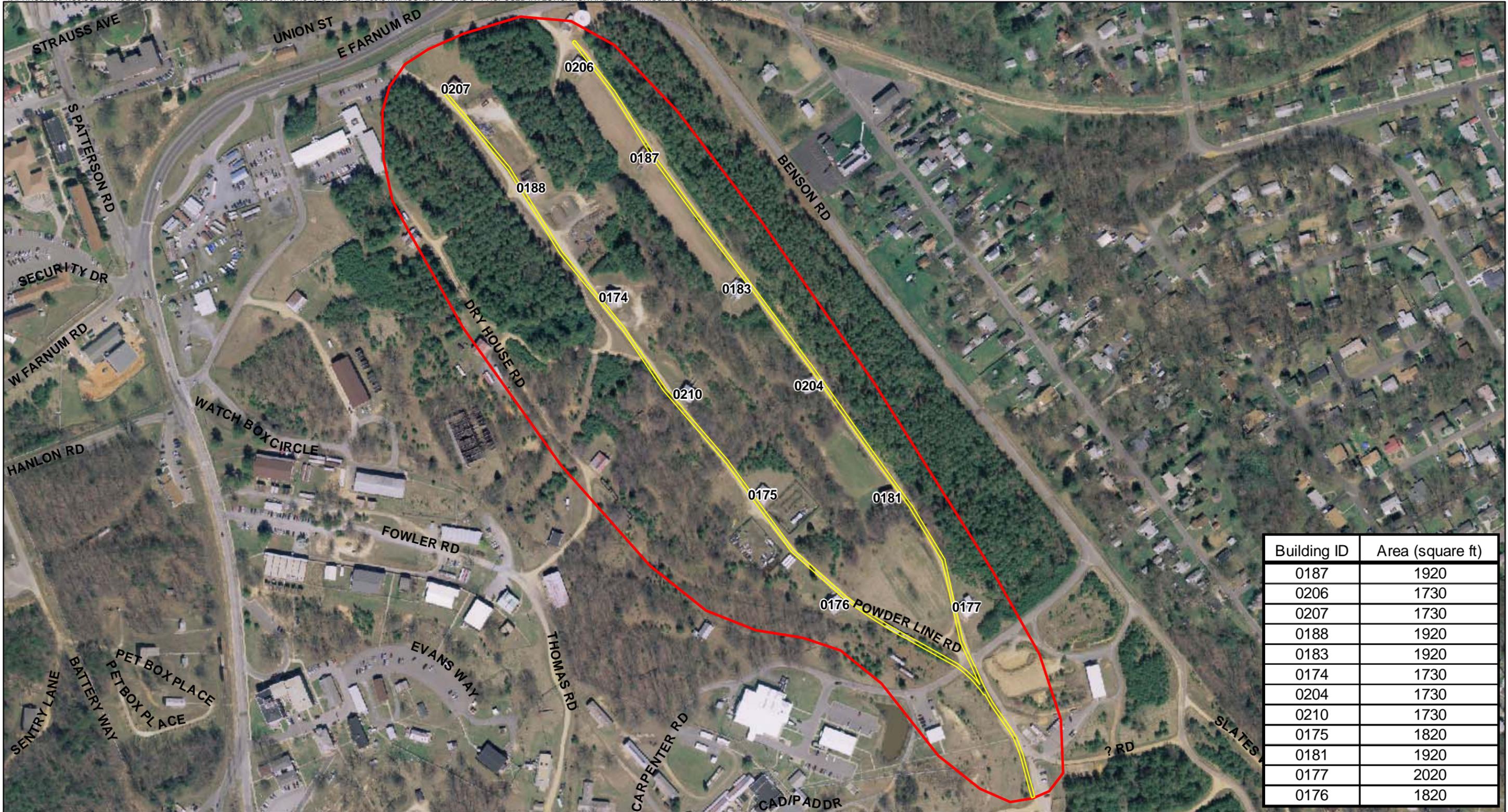
Step 7: Optimize the Design

This investigation is part of an overall phased approach to data collection that is designed to ensure that all appropriate data are collected for management decisions by the IHIRT. The

data collection and evaluation process presented in this Work Plan are part of the optimization process.

3.5 Data Evaluation

Information gained and data collected will be used to approximate the spatial distribution of the propellant grains along the railroad tracks and buildings. The data also will be used to create figures and maps for the SI report. The information will be used by the Navy at a later date to identify an area for a possible removal action.



Legend

- ▭ UXO 9 - Single Base Propellant Grains Spill Area
- ▭ Visual Inspection Area for Propellant Grains

Note:

1. According to Information from the Navy, the buildings were developed as powder dry houses.
2. A "Powder dry house" was a building in which the powder (or grains) that were produced at different sites were dried. The grains (or freeze powder) were transported by rail to the dry houses where they were left to dry for 5-6 weeks.



1 inch = 300 feet

Figure 3-1
 UXO 9 - Proposed Investigation Area
 Munitions Investigation Work Plan for Land Sites
 UXOs 6, 9, 11, 20, and 30; and Water Site UXO 27
 NSF-IH, Indian Head, Maryland

UXO 11 Investigation Activities

This section presents site background information, the objective of the investigation, field activities, and DQOs for UXO 11, The Valley.

4.1 Background Information

UXO 11 is a 21-acre site adjacent to the Potomac River on the northwest portion of the Main Installation ([Figure 4-1](#)). UXO 11 was previously listed as Installation Restoration Site 29 in the IAS. As reported in the PA, the site was a tidal marshland prior to the 1980s. In the 1890s, it was identified by the Bureau of Ordnance as ideal for testing guns and armor because the hills on both sides would absorb shots and potential explosions of new types of gun barrels.

The site was used for developing and testing numerous ordnance items between 1891 and 1921. It also was used for jet propulsion research from 1940 through 1944. Various calibers of guns (1-inch through 16-inch) were proved at UXO 11, using armor-piercing and various other projectiles. Tested projectiles contained a variety of explosive fillers, including black powder, smokeless powder, brown prismatic powder, emmensite, joveite, wet gun cotton, randite, and other high explosives, such as thorite. Testing of cartridge cases, fuzes, primers, firing devices, gum implements, and powders also was conducted. In addition, UXO 11 was used to test steel armor plates for shipboard use; sections of armor plates (8 feet by 10 feet and weighing up to 25 tons) were offloaded at the dock and moved by crane to the appropriate testing location. The projectiles tested ranged from 4 to 10 inches in diameter. UXO 11 also was used to test experimental guns, which led to modifications and improvements of the weapons. In addition, powder testing was performed to assess explosive force, deterioration in storage, and other characteristics.

The PA reported the presence of two firing points at UXO 11 ([Figure 4-2](#)). The North Battery firing point was used for firing long-range guns across UXO 11 south toward primary impact areas at Stump Neck Annex and the Potomac River; because of increasing gun distance and experimental firing, impacts also occurred as far as Quantico, Virginia. The South Battery firing point was used for firing short-range guns into the North Butt along the northeast hillside. The width of UXO 11 was approximately 400 feet, which enabled precision and accuracy testing of short-range guns. The primary impact areas of the short-range gun were sand butts with armor plates positioned against hillsides of UXO 11. The PA estimated the penetration depths for munitions tested and/or developed to range from 4 to 12 feet; these depths are likely overly conservative given that test firing occurred into prepared butts. The depth to which munitions can penetrate the ground surface depends on many factors, such as the type of soil, the angle of impact, the size of the munition, the velocity of the impact, and site-specific environmental conditions.

The PA noted two examples of specific explosions that had occurred in UXO 11; the information was taken from the 1987 annual report. The first example was that a 10-inch

armor-piercing projectile exploded on impact with a steel armor plate; fragmentation from the plate and projectile were spread over $\frac{1}{4}$ mile. The second example was that a gun with loaded Gathmaun projectile exploded on the battery as a result of excessive pressure buildup in the gun. The projectile contained 307 pounds of gun cotton, and debris was spread more than 1 mile away. According to the PA, munitions and related debris (such as base plates, inert mortar, and fins) may be located within this documented fragmentation zone of 1-mile radius.

On April 22, 2009, Mr. James Dolph, the Navy historian, informed the IHIRT that shots were also fired to the south-southeast at UXO 11. Since 1944, part of UXO 11 has been redeveloped as the Dashielle Marina and is used for recreational boat access to the Potomac River. There is also a Navy conference center at the site. The remainder of the site has been used for a variety of installation activities. As part of the PA, a site visit was conducted and it is reported that the data collection team was able to visually observe approximately 90 percent of the range. No munitions, MC, or evidence of munitions used was observed during that visual survey.

4.2 Objective

Because of the historical use of the site, the objective is to determine the potential presence of munitions in specific areas where munitions were fired. These include the hillsides to the northeast and west of the site, and to the south-southeast, shown as Areas A, B, C, and D on [Figure 4-3](#). An aerial photographic analysis will also be performed to identify past activities at the site.

4.3 Field Activities

4.3.1 Fieldwork

Specific tasks for this scope of work are as follows:

- Conduct an aerial photographic analysis
- Stakeout boundaries of Areas A through D
- Clear brush and trees smaller than 6 inches in diameter
- Conduct a DGM survey in Areas A through D

4.3.2 DGM Survey

A DGM survey will be conducted in Areas A through D ([Figure 4-3](#)) as follows:

- Area A (west hillside) (approximately 1.75 acres): The survey will cover 100 percent of all accessible areas of the gun barrel area and hillside.
- Area B (approximately 4 acres): The survey will cover 100 percent of all accessible areas of the north stop butt area.
- Area C (approximately 1.4 acres): The survey will cover 100 percent of all accessible areas of the hill slope.

- Area D (approximately 0.4 acre): The survey will cover 100 percent of all accessible areas.

4.4 DQOs

Step 1: State the Problem

According to historical evidence and site personnel interviews, the site has been used for research, development, gun proving, projectile testing, and testing of cartridge cases, fuzes, primers, firing devices, gum implements, and powders. Because facility activities may have resulted in munitions being released into the environment, an SI will be performed at UXO 11 to aid in site management decisions. The management team consists of representatives of the IHIRT.

Step 2: Identify the Decision

The objective of the SI is to investigate the potential presence or suggested absence of munitions at UXO 11. A geophysical survey will be conducted in discrete impact areas at the site to detect subsurface anomalies. If munitions items are observed on the surface, the type and function will be documented and GPS coordinates will be recorded. The collected information will be used by the IHIRT to evaluate current site conditions and assess future action alternatives.

Step 3: Identify Inputs to the Decision

Current information on the site consists of data collected during the PA and site visits conducted on November 25, 2008 and April 22, 2009. Geophysical data collected during the SI will be used to identify areas for anomaly confirmation by test pits.

Step 4: Define the Boundaries of the Study

In the PA, UXO 11 is reported to be a 21-acre site. Based on a review of the PA and a site visit conducted on April 22, 2009, four areas (Areas A through D) have been identified for a geophysical survey. [Figure 4-3](#) shows the x (1,200 feet) and y (800 feet) boundaries of the four proposed investigation areas. The actual extents of the areas to be investigated will be determined in the field, based on factors such as accessibility and visual observations.

Step 5: Develop a Decision Rule

Following collection of the geophysical data, the following decisions will be made:

- If anomalies are not identified, NFA will be recommended for munitions
- If anomalies are identified, additional investigation will be recommended, which would include excavation at anomaly locations to locate the source of the anomalies in the subsurface.

Step 6: Specify Limits on Decision Errors

Decision errors are minimal because the geophysical survey will be performed in the field with equipment that will be validated before use, and data will be collected as the survey is performed.

Step 7: Optimize the Design

This investigation is part of an overall phased approach to data collection that is designed to ensure that all appropriate data are collected for management decisions by the IHIRT. The data collection and evaluation process presented in this Work Plan are part of the optimization process.

4.5 Data Evaluation

Information gained and data collected will be used by the IHIRT to make a management decision on the path forward for this site. The data also will be used to create figures and maps for the SI report.



Legend
[Red Outline] UXO 11 - The Valley

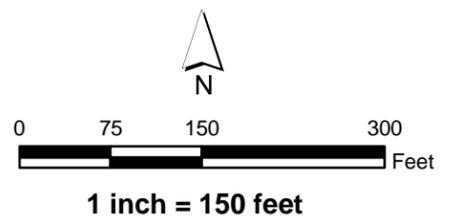


Figure 4-1
UXO 11 - Proposed Investigation Area
Munitions Investigation Work Plan for Land Sites
UXOs 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland



NOTE:
 Preliminary assesment (Malcom Pirnie, 2005) Map 5.7-7 used in creating this figure.

Legend
 [Red Outline] UXO 11 - The Valley
 [Yellow Hatched] Ranges

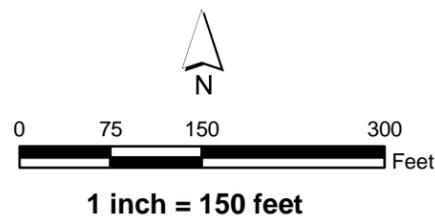


Figure 4-2
 UXO 11 - Historical Firing Points
 Munitions Investigation Work Plan for Land Sites
 UXOs 6, 9, 11, 20, and 30; and Water Site UXO 27
 NSF-IH, Indian Head, Maryland



NOTES:
 1. Area A - West Hillside
 2. Area B - North Stop Butt Area
 3. Area C - Hill Slope,
 4. Area D - North Battery

Legend
 [Red outline] UXO 11 - The Valley
 [Yellow outline] 100% DGM Survey

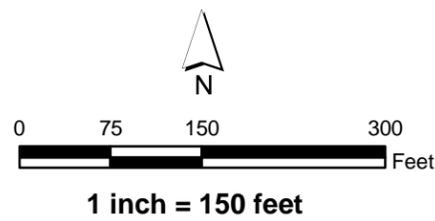


Figure 4-3
 UXO 11 DGM Survey Areas
 Munitions Investigation Work Plan for Land Sites
 UXOs 6, 9, 11, 20, and 30; and Water Site UXO 27
 NSF-IH, Indian Head, Maryland

UXO 20 Investigation Activities

This section presents site background information, the objective of the investigation, field activities, and DQOs for UXO 20, STTP.

5.1 Background Information

UXO 20 is a 1.6-acre site at the end of Old Burn Point Way on a peninsula that extends southwest from the Main Installation into the confluence of the Mattawoman Creek and the Potomac River (Figure 5-1). According to the IAS, the STTP is a man-made peninsula constructed of sand, fill material, rocket motor casings, empty cartridges, and coal fly ash. The PA reported an active test point that uses a maximum of 100 pounds 1.1 explosive, which translates to a fragmentation distance of 5,362 feet, north of the STTP site on the same peninsula. This potential fragmentation zone fully encompasses the site. At the time of the PA, testing occurred within enclosed chambers, but explosives testing outside of the chamber was being proposed.

After abandoning the original burning ground in 1942, OB of waste pyrotechnics and single base, double-base, and composite propellants was performed. Initially, the STTP was set up for two separate uses: (1) the primary burn area, located from the tip of the peninsula and the area 150 feet inland, used for OB of munitions; and (2) the secondary burn area used for munitions testing, which included deflagration-to-detonation testing and pierce testing. From 1942 to 1988, OB occurred at the site on a weekly basis. Until the 1950s, several types of propellants, including water or solvent wet wastes, were burned at the STTP at a rate of 40 to 50 pounds per week. The burning of up to 25,000 pounds per year of less-sensitive explosives, other pyrotechnics, and difficult-to-burn ordnance materials continued through 1988. Additionally, the STTP was used for the open burning/open detonation (OB/OD) of projectiles, cartridge-activated devices / propellant-actuated devices, primers, less-sensitive explosives, high explosives, and other pyrotechnics using in-ground pits. Although ejected materials occasionally left the OB area, most ordnance items would not have penetrated the ground because no firing of munitions occurred.

According to Mr. Perk, a retired production engineer at NSF-IH, all material was burned directly on the ground when the STTP was first constructed. Scrap propellants were put in pits in the ground and ignited. New soil would be brought in periodically as needed. Onsite burn pans were added in 1980. In a few instances, the steel deflection shield was not able to prevent ejected materials from leaving the area. These incidences were caused primarily by burning NG solvents or plastic-bonded explosives in bulk form.

The 1982 IAS performed by the Naval Energy and Environmental Support Activity (NEESA, 1982) reports that sometime in the late 1970s, 5 gallons of waste solvents were spilled on the STTP, reaching surface water. In addition, it was reported that during the same time period, metal items from the site were occasionally ejected into Mattawoman Creek and the Potomac River during OB.

The STTP was previously designated as solid waste management unit 20 under the installation's Resource Conservation and Recovery Act (RCRA) program. In 1993, a study was conducted at the STTP to evaluate whether a clean closure of the range was feasible under RCRA. As part of this site characterization, soil and groundwater samples were collected. The investigation concluded that the detected concentrations of explosives and metals within the soil and groundwater were at levels that would prohibit closure without further action. Soil and groundwater samples contained elevated levels of metals, explosives, volatiles, and semivolatiles when compared to background samples (Versar, 1996).

Several objects were observed during a June 2003 visual survey of the STTP. These objects included a large, cylindrical steel unit, which was identified as the former burn tank in the primary burn area, as well as a steel deflection screen and miscellaneous explosives testing equipment. A former burn tank was observed during the PA and the November 2008 site visit by CH2M HILL. A free-standing metal frame, a steel deflection screen, and other explosives testing equipment also are located on range.

5.2 Objective

Because of the OB activities and testing of ordnance items, the objective is to investigate the potential presence or suggested absence of munitions across the range. The areas to be investigated are shown on [Figure 5-1](#). An aerial photographic analysis will be performed to identify past activities at the site.

5.3 Field Activities

5.3.1 Field Work

Specific tasks for this scope of work are as follows:

- Conduct an aerial photographic analysis
- Document and record using GPS the locations of items in the open land area up to the shoreline, excluding items in buildings or structures
- Perform wipe sampling of items in the open area using Expray™ wipe test modules:
 - If the wipe test reveals that explosives may be present on an item, the item will be defined by description; the location will be surveyed with a GPS; and it will be photographed. The item may have to be decontaminated before disposal.
 - If the wipe test reveals that explosive hazards are not present on an item, the item will be moved to the staging area.
- Remove non-munition related metal debris and stockpile in a staging area to be identified by the Navy
- Stake out boundaries of the DGM survey
- Clear brush and trees smaller than 6 inches in diameter

- Conduct DGM survey

5.3.2 DGM Survey

The DGM survey will be conducted in areas shown in [Figure 5-2](#), covering 100 percent of the accessible areas of the site.

5.4 DQOs

Step 1: State the Problem

The site has been used for OB/OD of waste pyrotechnics, solvents, projectiles, cartridge-activated devices / propellant-actuated devices; primers, less-sensitive explosives, high explosives, and single base, double-base, and composite propellants, according to historical evidence and site personnel interviews. Because facility activities may have resulted in munitions being released into the environment, an SI will be performed at the STTP to aid in site management decisions. The management team consists of representatives of the IHIRT.

Step 2: Identify the Decision

The objective of the SI is to investigate the potential presence or suggested absence of munitions at the STTP. A geophysical survey will be conducted to detect anomalies in the subsurface. If munitions items are observed on the surface, the type and function will be documented and GPS coordinates will be recorded. The collected information will be used by the IHIRT to evaluate current site conditions and assess future action alternatives.

Step 3: Identify Inputs to the Decision

Current information on the site consists of data collected during the RCRA investigation, PA, and site visits conducted on November 25, 2008 and April 22, 2009. Geophysical data collected during the SI will be used to identify areas for anomaly confirmation by test pits.

Step 4: Define the Boundaries of the Study

For the PA, the STTP was documented as a 1.6-acre site. Based on a review of the PA and a site visit conducted on April 22, 2009, the accessible area of the site has been identified for a geophysical survey to confirm the presence of items from anomalies. [Figure 5-2](#) shows the x (200 feet) and y (350 feet) boundaries of the proposed investigation areas. The actual extents of the areas to be investigated will be decided in the field, based on factors such as accessibility and visual observations.

Step 5: Develop a Decision Rule

Following collection of the geophysical data, the following decisions will be made:

- If anomalies are not identified, NFA will be recommended for munitions
- If anomalies are identified, additional investigation will be recommended, which would include excavation at anomaly locations to locate the source of the anomalies in the subsurface.

Step 6: Specify Limits on Decision Errors

Decision errors are minimal because the geophysical survey will be performed in the field with equipment that will be validated before use and data will be collected as the survey is performed.

Step 7: Optimize the Design

This investigation is part of an overall phased approach to data collection that is designed to ensure that all appropriate data are collected for management decisions by the IHIRT. The data collection and evaluation process presented in this Work Plan are part of the optimization process.

5.5 Data Evaluation

Information gained and data collected will be used by the Navy at a later date to identify an area for a possible removal action. Expray™ sampling will be conducted to identify an explosive hazard and is not considered MC sampling because Expray™ cannot detect to hazardous waste levels of contamination.



Legend
 [Red Outline] UXO 20 - Safety Thermal Treatment Point

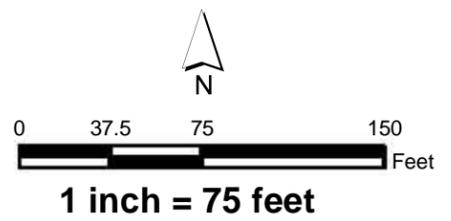


Figure 5-1
 UXO 20 - Proposed Investigation Area
 Munitions Investigation Work Plan for Land Sites
 UXOs 6, 9, 11, 20, and 30; and Water Site UXO 27
 NSF-IH, Indian Head, Maryland



- Legend**
- 100% DGM Survey
 - UXO 20 - Safety Thermal Treatment Point

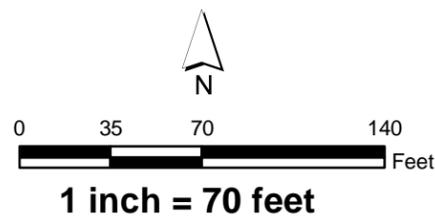


Figure 5-2
UXO 20 DGM Survey Area
Munitions Investigation Work Plan for Land Sites
UXOs 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland

UXO 30 Investigation Activities

This section presents site background information, the objective of the investigation, field activities, and DQOs for UXO 30, Gate 3 Burning Ground.

6.1 Background Information

UXO 30 is a 0.23-acre site along the shoreline of the Potomac River ([Figure 6-1](#)). The site is within the estimated firing fan from UXO 11 and is therefore a suspected munitions area (potential for munitions associated with UXO 11). The site is reported to have been a potential burning ground operating from 1955 to 1961. Explosives may have been brought to the site for burning; however, the types and quantities of explosives are unknown. Based on interviews conducted during the PA, burned munitions could have included flares, pyrotechnics, solid fuze boosters, bulk explosives, propellants, and small arms ammunition. Evidence of burned ground surface and pieces of an old stove were observed during the PA.

A visual survey of the Gate 3 Burning Ground was conducted on June 2, 2004 by the Malcolm Pirnie consultant team and facility personnel. They performed several walking transects across the site to visually inspect the location. Pieces of an old stove were observed during the visual survey, as well as evidence of burnt ground surface. However, the visual survey revealed no evidence of munitions at the site.

On November 25, 2008, the Navy and CH2M HILL conducted a site visit. The exact location of the site could not be determined. The same observation was made during the April 22, 2009 site visit CH2M HILL made with the Navy, EPA, and MDE.

6.2 Objective

Because of the location and potential use of the site, the objective is to investigate the potential presence of munitions across the site. An aerial photographic analysis will also be performed to identify past site activities.

6.3 Field Activities

6.3.1 Field Work

Specific tasks for this scope of work are as follows:

- Conduct an aerial photographic analysis
- Stake out the boundaries of the DGM survey
- Clear brush and trees smaller than 6 inches in diameter; vegetation removal will include clearing an area for a support road from Strauss Avenue
- Pick up surface metal and stage it onsite
- Perform visual observation and conduct DGM survey

6.3.2 DGM Survey

A DGM survey will be conducted in all accessible areas across the entire site (Figure 6-2).

6.4 DQOs

Step 1: State the Problem

The site reportedly has been used for burning explosives. Because facility activities may have resulted in munitions being released into the environment, an SI will be performed at the Gate 3 Burning Ground to aid in site management decisions. The management team consists of representatives of the IHIRT.

Step 2: Identify the Decision

The objective of the aerial photographic analysis is to review historical photographs to identify the location of the burning ground. The information will be used by the Navy, EPA, and MDE to investigate the potential presence or suggested absence of munitions at the site. A geophysical survey will be conducted across the entire site to detect subsurface anomalies. If munitions items are observed on the surface, the type and function will be documented and GPS coordinates will be recorded. The collected information will be used by the IHIRT to evaluate current site conditions and assess future action alternatives.

Step 3: Identify Inputs to the Decision

Current information on the site consists of data collected during the PA and site visits conducted on November 25, 2008 and April 22, 2009. The information from the photographic analysis will be used to define the area on land where burning may have occurred. Geophysical data collected during the SI will be used to identify areas for anomaly confirmation by intrusive investigation.

Step 4: Define the Boundaries of the Study

In the PA, the Gate 3 Burning Ground is reported as a 0.23-acre site. Based on a review of the PA and a site visit conducted on April 22, 2009, the site has not yet been identified. Figure 6-2 shows the x (80 feet) and y (360 feet) boundaries of the proposed investigation areas. The actual extent of the area to be investigated will be determined from the interpreted aerial photographs.

Step 5: Develop a Decision Rule

Following the collection of information during the SI, the following decisions will be made:

- If a burn area could be observed from aerial photographs, the DGM survey will take place in this area.
- If a burn (bare) area could not be observed from the aerial photographs, the DGM survey will take place in the area identified in the PA.

Following collection of the geophysical data, the following decisions will be made:

- If anomalies are not identified, NFA will be recommended for munitions

- If anomalies are identified, additional investigation will be recommended, which would include excavation at anomaly locations to locate the source of the anomalies in the subsurface.

Step 6: Specify Limits on Decision Errors

Decision errors for the aerial photographic analysis are nonexistent because the investigation consists of the review of aerial photographs to assess if there is a bare area that could be the burn area.

Decision errors for the DGM survey are minimal because the geophysical survey will be performed in the field with equipment that will be validated before use, and data will be collected as the survey is performed.

Step 7: Optimize the Design

This investigation is part of an overall phased approach to data collection that is designed to ensure that all appropriate data are collected for management decisions by the IHIRT. The data collection and evaluation process presented in this Work Plan are part of the optimization process.

6.5 Data Evaluation

Information gained and data collected will be used by the IHIRT to make a management decision on the path forward for this site. The data also will be used to create figures and maps for the SI report. The munitions data, in conjunction with the MC sampling results, will be documented in an SI report.



Legend

- Approximate Location of Former LP Gas Storage Tanks
- UXO 30 - Gate 3 Burning Ground

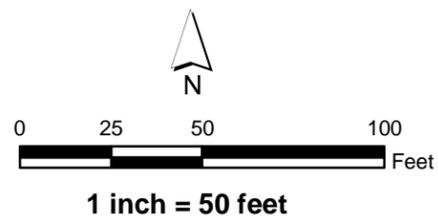


Figure 6-1
UXO 30 - Proposed Investigation Area
Munitions Investigation Work Plan for Land Sites
UXOs 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland



Legend

-  Approximate Location of Former LP Gas Storage Tanks
-  100% DGM Survey
-  UXO 30 - Gate 3 Burning Ground

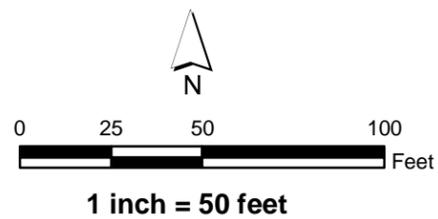


Figure 6-2
UXO 30 DGM Survey Area
Munitions Investigation Work Plan for Land Sites
UXOs 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland

UXO 27 Investigation Activities

This section presents site background information, the objective of the investigation, field activities, and DQOs for UXO 27, Sonar Training Area.

7.1 Background Information

UXO 27 is a 2.1-acre site, of which approximately 1.5 acres lies within the Potomac River and 0.6 acre is on the adjacent shoreline of the Stump Neck Annex (Figure 7-1). It is encompassed within the boundaries of the Water Impact Area. The PA reported that this site was used for sonar training by Navy divers during the 1980s to mid 1990s. During the training, inert munitions items were submerged just offshore so divers could train in underwater ordnance identification. One torpedo casing, one underwater mine casing, and one bomb casing were visible at low tide approximately 75 feet from the water's edge, and it is not known if the items were inert ordnance associated with sonar training. The water portion of the site is currently a recreational waterway, and the land portion is undeveloped. Because potentially non-inert ordnance items have been observed at the site, munitions may be present.

A visual survey of the Sonar Training Area was conducted on June 2, 2004 by the Malcolm Pirnie consultant team and NSF-IH personnel. Only a minimal portion of the Sonar Training Area was visible from the shoreline. The visual survey revealed no evidence of munitions at the site.

During the November 25, 2008 site visit, the site could not be located. Through conversations between CH2M HILL and former Naval EOD personnel, CH2M HILL was informed that the Sonar Training Area is close to the Navy Dive Locker and Wharf area on Stump Neck Annex. The location of the investigation will be based on the PA. If the results show the absence of metallic anomalies, it will be recommended in the SI report to investigate the area south of the docking pier facility.

7.2 Objective

Because of the historical use of the site, the objective is to identify the potential presence of munitions at the site. An aerial photographic analysis will also be performed to identify past site activities.

7.3 Field Activities

7.3.1 Field Work

Specific tasks for this scope of work are as follows:

- Conduct an aerial photographic analysis

- Perform water-based DGM surveys to search for potential munitions.

7.3.2 DGM Survey

The DGM survey will be conducted in areas shown in [Figure 7-2](#). The survey will cover 100 percent of the site within the Potomac River and will not be conducted on land.

7.4 DQOs

Step 1: State the Problem

The site reportedly has been used for training purposes. Because facility activities may have resulted in munitions being released into the environment, an SI will be performed at the Sonar Training Area to aid in site management decisions. The management team consists of representatives of the IHIRT.

Step 2: Identify the Decision

A geophysical survey will be conducted in the shallow water to investigate the presence or absence of items in or on the sediment. If munitions items are observed in the shallow water, the type and function will be documented and GPS coordinates will be recorded. The collected information will be used by the IHIRT to evaluate current site conditions and assess future action alternatives.

Step 3: Identify Inputs to the Decision

Current site information consists of data collected during the PA and site visits conducted on November 25, 2008 and April 22, 2009. The information from the photographic analysis will be used to define the area on land where training activities may have occurred. Geophysical data collected during the SI will be used to identify areas where munitions may be located.

Step 4: Define the Boundaries of the Study

For the PA, the Sonar Training Area was reported as a 2.1-acre site. Based on a review of the PA and a site visit conducted on April 22, 2009, the area has not yet been identified. [Figure 7-1](#) shows the x (500 feet) and y (200 feet) boundaries of the proposed investigation area. The actual extent of the area to be investigated will be based on the PA.

Step 5: Develop a Decision Rule

Following collection of the geophysical data, if anomalies are identified, recommendations for munitions will be made in the SI report.

Step 6: Specify Limits on Decision Errors

Decision errors for the DGM survey are minimal because the geophysical survey will be performed in the field with equipment that will be validated before use and data will be collected as the survey is performed.

Step 7: Optimize the Design

This investigation is part of an overall phased approach to data collection that is designed to ensure that all appropriate data are collected for management decisions by the IHIRT. The data collection and evaluation process presented in this Work Plan are part of the optimization process.

7.5 Data Evaluation

Information gained will be used by the IHIRT to make a management decision on the path forward for this site. The data will be used to create figures and maps for the SI report. The munitions data also will be documented in an SI report.



Legend
[Red Rectangle] UXO 27 - Sonar Training Area

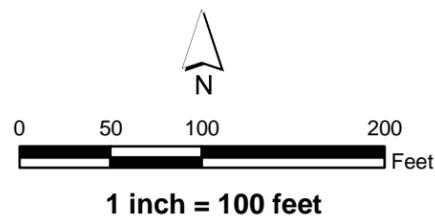


Figure 7-1
UXO 27 - Proposed Investigation Area
Munitions Investigation Work Plan for Land Sites
UXOs 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland



Legend

- UXO 27 - Sonar Training Area
- 100% DGM Survey

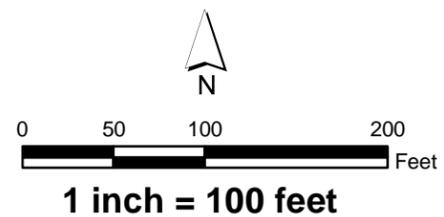


Figure 7-2
UXO 27 - DGM Survey Area
Munitions Investigation Work Plan for Land Sites
UXOs 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland

SECTION 8

References

Department of Defense Explosives Safety Board. 2004. *DDESB TP 18 – Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel.*

EPA. 2000. *Data Quality Objectives Process for Hazardous Waste Site Investigations.* EPA QA/G-4HW.

Fred C. Hart Associates, Inc., 1983. *Initial Assessment Study of Naval Ordnance Station, Indian Head, Maryland.*

Malcolm Pirnie. 2005a. *Preliminary Assessment, Main Installation, Naval District Washington, Indian Head, Maryland.*

Malcolm Pirnie. 2005b. *Final Water Area Munitions Study, Naval District Washington, Indian Head, Maryland.*

Naval Energy and Environmental Support Activity. 1982. *Portion from Initial Assessment Study of Naval Ordnance Station Indian Head Maryland*

NAVSEAINST. 8020.9B - *Ammunition and Explosives Personnel Qualification and Certification Program.*

TTNUS, 2009. *Final Master Sampling and Analysis Plan, Naval District Washington, Indian Head, Maryland.*

Versar, Inc., 1996. *Draft Closure and Post Closure Plans for the Safety Thermal Treatment Point.*

Appendix A
Accident Prevention Plan

Final

**Accident Prevention Plan
Geophysical Investigation of Land UXO Sites 6, 9, 11,
20, 30 and Land/Water UXO Site 27**

**Naval Support Facility
Indian Head, Maryland**

Contract Task Order 0012

January 2010

Prepared for

**Department of the Navy
Naval Facilities Engineering Command
Atlantic Division**

Under the

**NAVFAC CLEAN 1000 Program
Contract N62470-08-D-1000**

Prepared by



Chantilly, Virginia

Contents

Acronyms and Abbreviations	v
1 Signature Sheets	1-1
2 Background Information.....	2-1
3 Statement of Safety and Health Policy	3-1
3.1 Objective.....	3-1
3.2 Purpose.....	3-1
3.3 CH2MHILL Goals	3-1
3.4 Primary Environmental Health and Safety Program Functions	3-1
3.5 Safety Organization and Responsibility	3-2
3.6 Regulator Compliance Policy	3-3
3.7 CH2MHILL Medical Surveillance	3-4
3.8 CH2MHILL Position Statement on Modified Work	3-4
3.9 Field Safety Inspections.....	3-4
3.10 First Aid.....	3-4
3.11 Review of Health and Safety Statistics.....	3-5
3.12 Specific Written Safety Procedures/Permits.....	3-5
3.13 State, OSHA, and Other Regulations	3-5
3.14 Changes	3-5
4 Responsibilities and Lines of Authorities	4-1
4.1 Employee Competency	4-1
4.2 Pretask Safety and Health Analysis	4-1
4.3 Lines of Authority	4-2
4.4 Non Compliance with Safety Requirements.....	4-2
4.5 Managers and Supervisors Safety Accountability	4-2
4.6 CH2MHILL “Employee” Responsibility Requirements	4-3
5 Subcontractors and Suppliers	5-1
5.1 Subcontractor/Supplier Coordination and Control	5-1
5.2 Subcontractor/Supplier Safety Responsibilities.....	5-1
6 Training	6-1
6.1 Safety Indoctrination Subjects.....	6-1
6.2 Mandatory Training and Certifications.....	6-2
6.3 Supervisory and Employee Safety Meetings	6-2
7 Safety and Health Inspections	7-1
8 Accident Reporting and Investigation.....	8-1
8.1 Accident Investigation	8-1
8.2 Exposure Data (Man-hours Worked).....	8-1
8.3 Accident Investigations, Reports, and Logs.....	8-1
8.4 Immediate Notification of Major Incidents.....	8-2

9	Plans Required by the Safety Manual.....	9-1
9.1	Layout Plans.....	9-1
9.2	Emergency Response Plans.....	9-1
9.2.1	Procedures and Tests	9-1
9.2.2	Spill Plans	9-1
9.2.3	Firefighting Plan.....	9-1
9.2.4	Posting of Emergency Telephone Numbers.....	9-1
9.2.5	Man overboard / Abandon Ship.....	9-2
9.2.6	Medical Support	9-2
9.3	Plan for prevention of Alcohol and Drug Abuse.....	9-2
9.4	Site Sanitation Plan.....	9-2
9.5	Access and Haul Road Plan	9-3
9.6	Respiratory Protection Plan	9-3
9.7	Hazard Control Program.....	9-3
9.8	Hazard Communication Program	9-3
9.9	Process Safety Management.....	9-4
9.10	Lead Abatement Plan.....	9-4
9.11	Asbestos Abatement Plan.....	9-4
9.12	Radiation Safety Program	9-4
9.13	Abrasive Blasting.....	9-4
9.14	Heat/Cold Stress Monitoring Program	9-4
9.15	Crystalline Silica Monitoring Plan	9-4
9.16	Night Operations Lighting Plan.....	9-4
9.17	Fire Prevention Plan.....	9-4
9.18	Wild Land Fire Management Plan.....	9-5
9.19	Hazardous Energy Control Plan	9-5
9.20	Critical Lift Plan.....	9-7
9.21	Contingency for Severe Weather Plan.....	9-7
9.22	Float Plan	9-7
9.23	Site Specific Fall Protection and Prevention Plan	9-7
9.24	Demolition Plan.....	9-7
9.25	Excavation/Trenching Plan	9-8
9.26	Emergency Rescue (Tunneling).....	9-8
9.27	Underground Construction Fire Prevention and Protection Plan	9-8
9.28	Compressed Air Plan.....	9-8
9.29	Formwork Shoring and Removal Plan.....	9-8
9.30	Precast Concrete Plan.....	9-8
9.31	Lift Slab Plans.....	9-8
9.32	Steel Erection Plans	9-8
9.33	Site Safety and Health Plan (Hazwoper).....	9-8
9.34	Blasting Safety Plan.....	9-8
9.35	Diving Plan.....	9-9
9.36	Confined Space Program.....	9-9
10	Risk Management Process.....	10-1

Acronyms and Abbreviations

ANSI	American National Standards Institute
APP	Accident Prevention Plan
ASTM	American Society for testing and Materials
CFR	Code of Federal Regulation
CIH	Certified Industrial Hygienist
CPR	cardiopulmonary resuscitation
CSP	Certified Safety Professional
EH&S	Environmental Health and Safety
H&S	Health and Safety
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSM	Health & Safety Manager
HSP	Health and Safety Plan
IAQ	Indoor Air Quality
NIOSH	National Institute for Occupational Health
OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment
PTSP	Pre-Task Safety Plan
RHSM	Regional Health and Safety Manager
RPM	Remedial Project Manager
SHSO	Site Health and Safety Officer
STAC	Safety Task Analysis Card
SWO	Safe Work Observation
TBD	to be determined

SECTION 1

Signature Sheets

Plan Prepared By:

Name: Stephen Brand P.G.
Title: NAVFAC HSE Rep.
Company: CH2MHILL, Inc.
Telephone: 757-671-6211

Signature: _____
Stephan Brand P.G.

Plan Concurrence:

Name: Margaret Kasim
Title: Project Manager
Company: CH2MHILL, Inc.
Telephone: 703 376 5154
Fax: 703 376 5054

Signature: _____
Margaret Kasim, Project Manger

Plan Approval:

Name: Mark Orman
Title: ESH Operations Manager, NER Environmental Services
Company: CH2MHILL Inc.
Telephone: 414-847-0597

Signature: _____
Mark Orman CSP, CHMM, ARM

SECTION 2

Background Information

Background information for this project is detailed in the Health and Safety Plan (HSP), Section 1.1, Introduction as well as the project specific Work Plan, for which this Accident Prevention Plan (APP) and Health and Safety Plan (HSP) is an integral component of.

Statement of Safety and Health Policy

3.1 Objective

To provide a Safe Work Place for all employees by developing and administering an overall Environmental Health and Safety (EH&S) Program. To establish written policies and procedures that serve as vehicles through which the program will be implemented.

3.2 Purpose

The purpose of this Accident Prevention Plan (APP), in conjunction with the project Health and Safety Plan (HSP) is to define the policies, procedures and requirements that must be implemented for the NAVY CLEAN Program projects and to also establish the responsibilities requirements for management, supervisors, employees, and subcontractors that may participate in the execution of the program projects. It is the intent of this APP and HSP to address applicable requirements set forth by 29 CFR 191029 29 CFR 1926, EM 385 1-1, Appendix A and CH2MHILL policies and procedures incorporated by reference, herein.

3.3 CH2MHILL Goals

The health and safety goal of the CH2MHILL program is to eliminate workplace accidents, gain worker acceptance through cooperation and training, and provide our clients with a responsible, well-trained, safety-oriented work force.

CH2MHILL considers safety the highest priority during work at all project sites and its business offices and has established a goal of **zero incidents**. Projects will be conducted in a manner which minimizes the probability of near misses, injury, illness, equipment/property damage.

3.4 Primary Environmental Health and Safety Program Functions

The primary functions of the Environmental H&S program are to:

- Define the health and safety responsibilities of CH2MHILL personnel.
- Administer the medical surveillance program.
- Prepare the site safety plans.
- Provide safety training/maintaining training records.
- Provide safety procedures and protocols to be used at project sites, shops, and offices.
- Conduct accident investigations and maintaining records.

- Verify OSHA compliance under 29 CFR 1910 and 29 CFR 1926 and EM 385 1-1, as applicable to executable contract work.
- Provide guidance and assistance with preparation of safety protocols for specific tasks.
- Promote safety and health consciousness within the company.
- Designate the functional organization of safety committees to serve corporate and project specific safety and health program needs.

3.5 Safety Organization and Responsibility

With CH2MHILL, the safety and protection of employees, clients, and the community is the first priority. This concern for safety is not restricted to field operations but extends to laboratories, the offices, and treatment facilities. If an activity or condition is unsafe, the task will not proceed until the situation is corrected.

The **Program Manager** is the primary operational safety official for the Navy CLEAN Program at CH2MHILL and has overall responsibility for ensuring that program participants adhere to the H&S policies and procedures.

The **Health and Safety Manager (HSM)** administers the safety program for CH2MHILL and reports directly to the Program Manager with regard to Navy CLEAN program matters. The HSM, or his designee, is responsible to support and assist program staff in executing the HSSE policies and procedures. The HSM also maintains secondary reporting to the Deputy Program Manager.

The **Site Health and Safety Officer (SHSO)** is responsible for administration and enforcement of the safety procedures and protocols on project sites. The SHSO is the primary safety official at the working level. The responsibility for safety is delegated and shared by project managers, alternate site safety officers, and subcontractors' supervisors. At a minimum, the SHSO must perform, or otherwise supervise the performance of, the following:

- Motivate employees and supervisors of subcontractors to adhere to CH2MHILL's safety policy in each work situation.
- Schedule, organize, and lead preparatory phase meetings prior to all activities relevant to definable features of work and have a working knowledge of the safe procedure for all jobs and tasks under their supervision. When in doubt, seek assistance prior to initiating a task. This is the only acceptable manner in which to perform the task. If the task cannot be accomplished safely, it will not be attempted.
- Explain the safety procedure involved with a task to each employee and check frequently to see that the employee understands and works as instructed.
- Allocate sufficient time for the training and coaching of all employees to insure that everyone knows the correct procedure for safely accomplishing required tasks. New employees will not be allowed to perform any work until required training is completed.

- Immediately correct unsafe conditions that involve CH2MHILL employees or subcontractors.
- Ensure that employees are outfitted with and wear personal protective equipment as specified by this plan, the HASP, EM 385-1-1, and other CH2MHILL procedures.
- Set a good safety example.
- Obtain the cooperation of employees and sub-contractors. Sub-contractor safety performance records will be verified prior to contract award and will be continually monitored during operations.
- Report all accidents, near misses and property damage in accordance with the Incident Management and Reporting Procedure.

Every Employee, regardless of job title, shares the responsibility for safety and should report any unsafe work condition without fear of reprisal. It is imperative that employees observe the following minimum requirements in order to achieve a safe and healthy workplace:

- Each employee must be familiar with this Accident Prevention Plan and the general safety rules herein.
- Each employee will practice safe procedures and follow all safety rules and regulations for the successful completion of any job task.
- All employees will wear the necessary personal protective equipment required for the job or task as specified by this plan, EM385-1-1, and other CH2MHILL procedures.
- The employee will notify the immediate supervisor of any potential hazard or unsafe work practice that could result in injury or destruction of property.
- The employee will report all accidents to an immediate supervisor regardless of whether injury or property damage resulted. This includes all near misses (accidents without injury or damage). This requirement serves to bring unsafe conditions to the attention of management.
- Each employee will be subject to contraband search for safety purposes and for the safety of fellow employees.
- Violations of published safety policies and procedures may be cause for disciplinary actions up to and including dismissal.
- All employees who are taking prescribed medications that could affect work performance or might alter the manner in which they could be treated in an emergency will so advise their supervisor prior to beginning work.

3.6 Regulator Compliance Policy

The policy of CH2MHILL is to comply with all federal, state, local, and client regulations. It is the responsibility of all personnel to perform all work in full compliance with appropriate

regulations. Safety and health personnel will immediately bring any condition regarding safety and health compliance to the attention of supervisory operating personnel.

CH2MHILL will endeavor to ensure regulatory compliance by all of its subcontractors, including, safety records, OSHA training, and medical surveillance, as applicable.

3.7 CH2MHILL Medical Surveillance

All employees who perform work at hazardous waste sites or perform emergency response will be subject to the CH2MHILL medical surveillance program. This program conforms to the requirements established by 29 CFR 1910.120/1926.65 (f) Medical surveillance and is titled SOP HSE-113, Medical Surveillance.

3.8 CH2MHILL Position Statement on Modified Work

CH2MHILL will attempt to eliminate all accidents through strict compliance with OSHA regulations and CH2MHILL H&S procedures, as well as supervisor and employee safety training, safety audits, and constant attention to safety. Should employee be injured or become ill in the course of and arising from his employment, CH2MHILL will attempt to provide modified work. Modified work ("light duty") will be made available in order to bring the injured employee back to the work environment, for the benefit of the employee and the company, whenever medically appropriate.

Employees are expected to return to modified work when medically capable. The work assigned to the injured employee will meet the restrictions set forth by the treating and/or company physician. Examples of modified work include but are not limited to office work and light shop work.

3.9 Field Safety Inspections

Weekly safety inspections will be made of the work area/workers and documented on Safe Work Observation forms (SWOs). The inspection will be made by the Site Superintendent/Supervisor, Field Team Lead, (herein after as individual responsible for site operations) and/or the SHSO, or other designated CH2MHILL representative. These inspections are in addition to the daily inspections to be held by these individuals and designated crew leaders. Discrepancies found during inspections will be corrected as soon as practicable. Serious safety violations will be corrected immediately. Inspection records (SWOs) will be maintained in project files, and sent to regional HSSE for tracking.

Additionally, the CH2MHILL HSM or designated representative may make periodic unannounced inspections of work sites on their own discretion or at the request of an employee, supervisor, manager, or client.

3.10 First Aid

Each facility and work location must be evaluated to determine the potential requirement for medical emergencies. At a minimum, an industrial first-aid kit will be provided. An

adequate number of employees with current certification in first aid and cardiopulmonary resuscitation (CPR) will be maintained on the project sites.

The SSHO will ensure that emergency medical attention is readily available. For emergency response and remediation operations, the SSHO will establish the requirement for medical emergency response and identify an emergency medical facility with chemical contamination trauma capability. If site conditions require, a subcontract emergency medical technician (EMT) and/or the availability of ambulance service on site will be implemented.

Medical Support requirements are also defined by section 9.2.6 of this APP.

3.11 Review of Health and Safety Statistics

A designated representative from CH2MHILL will review and tabulate safety statistics as necessary:

- Workers' Compensation Experience Modification Ratings
- OSHA 300A forms

3.12 Specific Written Safety Procedures/Permits

In order to provide a safe work place and communicate specific work requirements for regulatory compliance, specific tasks are incorporated by reference to this procedure. These procedures deal with specific areas such as confined space, hot work, lock out tag out, etc.

All CH2MHILL personnel who may be subject to these procedures will receive appropriate training and will be held accountable for compliance with procedure requirements.

3.13 State, OSHA, and Other Regulations

Where state regulations differ from federal regulation cited in this plan, the more stringent regulation will apply.

3.14 Changes

Any user of this plan is welcome to recommend changes. Changes normally result from finding errors, regulatory changes, equipment modification, new equipment purchases, and changes to operation procedures or site conditions. The format for making a recommended change is:

Submit a written recommendation to the CH2MHILL HSM via your immediate supervisor (overall CH2MHILL Project Manager). The CH2MHILL HSM will review the recommendation.

After review, the CH2MHILL HSM will determine if the suggestions should be included as an amendment or new procedure in this plan. Changes to this plan will be distributed immediately upon approval.

Responsibilities and Lines of Authorities

Any CH2MHILL on-site employee will have the authority to intervene and suspend work in the interest of safety policy compliance; however, following intervention, the SHSO must be contacted immediately. The SHSO will contact the Project Manager and the Regional Health and Safety Manager (RHSM).

- Mark Orman CH2MHILL RHSM
- Margaret Kasim CH2MHILL Project Manger
- TBD CH2MHILL Site Health and Safety Officer

Safety responsibilities, accountability and lines of authority are further discussed in Section 3.2 of the HSP, Project Safety Responsibilities.

4.1 Employee Competency

Employee competency, as defined by 29 CFR 1926.32(f) and for areas of executable contract work for which an employee has responsibility for, shall be established by the appropriate employer only. Competency shall be determined by employee training, total work experience, professional certification and/or educational degrees. It is the opinion of CH2MHILL HILL that the above professionals are competent in their areas of expertise with regard to the management, field execution of the contract work, or in the implementation of CH2MHILL site specific or program health & safety requirements, as applicable. Executable on-site contract work, for which there is a requirement for a competent person to oversee, will not be conducted unless a competent person is available on-site.

Employee training records are available at corporate offices, by electronic means and maintained on the project site. Depending on the size of the project crew and because of work crew dynamics and scheduling, provision of hard copy employee training and medical surveillance records within the content of this APP or HSP is impractical. CH2MHILL HILL endeavors to maintain these documents on site for review and can be provided to government officials for verification upon request.

In addition to the above, the CH2MHILL HILL HSM is a Certified Safety Professional (CSP) and meets established qualification and training criteria requirements and exhibits sufficient knowledge in health, safety and/or industrial hygiene matters to act as the responsible program official in the oversight of the CH2MHILL Health and Safety Program.

4.2 Pretask Safety and Health Analysis

Requirements for completing Pre-Task Safety and Health Analysis for performing on-site work must be, at a minimum, in accordance with sections 10.1 and 10.2 of the HSP.

4.3 Lines of Authority

Safety responsibilities, accountability and lines of authority are discussed in Section 3.2 of the HSP and 3.5, 4.0 and 4.5 of this APP. The CH2MHILL Chain of Command and Incident Reporting Process for this project are included in sections 10.3 and 10.7 of the HSP.

4.4 Non Compliance with Safety Requirements

All project personnel have the authority to stop work if it is their judgment serious injury could result from continued activity. The individual responsible for site operations or SHSO will be notified immediately if this becomes necessary. To protect the health and safety of all personnel, employees that knowingly disregard safety policies/procedures may be subject to disciplinary actions up to and including termination.

4.5 Managers and Supervisors Safety Accountability

It is the duty of the first line supervisor to motivate employees to adhere to CH2M HILL's safety policy and procedures in each work environment. A first line supervisor, for these purposes, is defined as that person designated to give immediate onsite supervision to personnel involved in a task.

All manager and supervisors will have complete knowledge of the safe procedure for all jobs and tasks under their supervision. When in doubt, they will seek assistance of the HSM, or other authorized program safety professional, prior to initiating a task. This is the only acceptable manner in which to perform the task. If the task cannot be accomplished safely, it will not be attempted.

Managers and Supervisors will:

- Explain the safety procedure involved with a task to each employee and check frequently to see that the employee understands and works as instructed.
- Allocate sufficient time for the training and coaching of all employees to ensure that everyone knows the correct procedure for safely accomplishing required tasks.
- Prevent new employees from performing any tasks until required training is completed.
- Immediately correct unsafe conditions, which involve AGVIQ-CH2MHILL employees or contractors.
- Ensure that the employees are outfitted with and wear personal protective equipment as specified by this APP, site-specific health and safety plan, other CH2MHILL procedures or as directed by the HSM, Project Manager, SSHO.
- Set a good safety example.
- Obtain the cooperation of employees and contractors.
- Provide a safe work environment for employees and contractors.

- Confirm contractor safety performance records have been verified prior to contract award and monitor contractor performance during operations.
- Report all accidents, near misses and property damage in accordance with the Incident Management and Reporting Procedure.

Establish a safety culture, using the elements of the CH2MHILL Safety Improvement process, which promotes awareness, encourages participation and recognizes excellence.

4.6 CH2MHILL “Employee” Responsibility Requirements

Each employee is responsible for their personal safety as well as the safety of others in the area and is expected to participate fully in the *Safety Improvement Process*, particularly the Loss Prevention Observation (LPO) process. The employee must use all equipment provided in an appropriate and responsible manner as directed by the SSHO. All AGVIQ-CH2MHILL personnel will follow the policies set forth in the CH2MHILL Health and Safety Plan. Site personnel concerned with any aspect of health and safety will bring it to the attention of the Project Manager or SSHO. All project personnel have the authority to stop work, if it is their judgment that serious injury could result from continued activity. The individual responsible for site operations or SSHO will be notified immediately if this becomes necessary. Personnel that knowingly disregard safety policies/procedures may be subject to disciplinary actions in accordance with their employer’s established procedure.

Subcontractors and Suppliers

5.1 Subcontractor/Supplier Coordination and Control

CH2MHILL subcontractors should be screened for safety performance and compliance with federal alcohol and drug testing requirements prior to being issued any contract for site work. CH2MHILL subcontractors will comply with the requirements for site safety as outlined in CH2MHILL health and safety procedures.

Full identification of all subcontractors that are or may be required to successfully execute this contract may not be fully detailed at the time that Health and Safety documents are prepared for submission or implementation. Because of the potentially dynamic and evolving nature of contract requirements and resultant project scheduling at many points during the project evolution, only partial identification of potential subcontractors who may be selected for our projects is likely. To this end, continuously updating and amending this APP or HSP with potentially selected, newly selected, or approved subcontractors would not be practical or cost effective for all parties concerned.

CH2MHILL maintains an extensive and detailed process for subcontractor procurement with the Federal Acquisition Regulations (FAR) as the primary driver. The subcontractor selection is based on scope of work pricing, qualifications, safety performance and best value evaluations

5.2 Subcontractor/Supplier Safety Responsibilities

All subcontractor employees are subject to the same training and medical surveillance requirements as CH2MHILL personnel depending on job activity. All activities involving the potential for exposure to hazardous waste materials will require medical and training certification as mandated by 29 CFR 1910.120. All subcontractor personnel will be required to sign in daily and be required to attend a daily meeting discussing operations and safety issues. All CH2MHILL employees and subcontractors will jointly complete a Pre-Task Safety Plan (PTSP) or individually complete a Safety Task Analysis Card (STAC) prior to the start of work at the site. Subcontractors will submit Activity Analyses for their work activities to the CH2MHILL SHSO or HSM for review prior to start of work. The subcontractor reports directly to the CH2MHILL Project Manager, herein referred to as Project Manager. The CH2MHILL Project Manager may designate subcontractor reportability to the CH2MHILL individual responsible for site operations. All incidents involving subcontractor employees will be reported to the CH2MHILL individual responsible for site operations and a copy of the subcontractor's injury/illness report will be submitted to the CH2MHILL Project Manager and HSM, as soon as possible, but no later than 24 hours.

CH2MHILL subcontractors are required to sign off and comply with all requirements of the CH2MHILL Site-Specific HSP, which includes this Accident Prevention Plan (APP). Plans to

address specific hazards may be added to the APP during the course of work. CH2MHILL subcontractors will be required to sign off and comply with any such supplemental plans. Subcontractors not in compliance will be immediately dismissed from the site. Subcontractors will only be allowed on MEC sites when supervised by the appropriate UXO tech crew.

Suppliers delivering various materials to the project site or providing equipment and equipment maintenance will comply with all rules and regulations specified by the owner. Supplier personnel will not be permitted into contaminated areas unless training and medical surveillance is in accordance with 29 CFR 1910.120. Contractors will not ride on tractors, forklifts or similar vehicles unless specific seats are provided. They will follow Facility hot work rules if hot work is required for vehicle or equipment maintenance. Operators of mobile equipment on site must observe all traffic rules such as speed limits and right-of-ways of pedestrians. Suppliers will only be allowed on MEC sites when supervised by the appropriate UXO tech crew.

Training

CH2MHILL engages in environmental remediation, construction, and other services, and endeavors to comply with the numerous health and safety training requirements, mandated by governmental agencies, clients, and internal policies.

Personnel will be provided sufficient training to execute their jobs in a safe and healthy manner.

Direct supervisors are responsible to determine the training requirements of a task and ensure employees have the necessary training to complete the task safely. H&S personnel will assist with this determination and training.

Designated employer personnel and/or electronic databases will facilitate maintenance of training records and applicable experience documentation. If an employee is found to lack sufficient training or experience to perform an assigned task, every effort will be made to provide the employee with the necessary training, or the employee will be replaced by an alternate who does have the proper training and experience the original employee meets the requisite criteria.

Employee training records are available at corporate offices, by electronic means and maintained on the project site. Depending on the size of the project crew, provision of hard copy employee records within the content of this APP or HSP would be impractical, but must be maintained on-site and will be provided to government officials for verification upon request.

6.1 Safety Indoctrination Subjects

Outlines of the site safety orientation for CH2MHILL and subcontractor personnel and visitors are provided in Section 1.0, 2.0, 4.0, and 9.0 of the HSP.

General topics of the site safety orientation for CH2MHILL and subcontractor personnel and visitors:

- MEC safety, staying with and obeying the UXO techs.
- Indian Head Facility Safety Rules: Areas where cell phones and radio transmissions are not allowed, facility speed limits, other base specific safety requirements.
- Boating safety for working on water
- Vegetation clearance safety, including detailed discussion of chain saw operation safety, tree felling and limbing safety, machete safety, and brush cutting safety.
- Biological controls (poison ivy is still a risk even if the leaves are gone), ticks, bees, wasps, feral dogs, mosquito bites.

- Cold stress
- Chemical hazards expected, and on which sites.

6.2 Mandatory Training and Certifications

Mandatory training and certifications are discussed in Sections 3.1 (CH2M HILL Employee Medical Surveillance and Training) and 3.3 (Field Team Chain of Command and Communication Procedures) of the HSP, Training Requirements.

All personnel entering an exclusion zone will be trained in the provisions of this Accident Prevention Plan and be required to sign the Accident Prevention Plan. All personnel entering an MEC exclusion zone will be supervised by a UXO tech and review and sign the MEC Management and Contingency Plan. UXO techs are required to have training and certifications as stated in the MEC Management and Contingency Plan.

6.3 Supervisory and Employee Safety Meetings

The CH2MHILL SHSO will conduct daily safety meetings at the start of each work shift for on site personnel and will require subcontractors to follow similar meeting procedures or participate in the CH2MHILL daily safety meetings.

Safety and Health Inspections

The CH2MHILL Project Manager, individual responsible for site operations or/and the SSHO are required to perform site inspections using the designated checklists that are included herein by reference or are contained in referenced SOPs. The inspection will be made by the Project Manager, Field Team Lead, (herein after as individual responsible for site operations) and/or the SSHO, or other designated CH2MHILL representative. Discrepancies found during inspections will be corrected as soon as practicable and documented in the Loss Prevention Observation form (**Attachment 5** of the HSP). Serious inconsistencies will be corrected immediately. Inspections that identify Imminent Danger or Immediately Dangerous to Life and Health situations will require that work is immediately stopped and personnel are removed from the work area until the situation is abated, corrected or controlled to a non-hazardous condition.

The Individual Responsible for Site Operations or SSHO is responsible for conducting and preparing reports of daily inspections of work processes, site conditions, equipment conditions and submitting them for the project record, as necessary. Corrective actions resulting from identified discrepancies identified in inspections processes, will be reviewed with the Project Manager and implemented, as necessary. Copies of these reports are maintained on file at the project locations.

The CH2MHILL HSM or his designated representative may periodically conduct site visits and perform Site Safety Assessments. Additionally, the CH2MHILL HSM or designated representative may make periodic unannounced inspections of work sites at their own discretion or at the request of an employee, supervisor, manager, or client. Any discrepancies which are identified as part of these inspection processes will be addressed with the project manager overall, or may be corrected in the field if minor in nature.

As required, CH2MHILL's safety equipment will comply with appropriate OSHA, National Institute for Occupational Safety and Health (NIOSH), American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), and U.S. Coast Guard or other recognized certification organizations.

Accident Reporting and Investigation

8.1 Accident Investigation

All accidents, injuries, illnesses, Near Misses will be investigated by the SSHO or other authorized H&S program designate. Upon completion of such investigations, investigation reports shall be provided to the Project Manager for review and circulation to CH2MHILL program stakeholders (HSM, Program/Deputy Program Manager, other potential CH2MHILL stakeholder interests).

The CH2MHILL HSM or authorized designee will investigate all incidents and accidents. Such accidents include, but may not be limited to those accidents, injuries or illness to the following:

- A fatal injury
- A hospitalization of three (3) or more people resulting from a single occurrence
- A weight handling equipment incident
- A permanent total disability
- A permanent partial disability
- Property damage
- Spill
- Near Miss

The CH2MHILL HSM also requests that a specific written accident investigation be conducted in case of an unusual or serious injury or accident. In general, accident, injury, illness and property damage incidents will be investigated in accordance with the requirements in section 10.4 of the HSP.

8.2 Exposure Data (Man-hours Worked)

The CH2MHILL HSM with assistance from designated CH2MHILL personnel tracks and maintains incident records as to Federal reporting requirements (OSHA 300 Log), as applicable to the incident.

8.3 Accident Investigations, Reports, and Logs

Incident investigations for CH2MHILL shall be in accordance with section 10.4 of the HSP. The CH2MHILL HSM, or his designee, conducts accident/incident investigations. Incident investigation reports are completed by the SSHO or other authorized designee and will be reviewed and acknowledged by the Project Manager. The report must be submitted to the Project Manager and HSM, as soon as possible, but no longer than 24 hours.

8.4 Immediate Notification of Major Incidents

CH2MHILL will immediately notify the Base contact/Navy RPM/ROICC/EIT of any major incident, including injury, fire, equipment/ property damage and environmental incident. A full report will be provided within 48 hours. Procedures to be followed in response to any project incident are detailed in the, Section 9.7, Incident Notification and Reporting,.

Plans Required by the Safety Manual

9.1 Layout Plans

Site Layout Plans, drawings or sketches are included in the project specific Work Plan, for which this APP and HSP are an integral components of.

9.2 Emergency Response Plans

The emergency response preparedness and procedures are included in Section 9.0 of the HSP.

9.2.1 Procedures and Tests

The project team intends to verify that emergency response processes are in place and capable of being executed before field assignments begin. Pre-emergency planning procedures for this project are discussed in section 9.1 of the HSP. However, because response to medical or fire emergencies will be by government facility installation personnel or even by outside public responders, it may be impractical and disruptive to the “primary mission” of these responders to perform procedural response testing. When this happens, the designated responsible party shall verify that emergency services are available for response, that contact information is appropriate, and that responders know how to access to anticipated work areas.

9.2.2 Spill Plans

Spill prevention shall be conducted in accordance with the information identified in section 7.0 of the HSP, Project Hazards - Spill Containment Procedures.

9.2.3 Firefighting Plan

CH2MHILL personnel are not considered Firefighting Organizations. Only “small fires” that are containable by the use of first response fire protection equipment may be controlled by CH2MHILL personnel. All other response shall be considered “fire fighting” measures and shall be conducted by facility provided or public agency firefighting teams.

Fire Prevention measures and first response fire protection equipment shall be conducted in accordance with the information identified in section 2.1.4 Project Hazards – Fire Prevention, and section 9.2 Emergency Equipment and Supplies, of the HSP.

9.2.4 Posting of Emergency Telephone Numbers

Emergency contact numbers appropriate to project operations are included on page 5 of the HSP and referred to as the Emergency Contact List. Where temporary construction facilities are established at the project site, this Emergency Contact List shall be posted in a

conspicuous location. Where temporary construction facilities are not allowed or provided, the list shall be available for quick reference by the individual(s) responsible for site operations and location shall also be made known to other site personnel.

9.2.5 Man overboard / Abandon Ship

Not Applicable

9.2.6 Medical Support

Medical support shall be in accordance with section 9.4 of the HSP. Location and direction to medical support facilities shall be posted in a conspicuous location where temporary construction facilities are established at the project site. Where temporary construction facilities are not allowed or provided, the list shall be available for quick reference by the individual(s) responsible for site operations and location shall also be made known to other site other personnel.

In addition, the project shall be outfitted with first aid kits of suitable size and quality (i.e. contents) to meet health and safety requirements on on-site first aid or CPR response. Personnel protective devices shall be provided such that universal precautions against Bloodborne Pathogens can be exercised while administering CPR or first aid. Eye wash stations, either portable or stationary, will be available.

An effective means of communication and to summon transportation of injured workers to medical treatment facilities. Communication devices shall be tested in the area of use to assure functionality.

When a medical facility or physician is not accessible within five (5) minutes of an injury to a group of two (2) or more employees for the treatment of injuries, at least two (2) employees on each shift shall be qualified to administer first-aid and CPR.

9.3 Plan for prevention of Alcohol and Drug Abuse

CH2MHILL substance abuse program is in accordance with section 2.2.3 of the HSP and the CH2M HILL Drug Free Workplace SOP.

9.4 Site Sanitation Plan

Toilet facilities on construction sites shall be provided as follows:

Minimum Toilet Facilities at Construction Sites	
Number of Personnel	Number of Toilets
20 or fewer	One (1)
20 or greater	One (1) toilet seat and One (1) urinal per 40 workers
Greater than 200	One (1) toilet seat and One (1) urinal per 50 workers.

The above requirements do not apply to mobile crews or to normally unattended work locations if employees working at these locations have transportation immediately available to nearby toilet facilities. Separate toilet rooms for each sex need not be provided if toilet rooms can only be occupied by one person at a time, can be locked from the inside, and contain at least one toilet seat.

Toilet facilities shall be constructed so that the occupants are protected against weather and falling objects; all cracks shall be sealed, and the door shall be tight-fitting, self-closing, and capable of being latched. Adequate ventilation shall be provided and all windows and vents shall be screened. Toilet facilities shall be constructed so that the interior is lighted.

Provisions for routinely servicing and cleaning all toilets and disposing of the sewage shall be established before placing toilet facilities into operation. The method of sewage disposal and the placement location selected shall be in accordance with Federal, state, and local health regulations.

Washing facilities shall be provided at toilet facilities and as needed to maintain healthful and sanitary conditions. Each washing facility shall be maintained in a sanitary condition and provided with water (either hot and cold running water or tepid running water), soap, and individual means of drying. If it is not practical to provide running water, hand sanitizers may be used as a substitute. Washing facilities shall be in close proximity to the worksite.

Trash and garbage generated by site activities will be disposed in the facility's dumpsters.

9.5 Access and Haul Road Plan

Site Access and Haul road delineations are included in the project specific Work Plan as applicable, for which this APP and HSP are an integral components of.

9.6 Respiratory Protection Plan

Not Applicable

9.7 Hazard Control Program

The CH2MHILL hazard control program is defined by the entire contents of the HSP and APP, as well as documents included by reference.

9.8 Hazard Communication Program

The Site-Specific Hazard Communication information is included in Section 2.2.5 of the HSP, Project Hazards – Hazard Communication. Hazard Communication awareness training can be accomplished by using the Chemical-Specific Training & Project-Specific Chemical Product Hazard Communication Forms contained in Attachment 3 of the HSP. MSDS information associated with this project is not included herein, for submission, due to the volume of information necessary. It is the intent of the project to compile this information for inclusion in the hardcopy version of the HSP used for implementation on the project site.

9.9 Process Safety Management

Not Applicable

9.10 Lead Abatement Plan

Not Applicable

9.11 Asbestos Abatement Plan

Not Applicable

9.12 Radiation Safety Program

The radiation exposure control measures shall be conducted in accordance with the information identified in section 2.4 Project Hazards – Radiological Hazards and Controls and section 5 Air Monitoring, of the HSP as applicable.

9.13 Abrasive Blasting

Not Applicable

9.14 Heat/Cold Stress Monitoring Program

The heat/cold stress monitoring program shall be conducted in accordance with the information identified in sections 2.2.8 and 2.2.9 of the HSP, Project Hazards - Heat Stress Monitoring and Cold Stress Monitoring, as applicable.

9.15 Crystalline Silica Monitoring Plan

Not Applicable

9.16 Night Operations Lighting Plan

No night operations will be conducted for the execution of this project. However, project visible lighting requirements shall be in accordance with the information provided in section 2.1.7 of the HSP, Project Hazards - Visible Lighting.

9.17 Fire Prevention Plan

Fire prevention shall be conducted in accordance with the information identified in section 2.1.4 of the HSP, Project Hazards - Fire Prevention.

9.18 Wild Land Fire Management Plan

Not Applicable

9.19 Hazardous Energy Control Plan

This program establishes lockout practices of energy sources that could cause injury to personnel involved at the work site. The lockout program covers all employees and outside contractors affected by the cleaning, repairing, servicing and adjusting of prime movers, machinery, and equipment. Only authorized employees will perform such work.

- Authorized employees will be instructed in lockout/tagout procedures by their supervisor. Each new or transferred employee will be instructed by the supervisor in lockout procedures. A sufficient number of tags and padlocks will be supplied. During each phase of construction, a representative from CH2MHILL will be present while the electrical supervisor begins the lock out/tag out process.
- All equipment will be locked out to protect against accidental or inadvertent operation when such operation could cause injury to personnel. Do not attempt to operate any switch, valve, or other energy-isolating device bearing a lock.
- Documented periodic inspections will be made periodically by supervisors to ensure that each procedure is being properly followed. The SSHO will ensure these inspections are being performed and keep on record the inspection reports on the job site. The inspection must include a review addressing the employee's responsibilities. Documentation is to include the date of the inspection, equipment on which the procedure was being utilized, the employees involved, and the person performing the inspection.
- Authorized employees will be certain as to which switch, valve, or other energy isolating devices apply to the equipment being locked out. More than one energy source may be involved. Any questionable identification of sources will be cleared through the supervisors.
- To begin the lockout process, use the following items as a guide. If for any reason the following items are in question, contact your immediate supervisor before moving forward. If more than one individual is required to lock out equipment, each person will place his own personal lock on the energy isolating device(s). One authorized individual and a competent person from the prime contractor (CH2MHILL) with the knowledge of the crew may lock out equipment for the whole crew. In such cases, it is the responsibility of the individual to carry out all steps of the lockout procedure and inform the crew when it is safe to work on the equipment. Additionally, the authorized individual will not remove a crew lock until it has been verified that all individuals are clear and a prime contractor competent person is present.
 - Notify all affected employees that a lockout is required.
 - If the equipment is operating, shut it down by the normal stopping procedure.

- Operate the switch, valve, or other energy isolating devices so that the energy source(s) is disconnected or isolated from the equipment.
- Stored energy, such as capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc., must also be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.
- Lockout energy isolating devices with an assigned individual lock. A second lock will be used if possible by the superintendent.
- After ensuring that no personnel are exposed and as a check on having disconnected the energy sources, operate the push button or other normal operating controls to make certain the equipment will not operate. CAUTION: Return operating controls to the neutral position after the test.
- Attach a completed accident prevention tag and/or sign on the controls of the machine. The identification tag and/or sign will be coordinated with the electrical contractor and the prime contractor. An CH2MHILL representative will then make known to the facility personnel affected by this operation to familiarize them with the identification of these tags or signs and the procedures in which the contractors will be working by, and the point of contact of the electrical supervisor.
- The equipment is now locked out.
- To restore equipment to service, use the following items as a guide. If for any reason the following items are in question, contact your immediate supervisor before moving forward.
 - When the job is complete and equipment is ready for testing or normal service, check the equipment area to see that no one is exposed.
 - When equipment is clear, remove all locks. The energy isolating devices may be operated to restore energy to the equipment. There must be a supervisor from the electrical contractor and the prime contractor present.
- The included checklist for lockout training is a minimum requirement to provide to new employees. The supervisors must sign, date, and retain in their own records this information. The supervisor must also delivery a copy of this training to the Site Safety Officer.
 - Explain the significance of why a machine is locked or tagged out.
 - Explain what an employee is to do (and not do) when encountering a tag or lock on a switch or device they want to operate.
 - Explain the importance of notification of affected employees.
 - Show the employee the location of all locks, tags, and lockout devices.
 - Explain how to recognize the applicable hazardous energy sources.

- Explain the type(s) and magnitude of energy to be isolated on the machinery and how to control that energy.
- Explain the proper sequence of locking out.
- All utility outages will follow the contract specifications, EM 385-1-1 and OSHA standards. The contractors will follow the above information as well as the following:
 - The contractor will supply the required tags and/or locks for each utility outage.
 - PWC Utility outages will be conducted with PWC Utilities, the Contractor and sub-contractor.
 - Interior building/ facility utility outages will be coordinated with Facility Manager, the Contractor and sub-contractor.
 - A preparatory meeting will be held prior to all electrical work and utility outages, this meeting will also cover any safety issues that may pertain to the scope of work. The Activity Hazard Analysis will be reviewed and any additional concerns will be annotated on this form.

In addition to the above, Hazardous Energy Control shall be in accordance with the information identified in section 3.0 of the HSP, Project Hazards - Lock-Out/Tag-Out.

9.20 Critical Lift Plan

Not Applicable

9.21 Contingency for Severe Weather Plan

Not Applicable

9.22 Float Plan

The Float Plan shall be written following section 2.1.1 Project Hazards - Boating Safety, of the HSP.

9.23 Site Specific Fall Protection and Prevention Plan

Fall Protection shall be conducted in accordance with the information identified in section 2.1.8 Project Hazards - Fall Protection, of the HSP.

9.24 Demolition Plan

Not Applicable

9.25 Excavation/Trenching Plan

Not Applicable

9.26 Emergency Rescue (Tunneling)

Not Applicable

9.27 Underground Construction Fire Prevention and Protection Plan

Not Applicable

9.28 Compressed Air Plan

Not Applicable

9.29 Formwork Shoring and Removal Plan

Not Applicable

9.30 Precast Concrete Plan

Not Applicable

9.31 Lift Slab Plans

Not Applicable

9.32 Steel Erection Plans

Not Applicable

9.33 Site Safety and Health Plan (Hazwoper)

A Site Specific HSP for Hazwoper operations is a comprehensive document contained in sections 1.0-11.0 of the HSP and its attachments.

9.34 Blasting Safety Plan

Not Applicable

9.35 Diving Plan

Not Applicable

9.36 Confined Space Program

Not Applicable

SECTION 10

Risk Management Process

A detail of identified project specific hazards and hazard control measures are identified in section 2 of the HSP. A detailed Activity Hazard Analyses for each major phases or work are included in **Attachment 5** of the HSP

Appendix B
Geophysical Investigation Plan

Final

**Geophysical Investigation Plan
for
Land Sites UXO 11, UXO 20, UXO 30 and
Water Site UXO 27**

**Naval Support Facility Indian Head
Indian Head, Maryland**

Contract Task Order 0012

January 2010

Prepared for

**Department of the Navy
Naval Facilities Engineering Command
Washington**

Under the

**NAVFAC CLEAN 1000 Program
Contract N62470-08-D-1000**

Prepared by



Chantilly, Virginia

Approved By:

Project Manager

Date

Approved By:

Senior Geophysicist

Date

Approved By:

Activity Manager and QC Manager

Date

Contents

Acronyms and Abbreviations	vii
1 Geophysical Operations Overview	1-1
1.1 Safety Issues.....	1-1
1.2 DGM Personnel Qualifications	1-2
1.3 Areas to be Investigated.....	1-2
2 Background	2-1
2.1 Past, Current, and Future Site Uses.....	2-1
2.2 Anticipated MEC Types, Composition, and Quantities.....	2-1
2.3 Anticipated Depth of MEC Items	2-1
2.4 Vegetation and Topography.....	2-1
2.5 Bathymetry.....	2-1
2.6 Geologic Conditions	2-1
2.7 Shallow Groundwater Conditions	2-1
2.8 Adverse Geophysical Conditions	2-1
2.9 Site Utilities	2-2
2.10 Manmade Features Potentially Affecting Geophysical Operations	2-2
2.11 Site-specific Dynamic Events	2-2
2.12 Overall Site Accessibility and Impediments	2-2
2.13 Potential Worker Hazards	2-2
3 Geophysical Investigation	3-1
3.1 DGM DQOs	3-1
3.1.1 Magnetometer System Response.....	3-1
3.1.2 Magnetometer System Data Repeatability	3-1
3.1.3 Magnetometer System Positioning.....	3-2
3.1.4 GPS Performance Verification.....	3-2
3.2 Geophysical Instrumentation.....	3-2
3.2.1 Analog Geophysical Instruments	3-2
3.2.2 DGM Instruments	3-2
3.3 Data Acquisition, Processing and Reporting	3-4
3.3.1 Field Data Sheets.....	3-4
3.3.2 Data Processing.....	3-4
3.3.3 Interpretation/Anomaly Selection.....	3-5
3.3.4 Target Locations.....	3-5
3.3.5 Grid Maps	3-5
3.3.6 Records Management.....	3-6
3.3.7 Final Reports, Maps, and Geophysical Mapping Data.....	3-6
3.4 DGM Systems QC.....	3-6
3.4.1 QC Tests	3-7
3.4.2 QC Seed Items	3-8
3.4.3 QC of DGM Data and Deliverables.....	3-8
3.4.4 Corrective Measures	3-8

3.5 Analog Geophysical Systems QC3-8

Tables (located at the end of the plan)

- 1 Water-Based System Data Quality Objectives
- 2 Processing Documentation Requirements
- 3 DGM Instruments Standardization Tests and Acceptance Criteria

Figures (located at the end of the plan)

- 1 Nelco 4K Champion Sports 6-Pound Iron Shot Put
- 2 Overview of DGM Process QC
- 3 QC of DGM Data - Process Flowpath

Attachment

Geophysical System Verification Work Plan

Acronyms and Abbreviations

cm	centimeter(s)
DGM	digital geophysical mapping
DQO	data quality objective
GIP	Geophysical Investigation Plan
GPS	global positioning system
GSV	geophysical system verification
m	meter(s)
MEC	munitions and explosives of concern
MPC	measurement performance criterion
MPPEH	material potentially presenting an explosive hazard
MRP	Munitions Response Program
NSF-IH	Naval Support Facility, Indian Head
OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
QC	quality control
RTK	real-time kinematic
SUXOS	Senior UXO Supervisor
UXO	unexploded ordnance

SECTION 1

Geophysical Operations Overview

This Geophysical Investigation Plan (GIP) provides details of the equipment, approach, methods, operational procedures, and quality control (QC) methods to be used in performing the geophysical investigation at sites UXO 11, UXO 20, UXO 27 and UXO 30, Naval Support Facility, Indian Head (NSF-IH), Indian Head, Maryland. NSF-IH is a Navy facility in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington, DC. Background information on each of the sites can be found in Sections 4, 5, 6, and 7 of the main body of the Work Plan.

The following topics are covered in the remaining subsections of this GIP: safety issues; geophysical data quality objectives (DQOs); description of the site; anticipated munitions and explosives of concern (MEC) types, quantities, compositions, and depths; site physical conditions; adverse geophysical conditions; site utilities and manmade features that may affect the geophysical operation; data acquisition and reporting; and geophysical program QC requirements.

Geophysical instruments will be used during digital geophysical mapping (DGM) survey operations that record instrument response digitally, allowing for the subsequent download and interpretation of the data. DGM instruments will be operated by the DGM subcontractor.

Geophysical instruments used during operations such as clearing locations for emplacement of survey stakes will be analog, meaning these instruments will be used to detect metallic items in the subsurface on a real-time basis and the instrument response will not be recorded. Analog instruments generally indicate the presence of metallic anomalies through sound or visual display. These analog instruments will be operated by an unexploded ordnance (UXO) Technician III or II.

1.1 Safety Issues

Personnel are required to adhere to the project Health and Safety Plan. Surface metal will be removed at each of the land sites before DGM operations begin. MEC avoidance will be practiced during the land-based geophysical surveys. MEC avoidance will be provided by one UXO Technician III or the CH2M HILL Senior UXO Supervisor (SUXOS). DGM survey personnel will not access land areas outside of the survey area or access routes, as directed by the SUXOS or UXO Technician. Personnel are prohibited from touching, handling, moving, or investigating any item that resembles MEC or material potentially presenting an explosive hazard (MPPEH). It is noted that some MEC/MPPEH items potentially present at NSF-IH are not typical “inventory items” and therefore may not initially appear to be MEC/MPPEH (e.g., research and development items). Upon encountering a potential MEC/MPPEH item, DGM personnel will retreat to a designated rally point and immediately inform the SUXOS. The SUXOS will report the finding to the NSF-IH contact (Nick Carros, 301-744-2263) and then contact the

CH2M HILL Project Manager. The NSF-IH contact will coordinate any further action related to the item using NSF-IH resources.

1.2 DGM Personnel Qualifications

DGM operations will be conducted by personnel experienced in MEC geophysical operations and led by a qualified MEC geophysicist. All DGM support personnel onsite will have documented proof of completion of the 40-hour Occupational Safety and Health Administration (OSHA) certification, any necessary re-certification (8-hour refresher), and OSHA-compliant medical monitoring physical exams. At least one DGM team member will be qualified to administer first aid and cardiopulmonary resuscitation. Throughout DGM operations, DGM support personnel will strictly adhere to the general practices given in this GIP and specifically in the project Health and Safety Plan.

1.3 Areas to be Investigated

The areas to be investigated (Figures 4-3, 5-2, 6-2, and 7-2 in the MEC Work Plan) are shown with associated grids to be established for operational control for the DGM operations. Control points will be placed on the ground using either a real-time kinematic (RTK) global positioning system (GPS) or conventional survey equipment as required using the DGM systems.

Background

2.1 Past, Current, and Future Site Uses

Detailed discussions of the past uses of the sites are provided in Sections 4, 5, 6, and 7 of the Work Plan. Additional information can be found in the Preliminary Assessment (PA) report (Malcolm Pirnie, 2005).

2.2 Anticipated MEC Types, Composition, and Quantities

Refer to Work Plan and PA documents.

2.3 Anticipated Depth of MEC Items

The anticipated depth of potential MEC items at the land sites is from near-surface to greater than 4 feet below ground surface (if buried in disposal pits). The depth of MEC items at the water site (UXO 27) is unknown. The training items used at UXO27 were presumably not buried below the sediment surface; however, erosion and sediment deposition may have buried the items.

2.4 Vegetation and Topography

Refer to Work Plan and PA documents.

2.5 Bathymetry

The extent of the geophysical survey at UXO 27 will extend into the shallow water, approximately 75 feet from the water's edge; this is where munitions items were observed. Water depths at UXO 27 are unknown.

2.6 Geologic Conditions

Refer to Work Plan and PA documents.

2.7 Shallow Groundwater Conditions

Refer to Work Plan and PA documents.

2.8 Adverse Geophysical Conditions

There are no known adverse geophysical conditions that might affect DGM operations.

2.9 Site Utilities

No site utilities are expected in the areas where DGM will be performed. However, utility maps will be obtained from NSF-IH to confirm that there are no utilities in the area where DGM will be performed.

2.10 Manmade Features Potentially Affecting Geophysical Operations

It is unknown what manmade features are present at the site that would affect geophysical operations. CH2M HILL will coordinate with NSF-IH personnel to obtain maps and historical information for assessment of manmade features that could potentially affect the operation of the geophysical equipment. A site visit will also be conducted before field mobilization to identify any manmade features.

2.11 Site-specific Dynamic Events

No site-specific dynamic events (for example, unusually strong winds or harsh weather conditions) that might affect the DGM survey operations at the site are anticipated. Although it is possible that weather conditions may impede operations at some time during the project, no significant delays or effects on geophysical instruments resulting from weather are expected.

2.12 Overall Site Accessibility and Impediments

The survey areas are readily accessible via paved or dirt roads, and access impediments are not anticipated.

2.13 Potential Worker Hazards

No potential worker hazards are apparent at the site other than those associated with conducting project field work. Such hazards are addressed in the project Health and Safety Plan.

Geophysical Investigation

A geophysical system verification (GSV) process will be used to validate the DGM system to be used for the land-based surveys. The GSV Work Plan is provided as an Attachment to this plan.

3.1 DGM DQOs

The primary objective of the DGM activities at the site is to identify metallic anomalies that may be MEC, MPPEH or non-MEC metallic items. DQOs specific to the land-based DGM surveys at the site are provided in the attached GSV Work Plan. The DQOs, measurement performance criteria and test methods associated with the water-based system are summarized in Table 1 and discussed in this section. Achievement of the DQOs will be verified by the CH2M HILL Project/QC geophysicist.

3.1.1 Magnetometer System Response

The DQO for the magnetometer system response is determined by measuring how each magnetometer responds to a ferrous metallic item in accordance with industry standards. The measurement performance criterion (MPC) for this DQO is that the response to a standard object is within 20 percent of the expected value (as determined by individual sensor challenges made by using a standard object fitted into a test jig to challenge each sensor). The standard object to be used, shown as Figure 1, is a 6-pound shot put, as specified below:

Shape: Spherical

Material: Iron

Size: 6 pounds

Finish: Matte

Specification: Nelco 4K High School Competition Iron Shot Put (Dick's Sporting Goods Part No. 2033808)

This will be evaluated by ensuring that, on initial testing, the result from QC Test #4 (Static Background and Static Spike) described in Section 3.4 below meets the MPC.

3.1.2 Magnetometer System Data Repeatability

The DQO for magnetometer system data repeatability is that the system responds consistently from the beginning to the end of an operation and from day to day. The MPC for this DQO is that the response to the standard object will not vary more than ± 20 percent from the average value of all daily measurements. This will be evaluated by comparing, on a daily basis, results of QC Test #4 (Static Background and Static Spike) as outlined in Section 3.4 below.

3.1.3 Magnetometer System Positioning

The DQO for magnetometer system positioning is that the coordinates being obtained from the positioning system are at a sufficient enough accuracy to allow for appropriate relocation of MEC items for later investigation. The MPC for this DQO is that the positional error at a known ferrous metal object location will not exceed ± 1 meter (m). This will be evaluated by ensuring, on a daily basis, that the positioning system in use passes QC Test #2 (Record Sensor Positions), as outlined in Section 3.4 below.

3.1.4 GPS Performance Verification

The RTK performance of the GPS system will be verified each day by using a rover unit to acquire a known target position established near the site.

3.2 Geophysical Instrumentation

3.2.1 Analog Geophysical Instruments

The analog geophysical instruments to be used during non-DGM operations where a geophysical instrument is needed to detect metallic items will be a Schonstedt GA-52Cx magnetometer. The Schonstedt GA-52Cx fluxgate gradiometer is a handheld analog magnetometer that detects ferrous objects and ferromagnetic minerals. The instrument provides an audible signal representing the magnitude and direction of the local magnetic field. In application, the operator sweeps the instrument back and forth in the area of interest and monitors the change in pitch of the sound emanating from the instrument. The change in pitch is the magnetometer response to a secondary magnetic field produced by a ferrous metallic item in the area of interest. This instrument will only be used in areas where non-ferrous MEC items are not considered likely to be present.

In cases where non-ferrous MEC items may be present, the White's XLT will be used. The White's XLT is an electromagnetic metal detector that uses a transmitter coil to establish a localized electromagnetic field that induces eddy currents in nearby conductive materials. A collocated receiver coil measures the eddy current response, and the system provides an audible and visual signal representing the magnitude of the response. In application, the operator sweeps the instrument back and forth in the area of interest and monitors the change in pitch of the sound emanating from the instrument.

3.2.2 DGM Instruments

Land-based Surveys

The DGM instrument to be used for the land-based DGM geophysical survey will be the EM61-MK2. The EM61-MK2 is a high-resolution, time-domain electromagnetic instrument designed to detect, with high spatial resolution, shallow ferrous and non-ferrous metallic objects. In comparison with other metal detectors, especially magnetometers, it is much better suited for work in close proximity to man-made structures and in areas of dense subsurface metallic debris. The standard EM61-MK2 system consists of two air-cored, 1-m by 0.5m coils, a digital data recorder, batteries, and

processing electronics. The EM61-MK2's transmitter generates a pulsed primary magnetic field, which then induces eddy currents in nearby metallic objects. Each of the two spatially separated receiver coils measures these eddy currents. The EM61-MK2 offers the ability to measure the eddy currents at three distinct time intervals in the bottom coil or four intervals if no top coil measurements are recorded. Earlier time gates provide enhanced detection of smaller metallic objects. Secondary voltages induced in both coils are measured in millivolts. The arrangement of coils in the standard setup is such that there is a vertical separation of 40 centimeters (cm). Assuming accurate data positioning, target resolution of approximately 0.5 m can be expected.

Positioning of the EM61-MK2 data will be performed either using an RTK GPS or, in areas of the site where tall vegetation will obstruct line-of-sight with the satellites required for GPS positioning, odometer or fiducial positioning methods will be used.

Global Positioning Systems. GPS satellites orbit the earth transmitting a signal that can be detected with a GPS receiver. The GPS receiver uses the known locations of the satellites and the time of signal transmittal to calculate its position. Differential GPS increases the accuracy of GPS readings through the use of two receivers: a stationary receiver that acts as a base station and collects data at a known location and a second roving receiver that makes the position measurements. The base stations can be configured to either transmit the correction data to the rover system or to save the data to be used to correct positional data during post-processing. RTK GPS instruments are ideal for field-mapping applications when satellite visibility conditions are adequate because they provide the highest GPS accuracy possible (sub-cm accuracy). Typical accuracies of geophysical data positioning after adding errors induced by the DGM system operation are in the range of 20 to 50 cm.

Odometer and Fiducial Methods. Odometer methods use a procedure wherein a measuring device (for example, a wheel-based, thread-feeding apparatus) is used to determine the distance traveled along a linear transect. Using this approach, a series of survey lanes are established over a grid. Flags are placed at the beginning and end of each lane, and an operator walks down the lane while sensor readings are collected when triggered by the odometer system at a pre-defined interval (for example, every 20 cm). Walking past the starting and ending points in the survey lane, the operator stops the data collection. By assuming the operator walked in a straight line, the total distance recorded by the odometer system is compared to the known distance travel, and the down-line position for each of the data points is adjusted accordingly.

Fiducial methods use a time-marking procedure to determine the spatial location of the collected data. As in the odometer approach, a series of survey lanes are established over a grid. Flags are placed at the beginning and end of each lane, and at equal distances along the transect (for example, every 30 m). An operator walks down the lane while the data logger collects sensor readings at a prescribed sampling. Walking past the starting, Fiducial, and end lines in the survey lane, the operator presses a button on the data logger that places a fiducial time mark in the data stream. By assuming the operator walked in a straight line at a constant velocity, the location of each data point can be calculated.

Water-based Surveys

The DGM instrument to be used for the water-based DGM geophysical survey will be the G-882 (or comparable) total field magnetometer. The G-882 is a high-resolution, optically pumped cesium vapor instrument that measures the intensity of the earth's magnetic field. The system can be used in shallow or deep water and is capable of detecting ferrous metallic items, such as those potentially present at the UXO 27 site.

Positioning for the water-based DGM data will be through RTK GPS because there are no overhead obstructions to satellite communications. Depending on the setup used by the DGM subcontractor, the GPS system may either be placed with the platform holding the sensors or on the tow vessel. If placed on the tow vessel, layback algorithms will be used to calculate the position of the sensors.

3.3 Data Acquisition, Processing and Reporting

3.3.1 Field Data Sheets

Field information to be recorded in the Munitions Response Program Enterprise (MRP Enterprise) System field devices will include the following:

- Site ID
- Grid ID (or other identifier of surveyed area)
- Field team leader name
- Field team members' names
- Date of data collection
- Instrument used
- Positioning method used
- Instrument serial numbers
- File names in data recorders
- Data collection sampling rate
- Line numbers, survey direction, fiducial locations, start and end points
- Weather conditions
- Grid conditions
- Terrain conditions
- Cultural conditions
- Survey area sketch
- Associated QC data file names
- Field notes (other)

3.3.2 Data Processing

Instrument-specific software will be used for initial data processing, and the output will be imported into Geosoft Oasis Montaj™ for additional processing, graphical display, anomaly selections, and QA/QC. The types of processing used will be system-specific, but the general processing steps that may be performed on the data include the following:

- Positional offset correction

- 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)
- Contour level selection with background shading
- Digital filtering and enhancement (low pass, high pass, band pass, convolution, correlation, non-linear, etc.)

3.3.3 Interpretation/Anomaly Selection

MEC-experienced data processing geophysicists will use the following criteria, supplemented by site- and system-specific criteria established during instrument validation, for selecting and locating anomalies:

- Maximum amplitude of the response with respect to local background conditions
- Lateral extent (plan size) of the area of response
- Three-dimensional shape of the response
- Decay curve characteristics
- Location of the response with respect to the edge of the grid, unsurveyable areas, land features, cultural features, or utilities within or adjacent to the grid
- Potential distortions in the response from interference of nearby cultural features

3.3.4 Target Locations

The target analysis process culminates in the creation of digital target location sheets that contain target information location and amplitude and can be used for future investigation operations (if performed).

3.3.5 Grid Maps

With each target sheet, the DGM subcontractor will also provide a grid map containing the following information:

- Client
- Project
- Contractor
- Map creator
- Map approver
- Date map was created
- Map file name (full path and file extension)
- Scale
- Grid identification

- Grid corner locations
- Contoured data
- Anomaly locations with unique identification numbers
- North arrow, legend, title block, etc.

3.3.6 Records Management

All files will be made available for QC verification during the project to verify that the field and data processing procedures are properly implemented. All raw data files, final processed data files, hard copies, and field notes will be maintained for the duration of the project.

3.3.7 Final Reports, Maps, and Geophysical Mapping Data

No later than 3 work days after collection, the DGM subcontractor will provide each day's data for QC inspection via the Internet using a File Transfer Protocol site, electronic mail (email) attachments for small files under 5 megabytes, or digital compact disk. Such data are considered to be in raw form. These data will be corrected for sensor offsets, diurnal variations, latency, heading error (if magnetometer is used), and drift. The DGM subcontractor also will provide a digital planimetric map, in Geosoft format and coincident with the location of the geophysical survey, so that each day's geophysical data set can be registered within the original mission plan survey map.

All geophysical field data will be provided to CH2M HILL in delineated fields as x, y, z, v1, v2, and so on, where x and y are universal transverse mercator grid plane coordinates in easting (meters) and northing (meters) directions and z (elevation is an optional field in feet), 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. No individual file will be more than 100 megabytes in size and no more than 600,000 lines long. Each grid of data will be logically and sequentially named so that the file name can be easily correlated with the grid name used by other project personnel.

Within 45 days of data collection, the processed geophysical field data, all final maps, and supporting geophysical interpretations will be provided to CH2M HILL. All geophysical data will be accompanied by a report (standard report format out of MRP Enterprise) documenting the field activities associated with the data and the processing performed. Information provided by the MRP Enterprise report is summarized in Table 2.

All sensor data will be correlated with navigational data, based on a local "third order" (1:5,000) monument or survey marker. If a suitable point is not available, a land surveyor will establish a minimum of two new monuments or survey markers with a minimum of third-order accuracy.

3.4 DGM Systems QC

An extensive QC program will be applied to the DGM operations at the site. Figure 2 shows an overall chart of the QC steps.

3.4.1 QC Tests

Each of the DGM systems will be field tested to confirm proper operating conditions. Several basic QC tests will be performed in addition to instrument-specific tests. A description of each basic QC test, its acceptance criteria, and its frequency is provided below and summarized in Table 3.

1. **Equipment Warm-up.** This is an instrument-specific activity, although standard warm-up time is 5 minutes. Some geophysical systems require more warm-up time than others. Each system-specific standard operating procedure defines the equipment-specific warm-up time. Equipment warm-up will be performed the first time an instrument is turned on for the day or has been turned off for a sufficient amount of time for the specific instrument to cool down.
2. **Record Sensor Positions.** Positioning accuracy of the final processed data will be demonstrated by operating the equipment over one or more known points. The accuracy of the data positioning will be assessed by calculating the difference between a known location over which a positioning instrument is held and the displayed position. The sensor position test will be conducted at the beginning of the survey operation for each work day.
3. **Personnel Test.** (*Land-based system only.*) This test checks the response of instruments to personnel and their clothing/proximity to the system. On a daily basis, the instrument coils for those instruments being used that day will be checked for their response to the personnel operating the system. The response will be observed in the field for immediate corrective action and transmitted back to the processor, and analyzed and checked for spikes in the data that could create false anomalies. The personnel test will be conducted at the beginning of the survey operation for each work day.
4. **Vibration Test (Cable Shake).** This test checks the response of instruments to vibration. On a daily basis, the instrument coils/sensors for those instruments being used that day will be checked for their response to vibrations in the cables. The response will be observed in the field for immediate corrective action and transmitted back to the processor and analyzed and checked for spikes in the data that could create false anomalies. The vibration test will be conducted at the beginning of the survey operation for each work day.
5. **Static Background and Static Spike.** Static tests will be performed by positioning the survey equipment within or near the survey boundaries in an area free of metallic contacts and collecting data for at least 1 minute. During this time, the instrument will be held in a fixed position without a spike (known standard) and then with a spike. The purpose of the static test is to determine whether unusual levels of instrument or ambient noise exist. The static background and static spike test will be conducted at the beginning and end of each survey operation.
6. **Repeat Data.** This test is performed to verify repeatability of the data and will be performed after the initial survey over an area. At least 2 percent of the survey area will be resurveyed.

3.4.2 QC Seed Items

At least one QC seed item, a small industry-standard object (discussed in the GSV Plan, provided as an Attachment) will be seeded every 0.75 acre in the land-based survey areas. The seed items will be tagged with labels identifying them as inert and providing a contract reference, a point of contact address, phone number, and a target identifier. CH2M HILL personnel will perform seeding using hand tools. The seed locations will be checked using a hand-held analog geophysical instrument to confirm that no existing anomalies are present at the seed location. Once placed, the locations of all seeded items will be surveyed using an RTK differential GPS or conventional survey equipment. The items will be placed at easily detectable depths in order to have a high enough signal-to-noise ratio to compare to known industry standard target values. Detection of the QC seed items will be monitored by CH2M HILL and if an item is not detected, a root-cause analysis will be performed and corrective actions identified.

3.4.3 QC of DGM Data and Deliverables

Both the DGM subcontractor and CH2M HILL will perform QC of geophysical data and data deliverables at each step of the processing path. Figure 3 shows the processing path and the QC steps performed. Data will not move to the next stage until they have passed the QC check.

QC checks to be performed on field forms, pre-processed data, and processed data can be found in Table 2.

3.4.4 Corrective Measures

Specific corrective measures are related to the type of geophysical equipment used; however, the following are the basic corrective measures to be followed in association with DGM surveying:

- Replacement of sensors if they fail to meet instrument check requirements.
- Resurvey of grids if seeded items are not identified (do not show in the DGM data). When there is a failure to select a seed item from the data but the item is clearly present in the DGM data, a re-analysis of the DGM data will be performed instead of a resurvey.

3.5 Analog Geophysical Systems QC

QC over the analog geophysical instruments will be accomplished through daily checks that the instruments are functioning before using them for field activities. Each instrument will be operated over a small ferrous metallic item. If the instrument is not able to detect the item, it will be taken out of use until it is repaired.

Tables

TABLE 1

Water-Based System Data Quality Objectives

*Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27**NSF-IH, Indian Head, Maryland*

Data Quality Objective	Measurement Performance Criteria	Test Method
Magnetometer System Response. Each mag sensor responds in accordance with industry standards.	Response to standard object will not vary more than $\pm 20\%$ from expected value.	Results of Static Background sensor noise levels and Static Spike QC test will be evaluated to ensure compliance.
Magnetometer System Data Repeatability. Repeatable data are being obtained from each magnetometer.	Response to standard object will not vary from previous measurements more than $\pm 20\%$ on a daily basis.	Results of Static Background noise levels and Static Spike QC Test will be compared to previous days' measurements to ensure compliance.
GPS-based System Positioning. Accurate coordinates are being obtained from magnetometer positioning system.	Positional error at known ferrous metal object location will not exceed $\pm 1\text{m}$ based upon underway system survey data and analyzed position fits	Results of derived positions from the Sensor QC Test will be evaluated to ensure compliance. RTK GPS positioning will be verified by checking a known surface position each day before beginning work.

TABLE 2
 Processing Documentation Requirements
Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland

Information Type	“Raw” Data Delivery Report	Final Data Delivery Report	Must be in File Headers
Site ID	X	X	X
Geophysical instrument type used	X	X	
Positioning method used	X	X	
Instrument serial numbers (geophysical and positioning)	X	X	
Coordinate system and unit of measure	X	X	
Grid ID (or other identifier of surveyed area)	X	X	X
Date of data collection	X	X	X
Raw data file names associated with delivery	X	X	
Processed data file names associated with delivery	X	X	
Name of Project Geophysicist	X	X	
Name of Site Geophysicist	X	X	
Name of data processor	X	X	
Data processing software used	X	X	
Despiking method and details	X	X	
Sensor drift removal and details	X	X	
Latency/lag correction and details	X	X	
Sensor bias, background leveling and/or standardization adjustment method and details		X	
Portable document format (PDF) document showing graphical results of each field quality control test	X	X	
Geophysical noise identification and removal (spatial, temporal, motion, terrain induced) and details		X	
Other filtering/processing performed and details		X	
Gridding method		X	
Anomaly selection and decision criteria details		X	
Geosoft “.xyz” file for unit of survey being delivered (e.g., grid or area agreed upon with Geophysicist)		X	
Geosoft “.grd” file for unit of survey being delivered		X	

TABLE 2
 Processing Documentation Requirements
Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland

Information Type	“Raw” Data Delivery Report	Final Data Delivery Report	Must be in File Headers
Geosoft “.map” file for unit of survey being delivered		X	
PDF of Geosoft map for unit of survey being delivered		X	
Geosoft “.map” mosaic of all processed data to date		X	
PDF mosaic of Geosoft map of all processed data to date		X	
Other processing comments		X	
Date data processing is completed	X	X	
Data delivery date	X	X	
Scanned copy of field notes and field mobile data collection device notes (if applicable)	X		

TABLE 3
DGM Instruments Standardization Tests and Acceptance Criteria
Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland

Test	Test Description	Acceptance Criteria	Power On	Beginning of Day	Beginning and End of Day	2% of Total Area Surveyed
1	Equipment Warm-up	Equipment specific (typically 5 min)	X			
2	Record Sensor Positions	± 4 inches (2.54 centimeters)		X		
3	Personnel Test <i>(Land-based system only)</i>	Based on instrument used. Personnel, clothing, etc. should have no effect on instrument response		X		
4	Vibration Test (Cable Shake)	Data profile does not exhibit data spikes		X		
5	Static Background & Static Spike	± 20% of standard item response, after background correction			X	
6	Repeat Data	Qualitative comparison of data.				X

Figures

FIGURE 1
Nelco 4K Champion Sports 6-Pound Iron Shot Put
*Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11,
20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland*



FIGURE 2
Overview of DGM Process QC
Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland

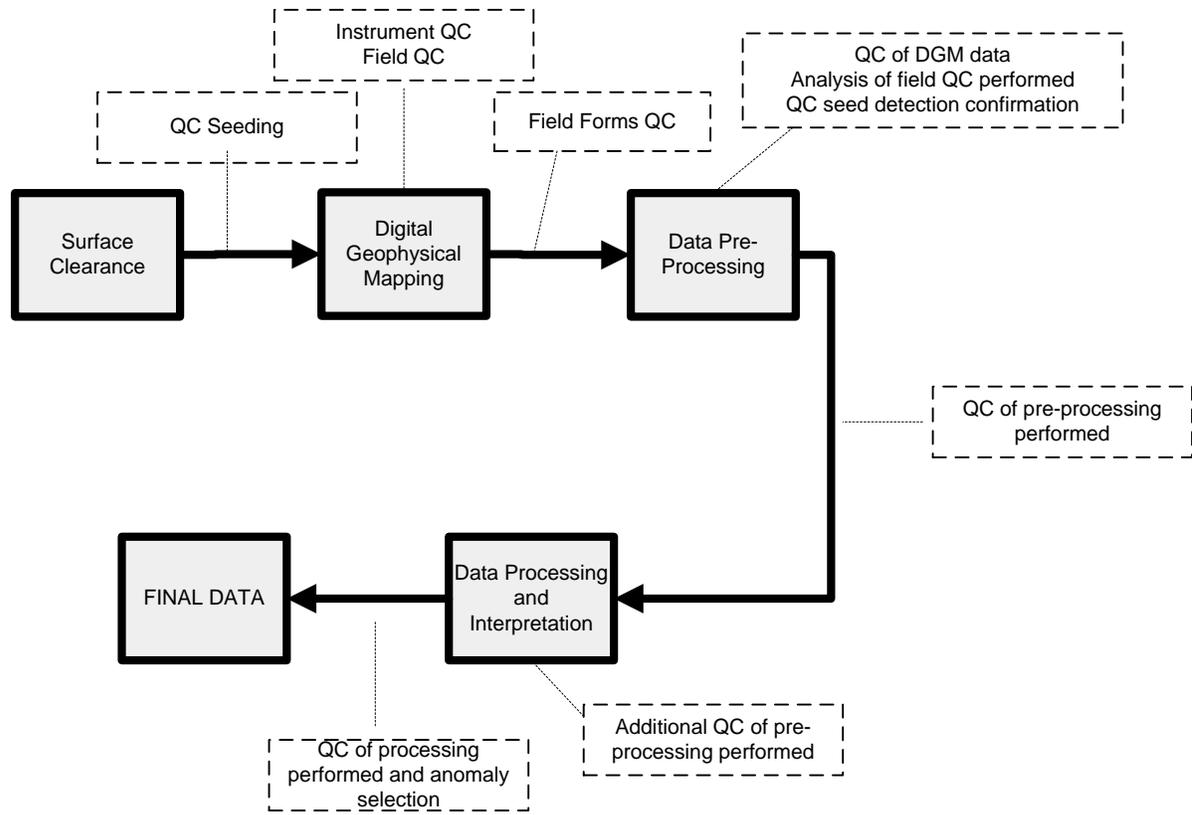
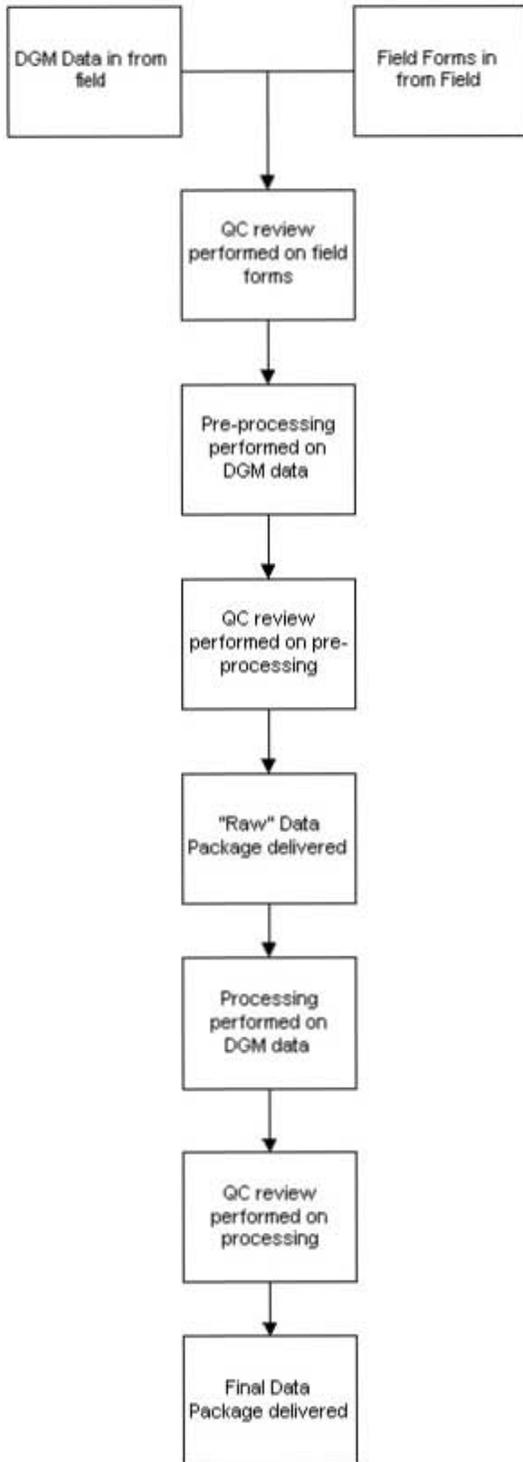


FIGURE 3

QC of DGM Data – Process Flowpath

Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27

NSF-IH, Indian Head, Maryland



**Attachment
GSV Work Plan**

Final

**Geophysical System Verification Work Plan
for
Land Sites UXO 11, UXO 20, and UXO 30**

**Naval Support Facility Indian Head
Indian Head, Maryland**

Contract Task Order 0012

January 2010

Prepared for

**Department of the Navy
Naval Facilities Engineering Command
Washington**

Under the

**NAVFAC CLEAN 1000 Program
Contract N62470-08-D-1000**

Prepared by



Chantilly, Virginia

Contents

1	IVS	1-1
1.1	Personnel and Qualifications	1-1
1.2	Digital Geophysical Mapping System	1-2
1.3	Location and Length of IVS.....	1-2
1.4	Industry Standard Objects.....	1-2
1.5	IVS Procedures	1-2
1.6	Data Quality Objectives	1-4
1.7	Quality Control	1-5
1.8	Data Analysis and Interpretation	1-6
1.9	IVS Data Evaluation	1-6
2	Blind Seeding	1-1
2.1	Seeds Placement.....	2-1
2.2	Validation.....	2-1
3	Reporting	2-1

Tables (located at the end of this plan)

1	Existing IVS System Coordinates
2	IVS Transects Descriptions and Purpose
3	Project Data Quality Objectives
4	Geophysical Instrument Standardization Tests and Acceptance Criteria

Figures (located at the end of this plan)

1	Existing IVS Location Map
2	Industry Standard Object
3	IVS Process
4	IVS Strip
5	IVS Transects
6	NRL results for small (4 inch x 1 inch) Industry Standard Object tested under EM61-MK2 bottom coil
7	Example Spike Test Setup
8	QC Seed Burial Illustration

Acronyms and Abbreviations

cm	centimeter
DGM	digital geophysical mapping
DQO	data quality objective
GSV	geophysical system verification
GPS	global positioning system
in.	inch
ISO	industry standard objectives
IVS	instrument verification strip
MEC	munitions and explosives of concern
NRL	Naval Research Laboratory
QC	quality control
RTK	real-time kinematic
SOP	standard operating procedure
UXO	unexploded ordnance

Geophysical System Verification

Geophysical system verification (GSV) is a physics-based, presumptively selected technology process in which signal strength and sensor performance are compared to known response curves of industry standard objectives (ISOs) to verify digital geophysical mapping (DGM) systems before and during site surveys. The GSV process is designed to perform initial verification of the proposed DGM system using an instrument verification strip (IVS), followed by a blind seeding program for continued verification throughout the field operations.

1.1 IVS

The initial phase of the investigation to locate munitions and explosives of concern (MEC) as well as non-MEC metallic items in the subsurface at each site will be verification of the presumptively selected DGM system using an IVS.

1.1.1 Personnel and Qualifications

The following individuals will be involved in the IVS process:

- CH2M HILL Project/Quality Control (QC) Geophysicist
- DGM subcontractor's Site Geophysicist
- DGM subcontractor's Field Geophysicist or Geophysical Technician
- DGM subcontractor's Data Processor

DGM subcontractor personnel involved in performance of the IVS and the production geophysical surveys will meet the following qualifications:

- **Project/QC Geophysicist:** will have a degree in geophysics, geology, geological engineering, or a closely related field, and have a minimum of 5 years of directly related geophysical experience. This individual will be capable of managing a geophysical data collection and processing project/program including several task orders/sites and will have at least 1 year of experience in managing geophysical operations on an MEC site.
- **Site Geophysicist:** will have a degree in geophysics, geology, geological engineering, or a closely related field, and have a minimum of 2 years of directly related geophysical experience. This individual will be capable of competently managing personnel, equipment and data on projects requiring multiple geophysical field teams and geophysical data processors and will have at least 1 year of experience in performing geophysical operations on an MEC site.
- **Field Geophysicist:** will have a degree in geophysics, geology, geological engineering, or a closely related field, will have a minimum of 2 years of directly related geophysical experience and will have at least 1 year of experience in performing geophysical operations on an MEC site.

- **Geophysical Technician:** will have at least 6 months of experience in geophysical data collection on MEC-related projects.
- **Geophysical Data Processor:** will have a degree in geophysics, geology, geological engineering, or a closely related field, and will have at least 6 months of experience in processing geophysical data related to MEC projects.

1.1.2 DGM System

The presumptively selected DGM system to be verified and used for the production surveys will consist of the Geonics EM61-MK2 time domain electromagnetic metal detector, with positioning provided by either a real-time kinematic (RTK) global positioning system (GPS) or odometer/fiducial methods. The system and positioning methods are discussed in detail in the Geophysical Investigation Plan, of which this document is an attachment.

1.1.3 Location and Length of IVS

An IVS strip was established at the Indian Head site and will likely be used for the UXO 11, UXO 20, and UXO 30 survey areas unless the field team determines that setting up and using an IVS closer to the survey areas will be more time-efficient. The location of the existing IVS is shown as Figure 1 and endpoint and seed information is provided in Table 1.

The following sections provide all of the information needing for setting up a new IVS. The IVS establishment steps will be skipped if the existing IVS is used.

1.1.4 ISOs

The ISO items (Figure 2) to be used in the IVS are 1 inch (in) (2.54 centimeters [cm]) by 4 in (10.16 cm) steel pipes (part number 44615K466) from the McMaster-Carr on-line catalog (<http://www.mcmaster.com/>):

Shape: Straight Nipple, Threaded Both Ends

Schedule: 40

Pipe Size: 1 in (1.315 in outer diameter)

Length: 4 in

Finish: Black welded steel

Instrument response curves for this ISO have been developed by the Naval Research Laboratory (NRL). These response curves demonstrate their standard response under their best orientation and worst orientation at multiple distances from the instrument's bottom transmit/receive coil. The best orientation would be perpendicular to the EM61-MK2 instrument plane to cause the highest peak amplitude response. The worst orientation would be parallel to the instrument plane and perpendicular to the direction of travel to cause the lowest peak amplitude response. (NRL/MR/6110--09-9183 - provided as Figure 3).

1.1.5 IVS Procedures

A qualified and experienced MEC DGM operations geophysical team (see Section 1.1.1) will employ the system to be verified over the IVS. Figure 4 illustrates the IVS process and the procedures to be employed (numbered in accordance with the steps shown on Table 1)

during site work.

1. An IVS area will be selected with preference for the following (although none of the conditions are vital for IVS success):
 - (a) Terrain, geology and vegetation similar to that of most of the project site.
 - (b) Geophysical noise conditions similar to those expected across the survey area.
 - (c) Large enough site to accommodate all necessary IVS tests and equipment and for adequate spacing (at least 3 m) of the ISO items to avoid ambiguities in data evaluation.
 - (d) Readily accessible to project personnel.
 - (e) Closeness to the actual survey site (if not within the site).
2. A “background” DGM survey will be performed by the DGM subcontractor with the instrument to be validated over the IVS. This step will allow background geophysical conditions to be recorded, will help evaluate the appropriateness of the location (e.g., few existing anomalies), and will verify that ISOs are not seeded near existing anomalies. The data will be post-processed (e.g., filtered and positions attached to the geophysical data) and provided to the CH2M HILL Project Geophysicist for evaluation.
3. Following verification that the IVS area is clear of subsurface anomalies (or that existing anomalies can be avoided during seeding), two ISO items will be buried parallel to the plane of the EM61-MK2 system’s transmit/receive coil (i.e., horizontally) and oriented along the direction of travel at depths of approximately 3 and 7 times their diameter. The approximate IVS setup will be as shown on Figure 5.

Measurements of the item depths will be to the center of mass of each item. CH2M HILL personnel will bury the ISOs to the appropriate depths for seed items. The background survey data and anomaly avoidance techniques will be used to ensure that end stakes and ISOs are not placed on top of or near existing anomalies. Personnel will emplace ISOs and record the emplacement data (depth, orientation, and azimuth).

4. An RTK GPS or conventional Total Station survey equipment will be used to record the center of each ISO location and the IVS endpoints. The holes will then be filled with soil and a polyvinyl chloride surveyor’s flag or 6-inch wooden survey stake placed at each ISO location.

A DGM survey will be performed by the DGM subcontractor over the IVS area, including transects as described in Table 2 and shown on Figure 6. The data will be processed and interpreted by the DGM subcontractor and provided to the CH2M HILL Project Geophysicist for confirmation within 12 hours of completion of the survey.

5. If the initial DQOs have not been met, the CH2M HILL Project Geophysicist will meet with the DGM subcontractor to discuss whether modifications to instrumentation or procedures can be made to the DGM system in order to meet the DQOs.

6. If the DQOs cannot be met by the DGM subcontractor, the CH2M HILL Project Geophysicist will meet with the project team to discuss a resolution (i.e., modification of a DQO) before completing the IVS process.
7. Once the surveys have been performed and the system has met the initial (or modified) DQOs, the IVS process will be complete.

1.1.6 DQOs

The testing in the IVS area will verify the ability of the system to achieve the specific DQOs outlined in Table 3. The system will not be used for site surveys until it is able to meet the IVS DQOs or until the project team agrees on the reasoning behind a DQO not being met and an appropriate revised DQO.

Production survey DQOs will be achieved through the ISO blind seeding program and other QC tests, as discussed in the Geophysical Investigation Plan. The IVS DQOs, measurement performance criteria, and test method to be used during the IVS process are summarized in Table 1 and discussed in detail in the following subsections.

General System Verification

DGM System Positioning

The DQO for DGM system positioning is that the coordinates being obtained from the positioning system are of sufficient accuracy to allow for appropriate relocation of MEC items for intrusive investigation. The measurement performance criterion for this is that the positional error at known monuments will not exceed 25 cm (9.8 in). This will be evaluated during the IVS process by ensuring that the anomalies representing the ISO seeds in the IVS data are positioned within this distance from the measured locations.

DGM System Munitions Detection

The DQO for munitions detection is to demonstrate that the system in use is capable of detecting munitions within industry standards. This is demonstrated through a physics-based, presumptively selected technology process in which signal strength and sensor performance are compared to validated industry values. As an example, for the EM61-MK2 this process involves demonstrating that the maximum amplitude response over a standard item falls within the sensor response curve for that item, as determined through NRL demonstration tests for that item (Figure 3). Once it has been established that the system is responding comparably, a cross-correlation of industry experience with detection of munitions items can be assumed. In other words, the depths and orientations of munitions items which the EM61-MK2 has been shown to be effective at detecting under test scenarios¹ and other projects can be expected.

Because minor changes in the coil height as it passes over the item and slight variations in the path traveled down the IVS can significantly affect the amplitude response received from the instrument, the IVS results will be qualitatively evaluated. A finding that the geophysical instrument itself is responding within a specific threshold will be accomplished

¹ NRL/MR/6110--08-9155 (EM61-MK2 Response of Standard Munitions Items), Final Report for the Evaluation of UXO Detection Technology at the Standardized UXO Test Sites Aberdeen and Yuma Proving Grounds, Standardized UXO Technology Demonstration Site Program, SERDP, November 2007. Demonstrator scoring results: <http://aec.army.mil/usaec/technology/uxo01f.html>

through the spike test results (Section 1.7), wherein the distance from the coil and orientation of the item can be strictly controlled.

Data Handling

The DQO for data handling is that all data must be delivered in a timely manner and in a useable format. Because of the need for rapid feedback during IVS operations to effectively test potential DGM systems, the measurement performance criterion for data handling during IVS activities will require that initial data be completed and delivered to the CH2M HILL Project Geophysicist within 12 hours of collection. Final processed data for the IVS shall be delivered to the CH2M HILL Project Geophysicist within 3 working days of collection. This will be evaluated based on the actual delivery of data during the IVS process.

1.1.7 QC

Achievement of the instrument evaluation DQOs will be verified by the CH2M HILL QC Geophysicist. The selected IVS area, the process of emplacing the IVS items, and the survey locations will be verified through observation during the IVS process. Geophysical subcontractor-provided standard operating procedures (SOPs) (to be provided as an addendum to this GSV Work Plan after subcontractor selection) will be checked to ensure that equipment and procedures are being checked per documented standard operating procedures for the system employed. The QC tests listed in Table 4 and detailed in the following subsections will be performed on the geophysical system being used:

1. **Equipment Warm-up.** All geophysical equipment will be warmed up for a minimum of 5 minutes. Equipment warm-up will be performed the first time an instrument is turned on for the day or has been turned off for a sufficient amount of time for the specific instrument to cool down.
2. **Record Sensor Positions.** Positioning accuracy of the final processed data will be demonstrated by operating the equipment over one or more known points. The accuracy of the data positioning will be assessed by calculating the difference between a known location over which a positioning instrument is held and the displayed position. The sensor position test will be conducted at the beginning of the survey operation for each work day.
3. **Personnel Test.** This test checks the response of instruments to personnel and their clothing/proximity to the system. On a daily basis, the instrument coils/sensors for those instruments being used that day will be checked for their response to the personnel operating the system. The response will be observed in the field for immediate corrective action and transmitted back to the processor, and analyzed and checked for spikes in the data that could create false anomalies. The personnel test will be conducted at the beginning of the survey operation for each work day.
4. **Vibration Test (Cable Shake).** This test checks the response of instruments to vibration. On a daily basis, the instrument coils/sensors for those instruments being used that day will be checked for their response to vibrations in the cables. The response will be observed in the field for immediate corrective action and transmitted back to the processor and analyzed and checked for spikes in the data that could create false

anomalies. The vibration test will be conducted at the beginning of the survey operation for each work day.

5. **Static Background and Static Spike.** Static tests are performed by positioning the survey equipment within or close to the survey boundaries in an area free of metallic contacts and collecting data for a specific period, while holding the instrument in a fixed position without a “spike” (small ISO placed at accurately measured distance and orientation from the transmitter coil, as in the example shown in Figure 7) and then with a “spike.” The purpose of the static test is to identify any unusual levels of instrument or ambient noise. The static background and static spike test is conducted at the beginning and end of each survey operation. This is the test that essentially “opens” and “closes” a survey area (grid, grid block, set of transects, etc.)

The ISO can be placed above or below the EM61-MK2 transmitter coil as long as the distance is measured from the center of mass of the item to the horizontal plane of the coil (top of coil if item placed above coil, bottom of coil if item placed below), as illustrated in Figure 7.

1.1.8 Data Analysis and Interpretation

All data collected at the IVS test strip will be post-processed and analyzed. Instrument-specific data processing SOPs will be provided as an addendum to this Work Plan after subcontractor selection.

1.1.9 IVS Data Evaluation

The CH2M HILL QC Geophysicist will evaluate the data provided by the geophysical subcontractor and validate for the project team whether the selected geophysical system meets the IVS DQOs

Blind Seeding

As a continuing part of the GSV process, ISOs will be used as blind QC seeds in the areas to be surveyed to provide ongoing verification that the DGM system is properly functioning and the munitions detection and positioning DQOs are continuing to be met.

2.1 Seeds Placement

Seeds will be buried vertically at a depth of approximately 6 to 12 inches below ground surface, with the depth being measured to the center of mass of the item, as illustrated by Figure 8. Depths will be recorded in field notes.

The field team leader will be responsible for labeling each QC seed with a unique identifier. These can either be labeled with a paint pen or with a weather-resistant label taped to or secured within the seed.

The location of blind seeds will not be shared with personnel performing DGM surveys and data processing/interpretation until those tasks have been completed.

2.2 Validation

After each data set is delivered to CH2M HILL by the DGM subcontractor, the CH2M HILL QC Geophysicist will overlay the locations of the blind seeds and verify that the munitions detection and positioning DQOs are continuing to be met. Should an issue be detected (such as a data trend indicating a DQO limit is being approached) or a DQO is not met, a comprehensive root-cause analysis will be performed and a corrective action identified.

SECTION 3

Reporting

Results of the IVS process will be documented in a technical memorandum after the IVS process has been performed. The report will include a summary of the IVS operations, an as-built map of the IVS plot, and IVS results. Results of the blind seeding evaluation will be provided as part of the Site Inspection report.

Tables

TABLE 1
 Existing IVS Survey Coordinates
Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland

Point ID	Easting (m)	Northing (m)	Item Depth (cm)	Item Orientation	Description
IVS-south	310026.127	4274413.953	N/A	N/A	IVS northern end point
IVS-1	310023.621	4274417.842	11.2	Horizontal, perpendicular to line direction	Seed Item
IVS-2	310021.226	4274421.671	17	Horizontal, perpendicular to line direction	Seed Item
IVS-3	310016.609	4274429.046	23.4	Horizontal, perpendicular to line direction	Seed Item
IVS-north	310015.528	4274430.801	N/A	N/A	IVS southern end point

Coordinate system: North American Datum 1983 (NAD83) Universal Transverse Mercator (UTM) Zone 18 North (meters)

TABLE 2

IVS Transects Descriptions and Purpose

*Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27**NSF-IH, Indian Head, Maryland*

Transect	Description	Purpose
A	offset by 0.75m	Demonstrate horizontal drop off of item response
B	directly over center of strip	Verify response vs established response curves
C	offset by 0.37m (1/2 intended lane separation) from center of strip	Demonstrate horizontal drop off of item response
D	offset by 0.75m (on opposite side of strip from Transect A)	Demonstrate horizontal drop off of item response
E	offset by ~3m from strip	Measure background noise

TABLE 3

Project Data Quality Objectives

Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27

NSF-IH, Indian Head, Maryland

Data Quality Objective	Measurement Performance Criteria	Test Method During IVS
General System Verification		
<i>DGM System Positioning.</i> Accurate coordinates are being obtained from DGM positioning systems.	Positional error of ISO seeds will not exceed 25 centimeters (9.8 inches).	Results of IVS DGM survey vs IVS seed locations will be evaluated to ensure compliance.
<i>DGM System Munitions Detection.</i> DGM system response is within industry standards for detection.	Response to ISO is comparable to published or calculated results for that item. Response to standardized item will not vary more than $\pm 20\%$ of expected value in static test.	Results of IVS surveys over seed items in strip will be qualitatively reviewed. Results of static test will be quantitatively reviewed to ensure compliance.
Data Handling		
All data must be delivered in a timely manner and in a useable format.	IVS data is completed and delivered within 12 hrs.	Evaluate based on actual delivery of data

¹ NRL/MR/6110--09-9183 (Provided as Figure 6)

TABLE 4
 Geophysical Instrument Standardization Tests and Acceptance Criteria
Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland

Test	Test Description	Acceptance Criteria	Power on	Beginning of day	Beginning and end of day
1	Equipment Warm-up	Equipment specific (typically 5 min)	X		
2	Record Sensor Positions	+/- 4 inch (2.54cm)		X	
3	Personnel Test	Based on instrument used. Personnel, clothing, etc. should have no effect on instrument response.		X	
4	Vibration Test (Cable Shake)	Data profile does not exhibit data spikes		X	
5	Static Background & Static Spike	+/- 20% of standard item response, after background correction			X

Figures

FIGURE 1
Existing IVS Location Map
Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland

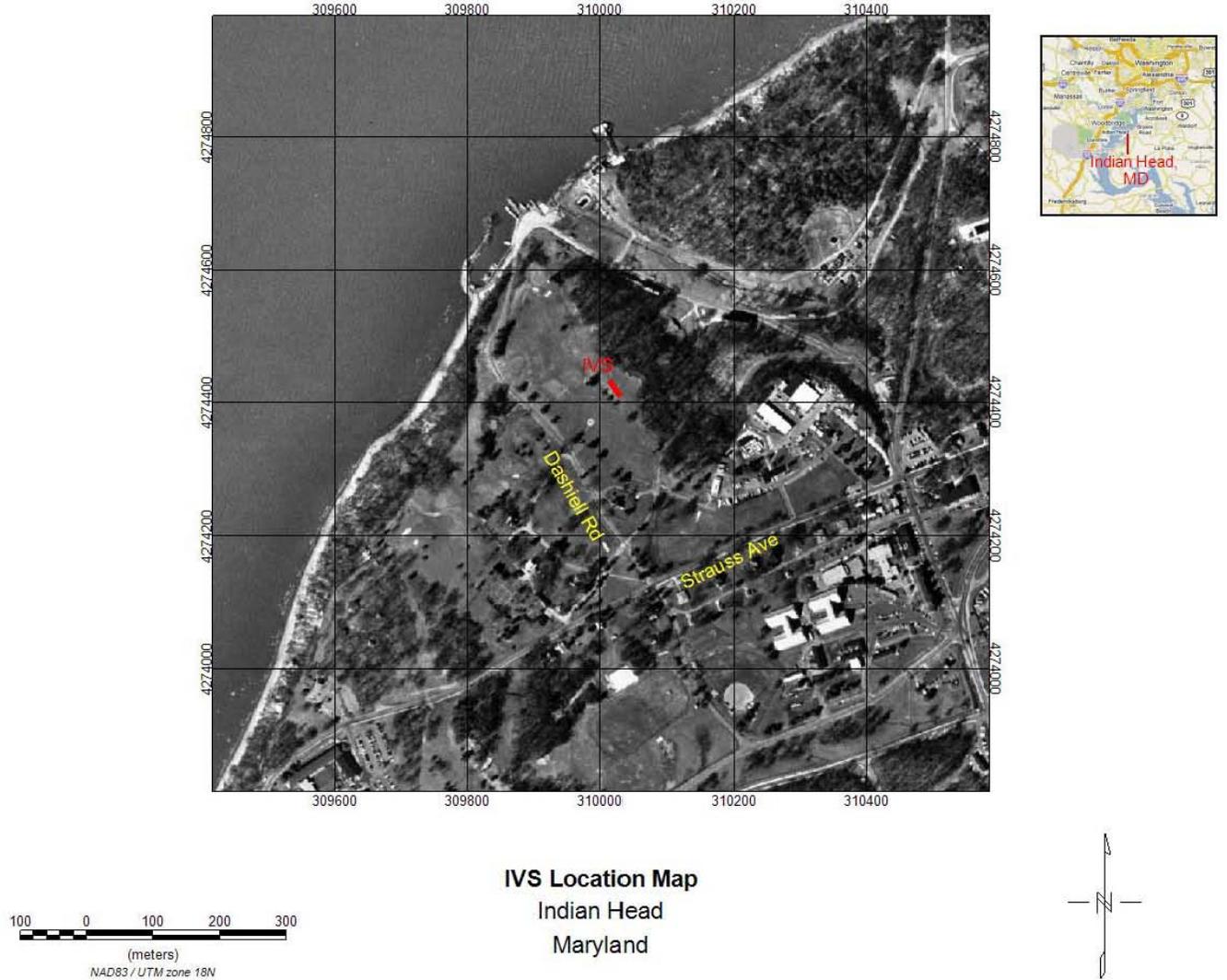


FIGURE 2

Industry Standard Object

Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27

NSF-IH, Indian Head, Maryland

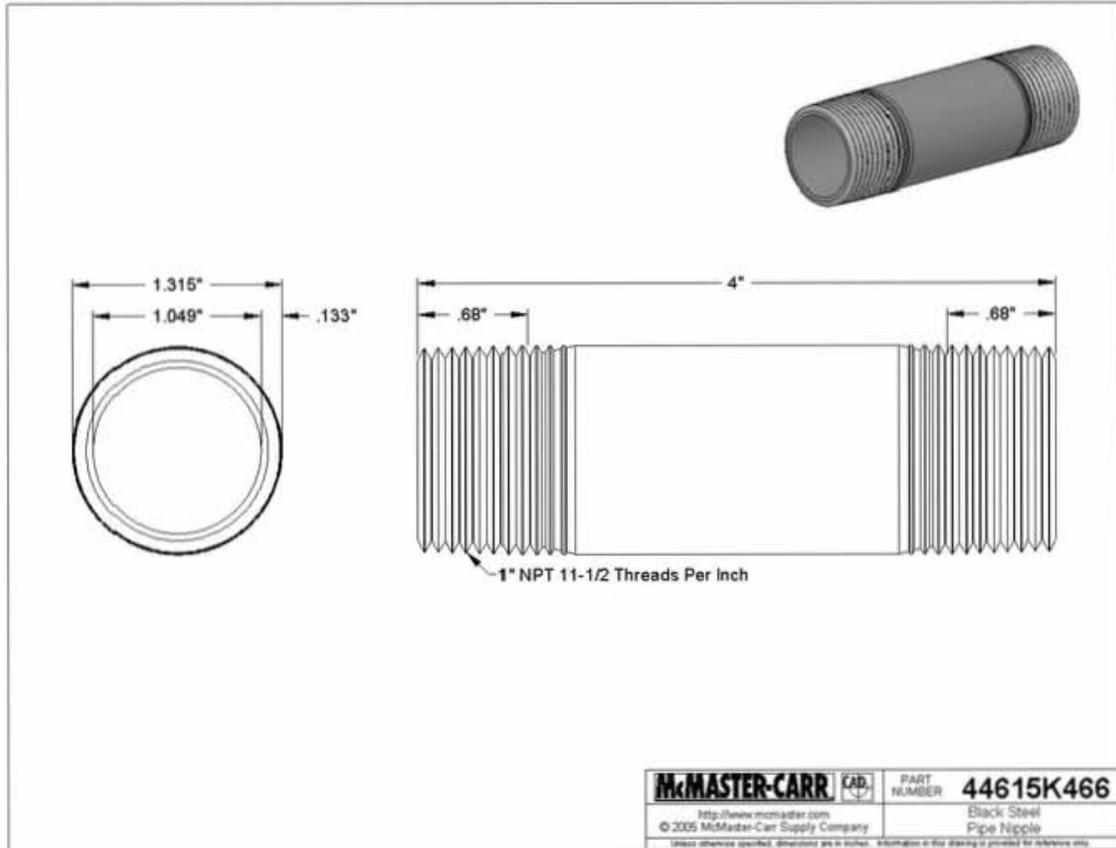
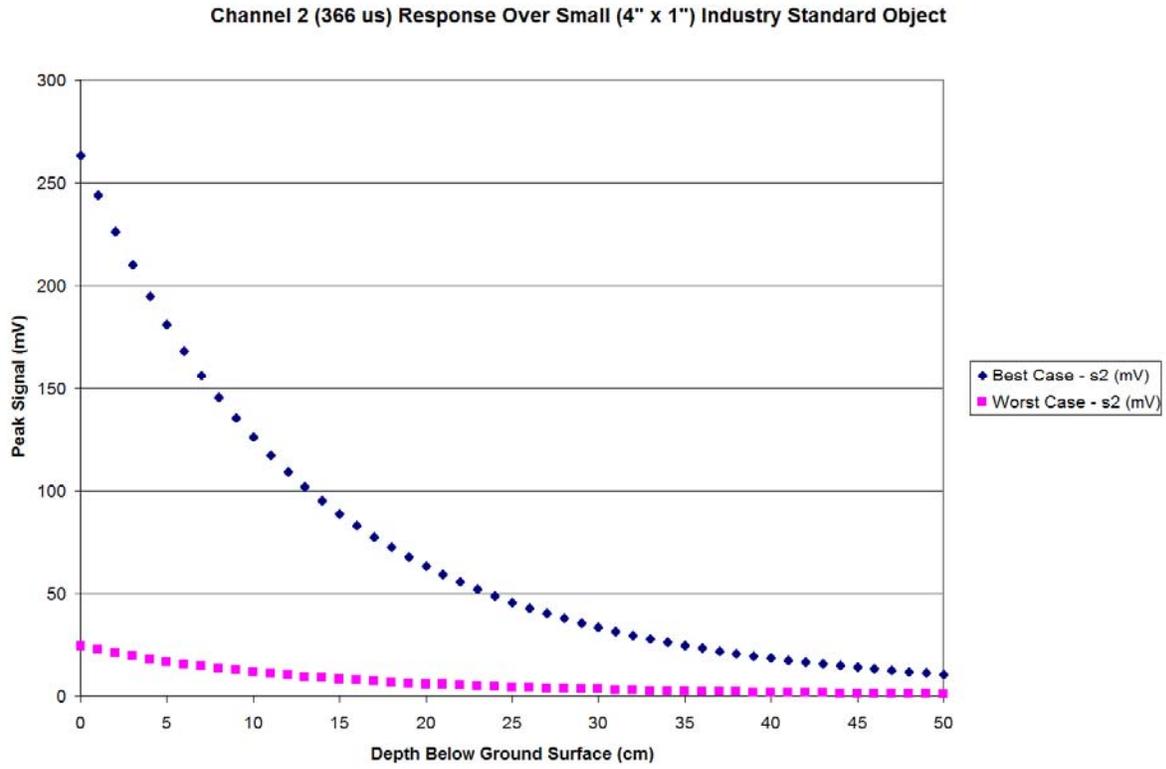


FIGURE 3
NRL results for Small (4 inch x 1 inch) ISO Tested under EM61-MK2 Bottom Coil
Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland



Reference: NRL/MR/6110-09-9183

FIGURE 4

IVS Process

Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland

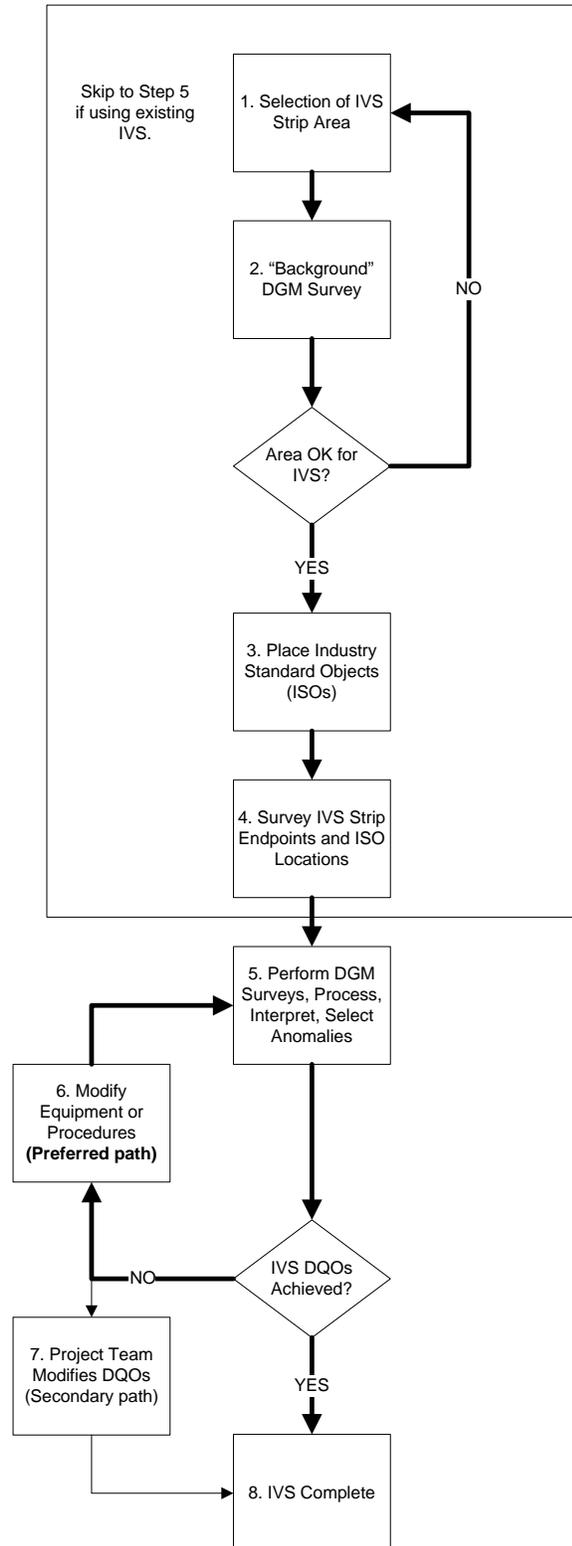


FIGURE 5

IVS Strip

*Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland*

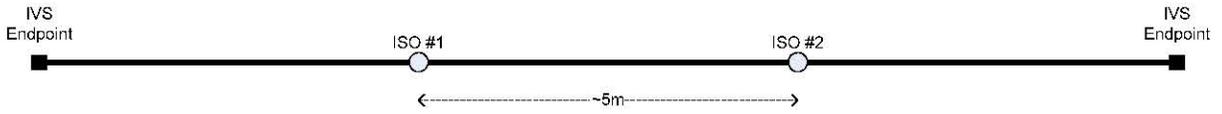


FIGURE 6

IVS Transects

Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27

NSF-IH, Indian Head, Maryland

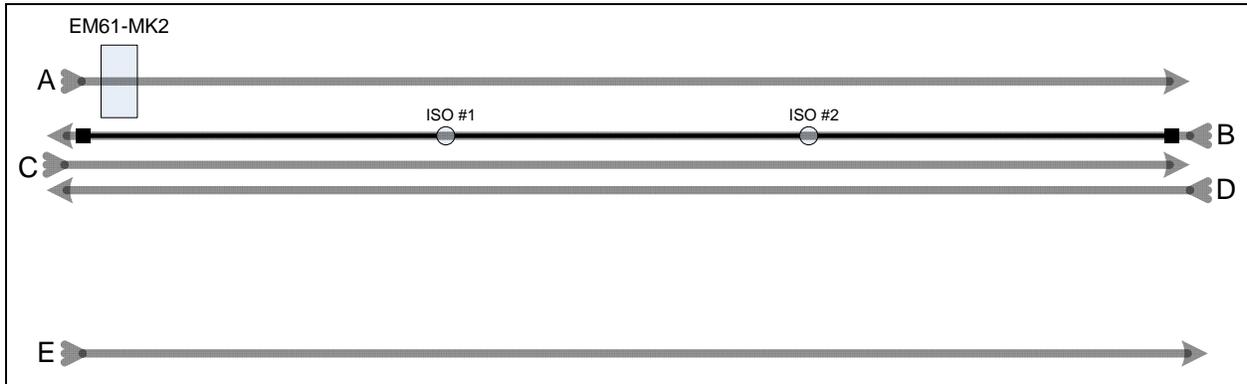


FIGURE 7

Example Spike Test Setup

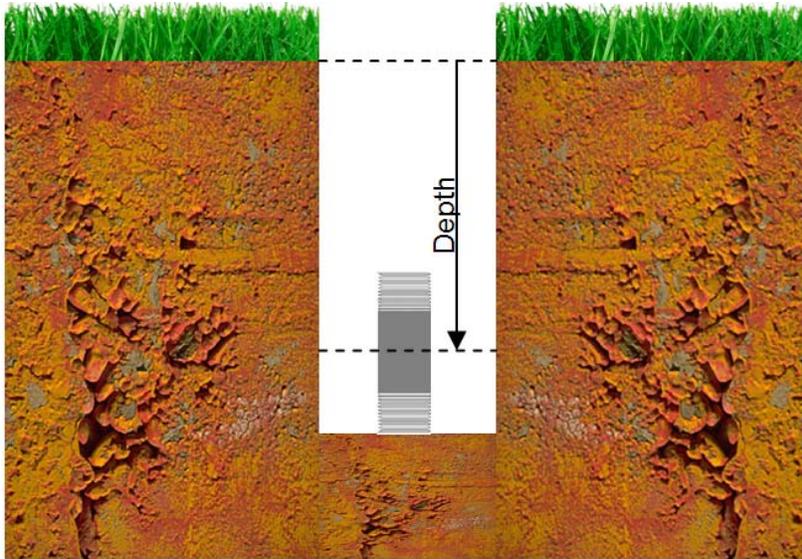
*Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland*



FIGURE 8

QC Seed Burial Illustration

*Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland*



Appendix C
Quality Control Plan

Final

**Quality Control Plan
for
Land Sites UXO 6, UXO 9, UXO 11, UXO 20, and UXO
30; and Water Site UXO 27**

**Naval Support Facility Indian Head
Indian Head, Maryland**

Contract Task Order 0012

January 2010

Prepared for

**Department of the Navy
Naval Facilities Engineering Command
Washington**

Under the

**NAVFAC CLEAN 1000 Program
Contract N62470-08-D-1000**

Prepared by



Chantilly, Virginia

Approved By:

Project Manager

Date

Approved By:

Senior Geophysicist

Date

Approved By:

Activity Manager and QC Manager

Date

Contents

Acronyms and Abbreviations	vii
1 Introduction	1-1
2 QC Organization and Responsibilities	2-1
2.1 Project Team Members	2-1
2.1.1 Project Manager	2-1
2.1.2 Technical Consultant.....	2-1
2.1.3 UXO Quality Control / Safety Manager	2-1
2.1.4 Corporate UXO Safety Manager	2-2
2.1.5 Field Team Leader	2-2
2.1.6 QC Geophysicist	2-2
2.2 Project Communication	2-3
3 DFOWs and the Three-Phase Control Process	3-1
3.1 DFOWs.....	3-1
3.2 Three Phases of Control.....	3-1
3.2.1 Preparatory Phase	3-1
3.2.2 Initial Phase	3-2
3.2.3 Follow-up Phase	3-3
4 Audit Procedures	4-1
5 Corrective/Preventive Action Procedures	5-1
5.1 Preventive Measures	5-1
5.2 Continual Improvement	5-1
5.3 Deficiency Identification and Resolution	5-1
5.4 Corrective Action Request.....	5-1
5.5 Deficiency and Corrective Action Tracking.....	5-2
5.6 Lessons Learned and Other Documentation	5-2
6 Records Generated	6-1
6.1 Onsite Project File	6-1
6.2 Weekly QC Report	6-2
7 Testing and Maintenance	7-1
8 DGM Systems Quality Control	8-1
9 Forms	9-1

Table

- 1 Definable Features of Work Auditing Procedures and Responsibilities

Attachments

QC Forms

Acronyms and Abbreviations

CAP	corrective action plan
CAR	corrective action request
DFOW	definable feature of work
DGM	digital geophysical mapping
FTL	field team leader
GIP	Geophysical Investigation Plan
GIS	geographic information system
HASP	Health And Safety Plan
MR	munitions response
MRP	Munitions Response Program
PM	Project Manager
QC	quality control
QCP	Quality Control Plan
UXO	unexploded ordnance
UXOQCSM	UXO Quality Control / Safety Manager
UXOSM	UXO Safety Manager

SECTION 1

Introduction

This Quality Control Plan (QCP) describes the QC approach and procedures for the Site Inspection of six sites at Naval Support Facility, Indian Head in Indian Head, Maryland. The requirements and systems established in this QCP are relevant and applicable to project work performed by CH2M HILL and its subcontractors. The unexploded ordnance (UXO)-related QC forms (Forms 1b through 9b) referenced throughout this section are presented in the attachment to this plan.

QC Organization and Responsibilities

This section identifies key project team members and lists the QA/QC responsibilities associated with each position and describes communication procedures that will be followed throughout the project.

2.1 Project Team Members

The organizational structure and responsibilities of the project team (refer to Figure 2-1 of the Work Plan) are designed to provide project QC for the site. Those positions with primary QC responsibilities are described in the following paragraphs.

2.1.1 Project Manager

The Project Manager (PM) for this project is Margaret Kasim. The PM is responsible for overall project activities, including cost control, schedule control, and technical quality. In addition, the PM develops the work plan and monitors project activities to ensure compliance with project objectives and scope. The PM also communicates with the Navy, regulators, and the CH2M HILL team regarding project progress.

The PM has the ultimate responsibility within the project team for producing deliverables that are technically adequate, satisfactory to the client, and cost-effective. To accomplish this, the PM develops an internal project review schedule, provides written instructions and frequent guidance to the project team, and monitors budgets and schedules. The PM will work with the project team to select an internal QC review team to coordinate review efforts, address review comments, and adjudicate technical issues.

2.1.2 Technical Consultant

The technical consultant for this project is Mr. John Tomik. Mr. Tomik has significant experience in the various technical aspects of a complex project. He is responsible for evaluating the technical merit of the work planning documents before field activities begin. Mr. Tomik will assist the PM in selecting an internal QC review team.

2.1.3 UXO Quality Control / Safety Manager

The UXO Quality Control / Safety Manager (UXOQCSM) for this project is Mr. Keith Schucker. The UXOQCSM is responsible for implementing and administering this QCP and communicating the onsite QC program policies, objectives, and procedures to the project personnel and subcontractors during project meetings and informal discussions. Onsite technical personnel will assist the UXOQCSM in monitoring, controlling, and documenting the quality of the field activities. Documentation related to the control of project quality, including audits and equipment check results, will be reviewed or prepared by the UXOQCSM. The UXOQCSM's QC responsibilities include the following:

- Developing, assessing the effectiveness of, and maintaining this QCP and related procedures
- Reviewing and approving the qualifications of proposed technical staff and subcontractors
- Planning and ensuring the performance of preparatory, initial, follow-up, and completion audits for each definable feature of work (DFOW)
- Identifying quality problems and verifying that appropriate corrective actions are implemented
- Ensuring that the requisite QC records, including submittals, are generated and retained as prescribed in this QCP
- Performing QC audits, as necessary, and surveillance
- Following the responsibilities specific to munitions response (MR) operations

In addition, the UXOQCSM will coordinate with the PM and will report to corporate QC and Safety Officers if quality or safety issues are not resolved to his satisfaction by the project team. The UXOQCSM has authority to enforce the procedures defined in this QCP. He has the authority to stop work to ensure project activities comply with specifications of this QCP, the contract, and the project. This authority applies equally to all project activities, whether performed by CH2M HILL or its subcontractors.

2.1.4 Corporate UXO Safety Manager

The corporate UXO Safety Manager (UXOSM) for this project is Mr. Dan Young. The UXOSM reviews and approves the Health and Safety Plans (HASP) for MR operations. The UXOSM serves as the point of contact for the UXOQCSM for any MR health- or safety-related issues, and may conduct MR-related project audits. He is also responsible for investigating MR-related accidents should any occur during the course of the project.

2.1.5 Field Team Leader

The field team leader (FTL) for this project is Mr. Kevin Lombardo. The FTL reports to the PM and is responsible for coordinating field efforts, providing and maintaining field equipment and materials, providing shipping and packing materials, and accurately completing the daily diaries. As the lead field representative, the FTL is also responsible for consistently implementing QC measures at the site and for performing field activities in accordance with approved work plans, policies, and field procedures.

2.1.6 QC Geophysicist

Mr. Tamir Klaff will serve as the Project QC Geophysicist. He will be responsible for the ultimate quality of the digital geophysical mapping (DGM) survey data and review and acceptance of the data.

2.2 Project Communication

At the beginning of the project the PM will prepare written project instructions that will be distributed to all team members. These instructions will document project and task objectives and each team member's responsibility in meeting the objectives, as well as a budget and schedule for successfully executing the work.

Before field activity begins, a project team meeting will be held to review the concept, assumptions, objectives of the field approach, and the project objectives. During the field investigation phase of the project, the field teams will meet daily to review the status of the project and to discuss technical and safety issues. When necessary, other meetings will be scheduled, or the FTL will meet individually with field personnel to resolve problems.

During the field effort, the FTL will be in regular telephone or face-to-face contact with the project team. When significant problems or decisions requiring additional authority occur, the FTL can immediately contact the PM for assistance.

All official communications with the Navy will be channeled through the CH2M HILL PM, who will be informed on a daily basis of field activities being conducted.

DFOWs and the Three-Phase Control Process

MR-related QC will be monitored through the DFOWs using a three-phase control process.

3.1 DFOWs

The DFOWs for this project are divided into activities related to planning, field operations, and final project reports and closeout:

1. Planning

- Pre-Mobilization Activities: System setup for geographic information system (GIS), document management and control, data management and subcontracting
- Preparing Work Plan

2. Field Operations

- Site Preparation: mobilization
- DGM survey
- Demobilization

3. Final Project Reports and Closeout

- Preparing GIS maps
- Draft and Final Reports: preparing and obtaining approval
- Data archiving and project closeout

3.2 Three Phases of Control

The UXOQCSM is responsible for ensuring that the three-phase control process, including the Preparatory Phase, Initial Phase, and Follow-up Phase, is implemented for each DFOW listed in this QCP, regardless of whether it is performed by CH2M HILL or its subcontractors.

3.2.1 Preparatory Phase

The Preparatory Phase culminates with the planning and design process leading up to actual field activities. Successful completion of the Preparatory Phase verifies that the project delivery, QC, and safety plans have been completed. The following actions will be performed as applicable for each DFOW:

1. Confirm that the appropriate technical procedures are incorporated into the project Work Plan and review procedures.
2. Confirm that adequate testing is called for to ensure quality delivery.
3. Ensure equipment testing procedures are in place, with control limits and frequency, for each piece of equipment.

4. Confirm qualifications/training of personnel and verify that roles/responsibilities are well-defined and communicated.
5. Confirm that the site HSERP adequately address the work operations and that applicable safety requirements have been incorporated into the plan.
6. Discuss methods to be employed during the field activities.
7. Confirm that any required permits and other regulatory requirements are met.
8. Verify that lessons learned during previous similar work have been incorporated as appropriate into the project procedures to prevent recurrence of past problems.

Project personnel must correct or resolve discrepancies between existing conditions and the approved plans/procedures identified by the UXOQCSM and the team during the Preparatory Phase. The UXOQCSM or designee must verify that unsatisfactory and nonconforming conditions have been corrected prior to granting approval to begin work.

Results of the activity are to be documented in the Preparatory Inspection Checklist (Form 1b) specific for the DFWO and summarized in the Weekly QC Report.

3.2.2 Initial Phase

The Initial Phase occurs at the startup of field activities associated with a specific DFWO. The Initial Phase confirms that this QCP, other applicable work plan sections, and procedures are being effectively implemented and the desired results are being achieved.

During the Initial Phase, the initial segment of the DFWO is observed and inspected to ensure that the work complies with contract and WP requirements. The Initial Phase should be repeated if acceptable levels of specified quality are not met. The following tasks shall be performed for each DFWO:

1. Establish the quality of work required to properly deliver the project in accordance with contractual requirements. The UXOQCSM will ensure that the field teams are aware of expectations associated with the field methods established under the Preparatory Phase by observing the initial work activities and interacting with the PM, AM, and responsible subcontractors' supervisors.
2. Resolve conflicts. The UXOQCSM will guide the PM and responsible supervisor(s) in resolving conflicts. Should conflicts arise in establishing the baseline quality for the DFWO, the responsibility to resolve the conflict falls to the PM.
3. Verify with the Health and Safety Manager that the site HSERP was developed to ensure that the identified hazards adequately address field conditions. Confirm that applicable safety requirements are being implemented during field activities.

Upon completion of Initial Phase activities, the results are to be documented in the Initial Phase Inspection Checklist (Form 2b) and the QC logbook and summarized in the Weekly QC Report. Should results be unsatisfactory, the Initial Phase will be rescheduled and performed again.

3.2.3 Follow-up Phase

Completion of the Initial Phase of QC activity leads directly into the Follow-up Phase, which addresses the routine day-to-day activities at the site. Inspection and audit activities associated with each DFOW are addressed in Section 1.4. Specific tasks associated with the Follow-up Phase include:

1. Inspection of the work activity to ensure work complies with the contract and Work Plan.
2. Evaluation and confirmation that the quality of work is being maintained at least at the level established during the Initial Phase.
3. Evaluation and confirmation that required testing is being performed in accordance with procedures established during the Preparatory Phase and confirmed during the Initial Phase.
4. Confirmation that nonconforming work is being corrected promptly and in accordance with the direction provided by the UXOQCSM.

To conduct and document these inspections, the UXOQCSM is to generate the Follow-up Phase Inspection Checklist (Form 3b). The Follow-up Phase inspections will be performed daily or as otherwise identified in this QCP until the completion of each DFOW.

The UXOQCSM is responsible for onsite monitoring of the practices and operations taking place and verifying continued compliance with the specifications and requirements of the contract, project, and approved project plans and procedures. The UXOQCSM is also responsible for verifying that a daily health and safety inspection is performed and documented, as prescribed in the HASP (refer to Appendix D). Discrepancies between site practices and approved plans and procedures are to be resolved, and corrective actions for unsatisfactory and nonconforming conditions or practices are to be verified by the UXOQCSM or a designee prior to granting approval to continue work. Follow-up Phase inspection results are to be documented in the QC logbook and summarized in the Weekly QC Report.

Additional Audits

Additional audits performed on the same DFOW may be required at the discretion of the UXOQCSM. Additional preparatory and initial audits are generally warranted under any of the following conditions: unsatisfactory work, changes in key personnel, resumption of work after a substantial period of inactivity (e.g., 2 weeks or more), or changes to the project scope of work/specifications.

Final Acceptance Audit

Upon conclusion of the DFOW and prior to closeout, the Final Acceptance Inspection must be performed to verify that project requirements relevant to the work are satisfied. Outstanding and nonconforming items are to be documented on the Final Inspection Checklist (Form 4b). Resolution of each item must be noted on the checklist. Contractor acceptance and closeout of each DFOW is a prerequisite to project closeout.

SECTION 4

Audit Procedures

The UXOQCSM is responsible for verifying compliance with this QCP through audits and surveillance. Each DFWO auditing procedure and responsibility is presented in Table 1 at the end of this plan. The UXOQCSM or a designee is to inspect/audit the quality of work being performed for the DFWO. The UXOQCSM or a designee is to verify that procedures conform to applicable specifications stated in this Work Plan or other applicable guidance. Identified deficiencies are to be communicated to the responsible individual and documented in the QC logbook and Weekly QC Report. Corrective actions are to be verified by the UXOQCSM and recorded in the Weekly QC Report.

Corrective/Preventive Action Procedures

Corrective and preventive action procedures are designed to prevent quality problems and to facilitate process improvements, as well as identify, document, and track deficiencies until corrective action has been verified.

5.1 Preventive Measures

While the entire QC program is directed toward problem prevention, certain elements of the program have greater potential to be proactive. The primary tool for problem prevention on this project is discussed in Three Phases of Control (Section 3.2). Should these preventive measures fail, tracking and communicating deficiencies provide a mechanism for preventing their recurrence.

5.2 Continual Improvement

Project team members at all levels are 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 more efficiently or cost-effectively. Typical quality improvement recommendations consist of identifying an existing practice that should be improved and/or recommending an alternate practice that provides a benefit without compromising prescribed standards of quality. Project personnel are to bring their recommendations to the attention of project management or the QC staff through verbal or written means. However, deviations from established protocols are not to be implemented without prior written approval by the PM and concurrence of the UXOQCSM. Where a staff-initiated recommendation results in a tangible benefit to the project, public acknowledgment is to be given by the PM.

5.3 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. Through implementation of the audit program prescribed in this QCP, the QC staff is responsible for verifying that deficiencies are identified, documented as prescribed herein, and corrected in a timely manner. Deficiencies identified by the QC staff are to be corrected by the operational staff and documented by the QC staff.

5.4 Corrective Action Request

A Corrective Action Request (CAR) (Form 6b) can be issued by any member of the project staff, including CH2M HILL and subcontractor employees. If the individual issuing the CAR is also responsible for correcting the problem, he or she should do so and document

the results on Part B of the CAR (Form 6b). Otherwise, the CAR should be forwarded to the PM, who is then responsible for evaluating the validity of the request, formulating a resolution and prevention strategy, assigning personnel and resources, and specifying and enforcing a schedule for corrective actions. Once a corrective action has been completed, the CAR and supporting information are to be forwarded to the UXOQCSM for closure. Sufficient information is to be provided to allow the QC reviewer to verify the effectiveness of the corrective actions.

In addition to observing actual work operations, CARs are to be reviewed during follow-up QC audits. The purposes of this review are as follows: to ensure that established protocols are implemented properly; to verify that corrective action commitments are met; to ensure that corrective actions are effective in resolving problems; to identify trends within and among similar work units; and to facilitate system root cause analysis of larger problems. The QC staff should pay particular attention to work units that generate either an unusually large or unusually small number of CARs.

The UXOQCSM will determine whether a written Corrective Action Plan (CAP) (Form 7b) is necessary, based on whether any of the following are met: the 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 recurrence. The CAP is developed by a PM designee and approved and signed by the PM. The CAP is to indicate whether it is submitted for informational purposes or for review and approval. In either event, the operational staff is encouraged to discuss the corrective action strategy with the QC staff throughout the process. The CAP form is included at the attachment to this QCP.

5.5 Deficiency and Corrective Action Tracking

Each CAR must be given a unique identification number and tracked until corrective actions have been taken and documented in Part B of the form and the CAR is submitted to the UXOQCSM or a designee for verification and closure.

5.6 Lessons Learned and Other Documentation

The lessons learned through the deficiency management process are documented on CARs and CAPs. CARs 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 logbook and Weekly QC Report without initiating a CAR. Deficiencies that cannot be readily corrected are to be documented by the QC staff on a CAR and in the Weekly QC Report. Copies of CARs are to be referenced in and attached to the Weekly QC Report. CAPs 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 CAP.

Records Generated

6.1 Onsite Project File

The UXOQCSM will establish and maintain an onsite project file in accordance with the CH2M HILL corporate quality procedures for document control. Part of the file will be in paper format and part in digital format. The onsite files will be maintained in the project field office or designated field vehicle and on the UXOQCSM's laptop computer. The purpose of these files is to maintain a complete set of all documents, reports, certifications, and other records that provide information on project plans, contractual agreements, and project activities.

The CH2M HILL MRP Enterprise, which consists of a mobile field data collection device used to collect form-based information of DGM operations and a centralized desktop interface and database, will be the repository for most of the information collected by the field team (e.g., daily reports). This database will contain information that can be easily presented and delivered through automated report production, which reduces the amount of actual paper in the files. The database will be backed up daily and stored in an offsite location. The files (in either paper or digital format) will include copies of the following:

- Qualifications and training records of all site personnel
- Submittals
- Schedule and progress reports
- Survey records
- Conversation logs
- Meeting minutes and agenda
- Audit logs and schedules
- Photo documentation
- Site maps
- Equipment check records
- Nonconformance and corrective action reports
- Daily work activity summary reports, which may include:
 - Weekly QC Report
 - Daily Health and Safety Report
 - Daily Report (including activity log)
 - Daily DGM team logs (field data sheets)
 - Reports on any emergency response actions (Explosive Ordnance Disposal personnel will handle emergencies on this project)
 - Equipment check records
 - Incident reports

As the project activities progress, the UXOQCSM will monitor the usefulness of the project filing system for information retrieval. If additional file sections are needed, the UXOQCSM will expand the initial filing structure to include additional sections.

6.2 Weekly QC Report

The UXOQCSM is responsible for preparing and submitting the Weekly QC Report to the PM for the project file. The report and any attachments is to be submitted to the PM on the first workday following the dates covered by the report.

The Weekly QC Report is to provide an overview of QC activities performed each day, including those performed by subcontractors. The report must present an accurate and complete picture of QC activities by reporting both conforming and deficient conditions, and the reports should be precise, factual, legible, and objective. Copies of supporting documentation, such as checklists and surveillance reports, are to be attached.

A field QC log is to be maintained by the UXOQCSM to document details of field activities during QC monitoring activities. At the end of each day, copies of the log entries are to be attached to the Weekly QC Report. The information in the field QC log provides backup information and is intended to serve as a phone log and memory aid in the preparation of the Weekly QC Report and for addressing follow-up questions.

Copies of Weekly QC Reports with attachments and field QC logs no longer in use are to be maintained in the project QC file. Upon project closeout, all QC logs are to be included in the project QC file.

SECTION 7

Testing and Maintenance

Testing and maintenance of equipment such as geophysical instruments, radios, cell phones, vehicles and machinery will be performed in accordance with the manufacturer's specifications, this Work Plan, and all applicable standard operating procedures. Geophysical detection equipment will be tested daily, as specified in the GIP.

Test results must be documented by the individual performing the test. Testing and maintenance records associated with measuring and testing equipment must be generated by the individual performing the activity. Documentation for testing and maintenance of equipment is to be made available to the client upon request.

The UXOQCSM is responsible for ensuring that the tests are performed and that the results are summarized and provided with the Weekly QC Report. To track each failing test for future retesting, the failing test must be noted on the deficiency log. Resolution of the failing test is complete when retesting is performed and the corrective action is verified on the deficiency log.

SECTION 8

DGM Systems Quality Control

A QC program will be applied to the DGM operations at the site. Program elements include DGM instruments quality control, QC seed items, QC of DGM data and deliverables, and analog geophysical systems QC. QC program details are provided in the GIP included as Appendix B.

SECTION 9

Forms

The QC forms are provided in the Attachment to this QCP.

TABLE 1
Definable Features of Work Auditing Procedures and Responsibilities
Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland

Definable Feature of Work with Auditable Function	Responsible Person(s) ¹	Audit Procedure ²	QC Phase ³	Freq. of Audit	Pass/Fail Criteria	Action if Failure Occurs
Planning						
Geographical Information System (GIS) Setup (Pre-mobilization Activities)	Project GIS Manager	Verify GIS system has been set up and is ready for site data.	PP	O	GIS system has been set up and is ready for site data.	Do not proceed with field activities until criterion is passed.
Document management and control (Pre-mobilization Activities)	Project Manager	Verify appropriate measures are in place to manage and control project documents.	PP	O	Appropriate measures are in place to manage and control project documents.	Do not proceed with field activities until criterion is passed.
Data Management (Pre-mobilization Activities)	Project Manager, QC Geophysicist	Verify appropriate measures are in place to manage and control project data.	PP	O	Appropriate measures are in place to manage and control project data.	Do not proceed with field activities until criterion is passed.
Subcontracting (Pre-mobilization Activities)	Project Manager, UXOQCSM	Verify subcontractor qualifications, training, and licenses.	PP/IP	O	Subcontractors' qualifications, training, and licenses are up to date and acceptable.	Ensure subcontractor provides the qualifications, training, and licenses or change subcontractor.
Technical and Operational approach (Project Planning)	Project Manager	Verify technical and operational approaches have been agreed on by the project team.	PP/IP	O	Technical and operational approaches have been agreed on by project team and incorporated into the WP.	Do not proceed with field activities until criterion is passed
Geophysical System Verification (GSV) Work Plan preparation and approval (Project Planning)	Project Manager	Verify GSV Work Plan has been prepared and approved.	PP/IP	O	GSV Work Plan has been approved by Navy.	Do not proceed with field activities until criterion is passed.
Work Plan (Mobilization)	Project Manager	Verify Work Plan has been prepared and approved.	PP/IP	O	Work Plan has been approved by Navy.	Do not proceed with field activities (excluding site mobilization) until criterion is passed.
Field Operations						
Site preparation (Mobilization)	UXOQCSM	Verify local agencies are coordinated.	PP/IP	O	Local agencies are coordinated.	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	UXOQCSM	Verify equipment has been inspected and tested.	PP/IP	E	Equipment passes inspection and testing.	Proceed only with activities for which equipment has passed inspection and testing.
Site preparation (Mobilization)	UXOQCSM	Verify communications and other logistical support are coordinated.	PP/IP	O	Communications and other logistical support are coordinated.	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	UXOQCSM	Verify emergency services have been coordinated.	PP/IP	O	Emergency services are coordinated.	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	UXOQCSM	Verify site-specific training is performed and acknowledged.	PP/IP	O	Site-specific training is performed and acknowledged	Do not proceed with field activities until criterion is passed.
GSV Execution (Mobilization)	QC Geophysicist	Verify data quality objectives (DQOs) established in UTA Work Plan have been accomplished.	PP/IP	O	DQOs identified in GSV Work Plan have been achieved	Continue with GSV until DQOs are achieved.
DGM Survey	QC Geophysicist	Verify DGM Survey conducted IAW Geophysical Investigation Plan and GSV Work Plan:	IP/FP	O/D	DGM Survey conducted IAW Geophysical Investigation Plan	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary.
DGM Survey	QC Geophysicist	Check results of QC tests performed as specified in GIP	FP	E	QC tests must pass IAW standards determined during the GSV and referenced SOPs.	If a QC test does not pass, a root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action.

TABLE 1
Definable Features of Work Auditing Procedures and Responsibilities
Munitions Investigation Work Plan for Land Sites UXO 6, 9, 11, 20, and 30; and Water Site UXO 27
NSF-IH, Indian Head, Maryland

Definable Feature of Work with Auditable Function	Responsible Person(s) ¹	Audit Procedure ²	QC Phase ³	Freq. of Audit	Pass/Fail Criteria	Action if Failure Occurs
DGM Survey	QC Geophysicist	Confirm that DGM survey DQOs established during UTA are being met.	FP	E	DGM survey DQOs are being met.	If the DQOs are not being met, a root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action.
DGM Data Processing	QC Geophysicist	Verify data checks specified in GIP and UTA Work Plan:	FP	E	Data checks must pass in accordance with standards determined during the GSV and referenced SOPs.	If a QC test does not pass, a root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action.
Demobilization	Field Supervisor	Verify facilities-support infrastructures are dismantled and shipped to appropriate location and area is returned to original condition.	FP	O	Facilities-support infrastructures are dismantled and shipped to appropriate location and site is returned to original condition.	Ensure that all support facilities are removed and that the site is returned to original condition

Notes:
IAW = in accordance with

<u>QC Phase</u>	<u>Frequency</u>
PP = Preparatory Phase	O = Once
IP = Initial Phase	D = Daily
FP = Follow-up Phase	W = Weekly
	E = Each occurrence

¹ The responsible person (if other than the UXOQCSM) is the individual with whom the UXOQCSM will coordinate with to ensure compliance with requirements and to verify that any necessary follow-up actions are taken.
² Where appropriate, a reference has been included referring the reader to a more detailed description of the procedures being audited.
³ Documentation to be in accordance with the three-phase control process as outlined in the Quality Control Plan.

**Attachment
QC Forms**

Form 1a: Field Change Documentation

Date: _____

Page _____ of _____

Project:

Project No.:

Applicable Document:

Change Description:

Reason for change:

Recommended disposition:

Impact on present and completed work:

Final disposition (MCB Camp Lejeune only)

Request by:

CH2M HILL Project Manager: _____ Date: _____

Approvals:

Navy RPM: _____ Date: _____

Form 2a: Corrective Action Request Form

Originator: _____ Date: _____

Person responsible for replying: _____

Description of problem and when identified: _____

Sequence of Corrective Action (CA): (Note, if no responsible person is identified, submit this form directly to the PM)

State date, person, and action planned:

CA initially approved by: _____ Date: _____

Follow-up date: _____

Final CA approval by: _____ Date: _____

Information copies to:

Responsible person: _____

Field Team Leader: _____

Project Manager: _____

FORM 1b

Preparatory Inspection Checklist (Part I)

Contract No.:

Date: _____

TITLE AND NO. OF TECHNICAL SECTION:

A. Planned Attendees:

	Name	Position	<u>Company</u>
1)	_____	_____	_____
2)	_____	_____	_____
3)	_____	_____	_____
4)	_____	_____	_____
5)	_____	_____	_____
6)	_____	_____	_____
7)	_____	_____	_____
8)	_____	_____	_____
9)	_____	_____	_____
10)	_____	_____	_____
11)	_____	_____	_____

B. Submittals required to begin work:

	Item	<u>Submittal No.</u>	Action Code
1)	_____	_____	_____
2)	_____	_____	_____
3)	_____	_____	_____
4)	_____	_____	_____
5)	_____	_____	_____
6)	_____	_____	_____
7)	_____	_____	_____
8)	_____	_____	_____

I hereby certify, that to the best of my knowledge and belief, that the above required materials delivered to the job site are the same as those submitted and approved.

Contractor Quality Control Systems Manager

FORM 1b (Continued)

Preparatory Inspection Checklist
(Part I)

Contract No.:

Date: _____

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:

E. Methods and procedures for performing Quality Control, including specific testing requirements:

The above methods and procedures have been identified from the project plans and will be performed as specified for the Definable Feature of Work.

Contractor Quality Control Systems Manager

FORM 2b

Initial Phase Check List

Contract No.:

Date: _____

Title and No. of Technical 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: _____

FORM 6b

CORRECTIVE ACTION REQUEST

(1)Page 7 of 2

(2)CAR #:	(3)PRIORITY: <input type="checkbox"/> HIGH <input type="checkbox"/> NORMAL	(4)DATE PREPARED:
-----------	--	-------------------

PART A: NOTICE OF DEFICIENCY

(5)PROJECT:	
(6)PROJECT MANAGER:	(7)MEC QCS:
(8)WORK UNIT:	(9)WORK UNIT MANAGER:
(10)ISSUED TO (INDIVIDUAL & ORGANIZATION):	
(11)REQUIREMENT & REFERENCE:	
(12)PROBLEM DESCRIPTION & LOCATION:	
(4)CAP REQUIRED? <input type="checkbox"/> YES <input type="checkbox"/> NO	(14)RESPONSE DUE:
(15)ISSUED BY (PRINTED NAME & TITLE): SIGNATURE: _____ DATE: _____	(16)MANAGEMENT CONCURRENCE:

Form 6B (continued)
CORRECTIVE ACTION REQUEST

CORRECTIVE ACTION REQUEST (CAR) INSTRUCTION SHEET

- (1) **MEC QCS:** Verify that the total number of pages includes all attachments.
- (2) **MEC QCS:** Fill in CAR number from CAR log.
- (3) **MEC QCS:** 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 deficiency's 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) **MEC QCS:** 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.
- (4) **MEC QCS:** 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) **MEC QCS:** Identify date by which proposed corrective action is due to QC for concurrence.

Form 6B (continued)
CORRECTIVE ACTION REQUEST

- (15) **MEC QCS:** 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) **MEC QCS:** Initial to identify concurrence with corrective action response from responsible manager.
- (20) **MEC QCS:** 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) **MEC QCS:** Indicate document closeout by signing and dating.

FORM 7b

CORRECTIVE ACTION PLAN

Page 11 of 1

Attach clarifications and additional information as needed. Identify attached material in appropriate section of this form.

PART A: TO BE COMPLETED BY PROJECT MANAGER OR DESIGNEE

(1)PROJECT:		
(2)PROJECT MANAGER:	(3)MEC QCS:	
(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 MEC QCS OR DESIGNEE

(10)CAP REVIEWED BY:	DATE:
(11)REVIEWER COMMENTS:	
(12)CAP DISPOSITION: (CHECK ONLY ONE AND EXPLAIN STIPULATIONS, IF ANY) <input type="checkbox"/> APPROVED WITHOUT STIPULATIONS <input type="checkbox"/> APPROVED WITH STIPULATIONS <input type="checkbox"/> APPROVAL DELAYED, FURTHER PLANNING REQUIRED	
COMMENTS:	
(4)MEC QCS SIGNATURE:	DATE:

FORM 8b

DAILY QUALITY CONTROL REPORT

Contract No.: _____

Date: _____ Task Order No.: _____ Report No: _____

LOCATION OF WORK: _____

DESCRIPTION: _____

WEATHER: (CLEAR) (FOG) (P.CLOUDY) (RAIN) (WINDY)

TEMPERATURE: MIN °F MAX °F

1. Work performed today:

2. Work performed today by CH2MHILL subcontractor(s):

3. Preparatory Phase Inspections performed today (include personnel present, specification section, drawings, plans, and submittals required for definable feature of work):

4. Initial phase Inspections performed today (include personnel present, workmanship standard established, material certifications/test are completed, plans and drawings are reviewed):

5. Follow-up Phase Inspections performed today (include locations, feature of work and level of compliance with plans and procedures):

6. List tests performed, samples collected, and results received:

7. Verbal instructions received (instructions given by Government representative and actions taken):

8. Non-conformances/ deficiencies reported:

9. Site safety monitoring activities performed today:

10. Remarks:

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 performed by CH2M HILL and our subcontractor(s) and have determined to the best of my knowledge and belief that noted work activities are in compliance with the plans and specifications, except as may be noted above.

MEC QCS (or designee) Signature: _____

Form 9b

Document Release and Review

Client:		Author:					Submittal Register Item No.:			Date:	
Document Title:							Revision:		D.O.#	WAD#	
Reviewer (<i>print</i>)		Reviewer initial & date	Technical	Project Manager	QCC System Mgr.	Health & Safety	Editorial	Chemistry	Construction	Reviewer Comments Resolved (<i>Signature & Date</i>)	
Same as Technical Reviewer Above			X	Topic outline with objectives for each section submitted prior to Rev. A							
<i>Program Reviewer's Acceptance for Document Submittal</i>							Signature		Yes	No	
1) A 4025 (as applicable) prepared and submitted with document?											
2) Technical Conclusions adequately supported by text and data?											
3) Tables and Figures are in the proper format and checked and approved?											
4) The Table of Contents consistent with text information?											
5) Technical Reviewers are qualified and accepted by Technical Manager?											
6) A document Distribution List been prepared and submitted with document?											

Approval:

 Project Manager

Approval:

 MEC QCS

Recommended
 4025 Code _____

Appendix D
Health and Safety Plan

Revision 2

**Health and Safety Plan
Geophysical Investigation of Land UXO Sites 6, 9, 11, 20,
30 and Land/Water UXO Site 27**

**Naval Support Facility Indian Head
Indian Head, Maryland**

Contract Task Order No. 0012

January 2010

Prepared for

**Department of the Navy
Naval Facility Engineering Command
Washington**

Under the

**Navy CLEAN 1000 Program
Contract No. N62470-08-D-1000**

Prepared by



Chantilly, VA

Prepared By:

Mark Orman

Responsible Health and Safety Manager

11/21/2008, Rev 1 9/22/09, Rev 2 12/22/09

Date

Approved By:

Project Manager

Date

Client Acceptance:

Responsible Authority

Date

Contents

PROJECT INFORMATION AND BACKGROUND.....	1
SITE MAP.....	5
1.0 TASKS TO BE PERFORMED UNDER THIS PLAN.....	9
1.1 DESCRIPTION OF TASKS	9
1.1.1 <i>Hazwoper-Regulated Tasks</i>	9
1.1.2 <i>Non-Hazwoper-Regulated Tasks</i>	9
1.2 CHANGE MANAGEMENT	10
2.0 HAZARD CONTROLS	13
2.1 PROJECT-SPECIFIC HAZARDS	13
2.1.1 <i>Munitions of Explosive Concern (MEC)</i>	13
2.1.2 <i>Chainsaws</i>	13
2.1.3 <i>Field Vehicles</i>	15
2.1.4 <i>Fire Prevention</i>	16
2.1.5 <i>Hand and Power Tools</i>	16
2.1.6 <i>Manual Lifting</i>	17
2.1.7 <i>Noise</i>	18
2.1.8 <i>Visible Lighting</i>	19
2.1.9 <i>Working over Water</i>	19
2.2 GENERAL HAZARDS.....	21
2.2.1 <i>General Practices and Housekeeping</i>	21
2.2.2 <i>Personal Hygiene</i>	22
2.2.3 <i>Drugs and Alcohol</i>	22
2.2.4 <i>Driving</i>	22
2.2.5 <i>Hazard Communication</i>	23
2.2.6 <i>Shipping and Transportation of Chemical Products</i>	23
2.2.7 <i>Ultraviolet (UV) Radiation (sun exposure)</i>	23
2.2.8 <i>Heat Stress</i>	24
2.2.9 <i>Cold Stress</i>	26
2.3 BIOLOGICAL HAZARDS AND CONTROLS.....	27
2.3.1 <i>Snakes</i>	27
2.3.2 <i>Poison Ivy and Poison Sumac</i>	27
2.3.3 <i>Ticks</i>	29
2.3.4 <i>Bees and Other Stinging Insects</i>	29
2.3.5 <i>Bloodborne Pathogens</i>	30
2.3.6 <i>Feral Dogs</i>	30
2.3.7 <i>Mosquito Bites</i>	30
2.4 RADIOLOGICAL HAZARDS AND CONTROLS	31
2.5 CONTAMINANTS OF CONCERN	31
3.0 PROJECT ORGANIZATION AND PERSONNEL	35
3.1 CH2M HILL EMPLOYEE MEDICAL SURVEILLANCE AND TRAINING	35
3.1.1 <i>Hazardous Waste Operations Training</i>	35
3.2 FIELD TEAM CHAIN OF COMMAND AND COMMUNICATION PROCEDURES	36
3.2.1 <i>Client</i>	36
3.2.2 <i>CH2M HILL</i>	36
3.2.3 <i>CH2M HILL Subcontractors</i>	38
4.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)	41

4.1	RESPIRATORY PROTECTION	42
5.0	AIR MONITORING/SAMPLING.....	45
5.1	AIR MONITORING SPECIFICATIONS	45
5.2	CALIBRATION SPECIFICATIONS	46
5.3	AIR SAMPLING	46
5.3.1	<i>Method Description</i>	46
5.3.2	<i>Personnel and Areas</i>	46
6.0	DECONTAMINATION.....	47
6.1	DECONTAMINATION SPECIFICATIONS (AS APPLICABLE)	47
6.2	DIAGRAM OF PERSONNEL-DECONTAMINATION LINE.....	47
7.0	SPILL CONTAINMENT PROCEDURES	51
8.0	SITE-CONTROL PLAN.....	53
8.1	SITE-CONTROL PROCEDURES.....	53
8.2	HAZWOPER COMPLIANCE PLAN	53
9.0	EMERGENCY RESPONSE PLAN.....	55
9.1	PRE-EMERGENCY PLANNING	55
9.2	EMERGENCY EQUIPMENT AND SUPPLIES.....	55
9.3	INCIDENT RESPONSE	56
9.4	EMERGENCY MEDICAL TREATMENT	56
9.5	EVACUATION	57
9.6	EVACUATION SIGNALS.....	57
9.7	INCIDENT NOTIFICATION AND REPORTING.....	57
10.0	BEHAVIOR BASED LOSS PREVENTION SYSTEM.....	63
10.1	ACTIVITY HAZARD ANALYSIS	63
10.2	PRE-TASK SAFETY PLANS.....	64
10.3	SAFE WORK OBSERVATIONS.....	64
10.4	LOSS/NEAR LOSS INVESTIGATIONS.....	64
11.0	APPROVAL.....	67
12.0	ATTACHMENTS.....	69

CH2M HILL HEALTH AND SAFETY PLAN

This Health and Safety Plan (HSP) will be kept on the site during field activities and will be reviewed as necessary. The plan will be amended or revised as project activities or conditions change or when supplemental information becomes available. The plan adopts, by reference, the Enterprise-wide Core Standards (CS) and Standard Operating Procedures (SOPs), as appropriate. In addition, this plan adopts procedures in the project Work Plan. The Safety Coordinator (SC) is to be familiar with the CSs and SOPs and the contents of these instructions. CH2M HILL's personnel and subcontractors must be trained on this plan and sign Attachment 1.

Project Information and Background

PROJECT NO: CLEAN 1000 CTO-0012

CLIENT: Naval Facilities Engineering Command Washington

PROJECT/SITE NAME: Naval Support Facility Indian Head (NSF-IH) Land UXO Sites 6, 9, 11, 20, and 30, and Land/Water UXO Site 27

SITE ADDRESS: Indian Head, Maryland

CH2M HILL PROJECT MANAGER: Margaret Kasim

CH2M HILL OFFICE: Chantilly, VA

DATE HEALTH AND SAFETY PLAN PREPARED: 11/18/2008

DATE(S) OF SITE WORK: December 2008 through January 2011

SITE BACKGROUND AND SETTING: NSF-IH is a military facility consisting of the main area (on the Cornwallis Neck Peninsula) and the Stump Neck Annex, near Indian Head, in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington D.C. The mission of NSF-IH is to provide primary technical capability in energetics for all warfare centers through engineering, fleet and operational support, manufacturing technology, limited production, and industrial base support. Secondary technical capability is provided through research, development, test and evaluation for energetic materials, ordnance devices and components, and related ordnance engineering standards including chemicals, propellants and their propulsion systems, explosives, pyrotechnics, warhead, and simulators.

NG Slums Burning Ground (UXO 6)

Site UXO 6 is a 0.3-acre site located along the shoreline of the Potomac River. It is speculated to be located on the southeastern shore of the Main Installation adjacent to Mattawoman Creek. The site is reported to have been used as open burning (OB) ground for NG slums (excess NG mixed with sawdust for stabilization). It was operated from the late 1940s to approximately 1953. The Navy is requesting an SI for both MEC and MC because of the use of nitroglycerin. The objective is to verify the presence or suggested absence of MEC and MC.

Single Base Propellant Grains Spill Area (UXO 9)

Site UXO 9 is a 52-acre site located in the northeastern portion of the IH peninsula at the Main Installation. The site consists of an area where propellant grains were spilled during transportation of the propellant by rail at the installation. Transportation of grains started between 1927 and 1942 and ended in the late 1980s. The PA recommended that the site be moved directly to the RI for MC, which includes nitrates and diphenylamine. This site, however, is a known MEC area because of observation of propellant grains during the PA. An SI is scoped. The objective of the SI is to verify the presence or suggested absence of MEC.

The Valley (UXO 11)

Site UXO 11 is a 21-acre site located adjacent to the Potomac River on the northwest portion of the Main Installation. The Valley was previously listed as Installation Restoration Site 29. Prior to the 1980s, it was a tidal marshland, which was ideal for testing guns because of the hills on each side; the hills would absorb shots and potential explosions of gun barrels. The site was used for developing and testing numerous ordnance items from 1891 to 1921. It was also used for jet propulsion research from 1940 through 1944. Various calibers of guns (1-inch through 16-inch) were proved at The Valley with various projectiles including armor piercing (AP) shell. Tested shells contained different types of explosives. Gun proving, projectile testing, and testing of cartridges cases, fuzes, primers, firing devices, gun implements, and powders. Short-range guns and projectiles were tested by firing into butts placed against the hillsides of The Valley. Long-range guns were tested by firing south toward primary impact areas at Stump Neck and the Potomac River. MEC is suspected to be at the site. Potential MC includes metals and explosives (in surface soil and subsurface soil). The objective of the SI is to verify the presence or suggested absence of both MEC and MC.

Safety Thermal Treatment Point (UXO 20)

Site UXO 20 is a 1.6-acre site located at the end of a peninsula that extends southwest from the Main Installation into Mattawoman Creek. It was reportedly used for open burning/open detonation (OB/OD) and testing of projectiles, bulk propellant, bulk high explosives, demolition charges, CAD/PADs, primers, less sensitive explosives, and various other pyrotechnics. It operated from the late 1940s to 1988. Soil and groundwater samples showed elevated levels of explosives and metals (1996 Draft Closure and Post Closure Plans for the Safety Thermal Treatment Point). Because MC (TNT, RDX, Composition A, Composition B, Composition C, torpex, PETN, dynamite, nitrocellulose, cordite, perchlorate, metals) was detected, this site will move forward to an RI for MC. An SI is scoped. The objective of the SI is to verify the presence or suggested absence of MEC.

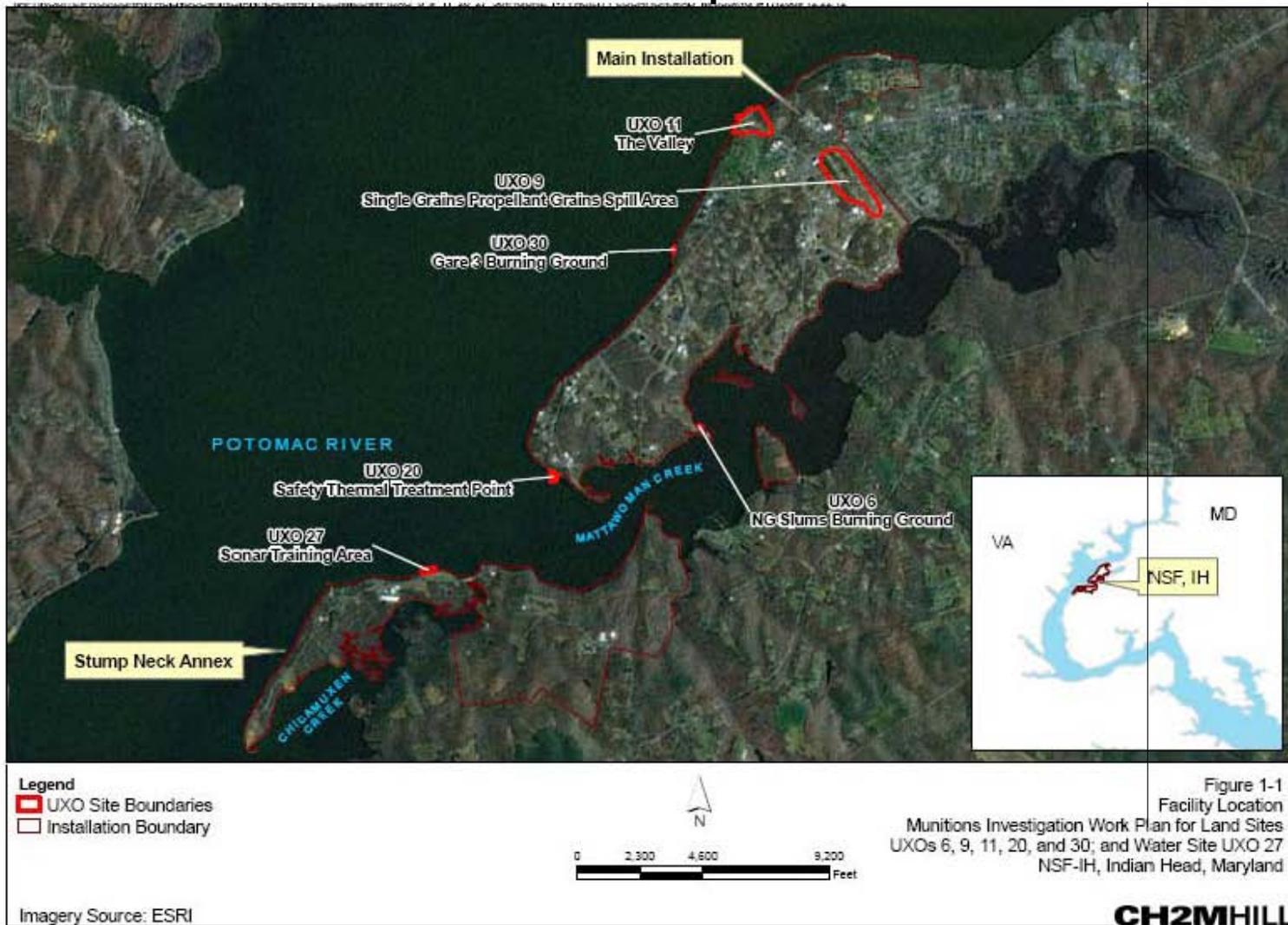
Gate 3 Burning Ground (UXO 30)

Site UXO 30 is a 0.23-acre site located along the shoreline of the Potomac River. It is within the estimated firing fan from The Valley site; therefore, it is a suspected MEC area (potential for munitions associated with The Valley). The site is reported to have been in operation from 1955 to 1961. Explosives may have been brought to the site for burning; however, the types and quantities of explosives are unknown. Based on interviews during the PA, MEC burned could have included flares, pyrotechnics, solid fuse boosters, bulk explosives, propellants, and small arms ammunition. Evidence of burned ground surface and pieces of an old stove were observed during the PA. An SI is scoped for both MEC and MC. The objective of the SI is to verify the presence or suggested absence of MEC and MC.

Sonar Training Area (UXO 27)

Site UXO 27 is a 2.10-acre site of which approximately 1.5 acres is located within the Potomac River and 0.6 acres is located on the adjacent shoreline of the Stump Neck. It is encompassed within the boundaries of the Water Impact Area. The PA reported that it was used for sonar training by Navy divers during the 1980s to mid 1990s. During the training, inert ordnance items were submerged just off-shore so divers could train in underwater ordnance identification. One torpedo casing, one underwater mine casing, and one bomb casing were visible at low tide approximately 75 feet from the water's edge, and it is not known if the items were inert ordnance associated with sonar training. The water portion of the site is currently a recreational waterway, while the land portion is undeveloped. Because of the observation of non-inert items, MEC and MC may be present. Potential munitions constituents include TNT, explosive residuals, and metals. The PA recommended an RI for MC. A SI has been scoped. The objective of the SI is to verify the presence or suggested absence of MEC.

Site Map



Note locations of Support, Decontamination, and Exclusion Zones; site telephone; first aid station; evacuation routes; and assembly areas.

Emergency Contacts

**24-hour CH2M HILL Serious Incident Reporting Contact/Pager
– 720-286-4911**

**If injured on the job, notify your supervisor and then call
1-866-893-2514 to contact CH2M HILL'S Occupational Nurse**

Medical Emergency

Facility Medical Response #: 301-744-4333 (if in restricted area, use red call boxes – no cell phone usage in restricted area!)
Off Base# 911

CH2M HILL- Medical Consultant

WorkCare
Dr. Peter Greaney M.D.
300 S. Harbor Blvd, Suite 600
Anaheim , CA 92805
800-455-6155
714-978-7488

Urgent Care Facility Bryans Road Urgent Care
3059 Marshall Hall Road, Bryans Road MD
301/375-8080

CH2M HILL Director Security Operations

Thomas Horton/DEN
720/273-3100 (cell) or 720/286-0022 (office)

Fire/Spill Emergency

Facility Fire Response #:301-744-4333
Local Fire Dept #: 911

Responsible Health and Safety Manager (RHSM)

Name: Mark Orman
Phone:(414) 847-0597

Security & Police – 911

Facility Security #:301-744-4333 (if in restricted area, use red call boxes – no cell phone usage in restricted area!)
Local Police #:911

Human Resources Department

Name: Sherri Huntley
Phone:703-376-5000

Utilities Emergency Phone Numbers

On base: Contact Nick Carros, NSF-IH
Phone: 301-744-2263

Worker's Compensation:

Contact Business Group HR dept. to have form completed or contact Jennifer Rindahl after hours: (720)891-5382

Safety Coordinator (SC)

Name: TBD
Phone:TBD

Media Inquiries Corporate Strategic Communications

Name: John Corsi
Phone: (720) 286-2087

Project Manager

Name: Margaret Kasim
Phone: 703/376-5154

Automobile Accidents:

Rental: Linda Anderson/COR 720/286-2401
CH2M HILL owned vehicle: Linda George 720-286-2057 See attachment 4 Vehicle Accident Guidance

Federal Express Dangerous Goods Shipping

Phone: 800/238-5355

CH2M HILL Dangerous Goods Shipping

Phone: 800/255-3924

Facility Alarms: Since CH2M HILL personnel will not always be working in close proximity to each other, hand signals, voice commands, air horns, and two-way radios will comprise the mechanisms to alert site personnel of an emergency.

All onsite contractors must read and sign the “Hazard Control Briefing for Environmental Division Visitors IHDI/NAVSURFAWARCEN”, and attend the “Pre-construction Safety Briefing” from the Safety Department prior to commencing work.

Evacuation Assembly Area(s): In the event that the site must be evacuated, all personnel will immediately stop activities and report to a safe place of refuge at the support zone area. The safe place of refuge may also serve as the telephone communication point, as communication with emergency response agencies may be necessary. A telephone communication point and safe place of refuge will be determined prior to the commencement of site activities at each site.

Facility/Site Evacuation Route(s): TBD for each site before start of work on that site.

Directions to Local Hospital

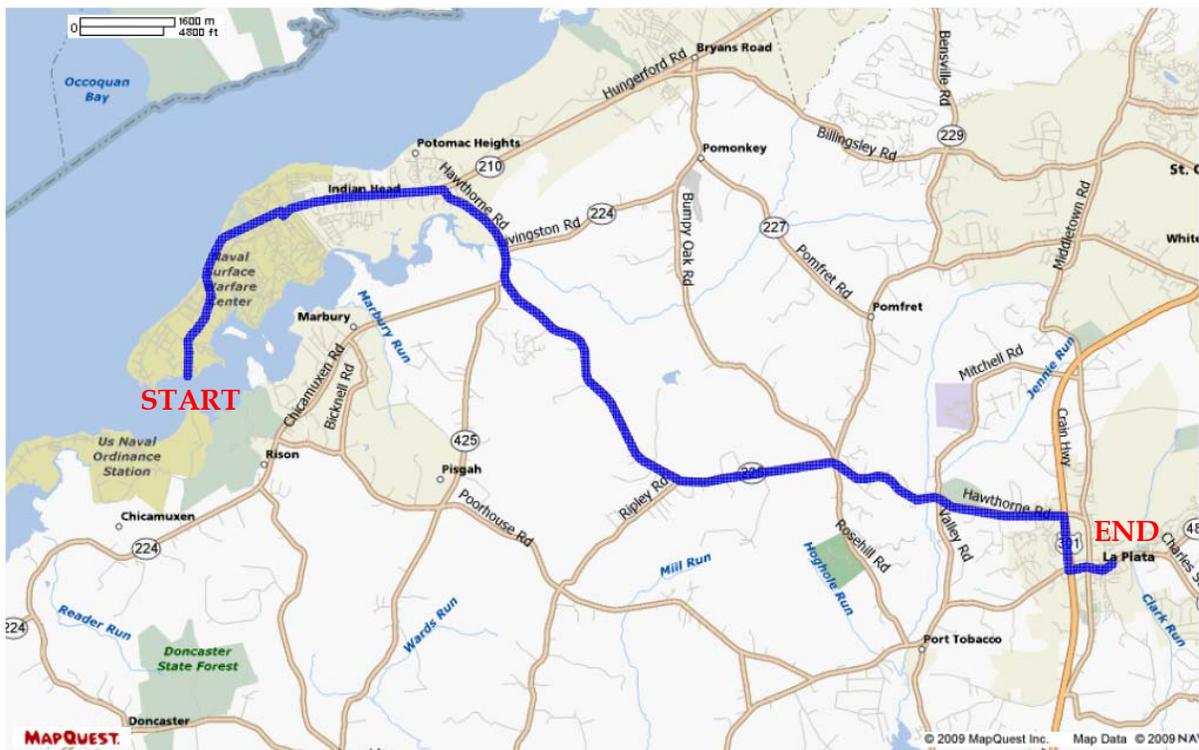
Local Hospital

Civista Medical Center
701 East Charles St., LaPlata MD 20646

Hospital Phone#: 301-609-4000

Start at : Indian Head, MD

- 1) Head **east** on **Strauss Ave** toward **Ward Rd** 0.6 mi
- 2) Continue on **MD-210** for 2 mi
- Turn **right** at **Hawthorne Rd/MD-225**. Continue to follow MD-225 for 10.9 mi
- Turn **right** at **Kent Ave.** go 0.7 mi
- Turn **left** at **Charles St/MD-6** Destination will be on the right go 0.2 mi



1.0 Tasks to be Performed under this Plan

1.1 Description of Tasks

Refer to project documents (i.e., Work Plan) for detailed task information. A health and safety risk analysis (Table 1) has been performed for each task and is incorporated in this plan through task-specific hazard controls and requirements for monitoring and protection. Tasks other than those listed below require an approved amendment or revision to this plan before tasks begin. Refer to Section 8.2 for procedures related to “clean” tasks that do not involve hazardous waste operations and emergency response (Hawwoper).

1.1.1 Hazwoper-Regulated Tasks

- Vegetation clearance including removal of trees of up to 6-inch diameter in preparation for geophysical surveying
- Geophysical surveying of MEC sites
- Site walk to inspect for surface MEC/MC

1.1.2 Non-Hazwoper-Regulated Tasks

Under specific circumstances, the training and medical monitoring requirements of federal or state Hazwoper regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-Hazwoper-trained personnel. **Prior approval from the Responsible Health and Safety Manager (RHSM) is required before these tasks are conducted on regulated hazardous waste sites.**

TASKS	CONTROLS
<ul style="list-style-type: none">• No non-hazwoper regulated tasks currently scoped.	<ul style="list-style-type: none">• Brief on hazards, limits of access, and emergency procedures• Post contaminant areas as appropriate (refer to Section 8.2 for details)• Sample and monitor as appropriate (refer to Section 5.0)

1.2 Change Management

PROJECT HS&E Change Management Form			
<p><i>This evaluation form should be reviewed on a continuous basis to determine if the current site health and safety plan adequately addresses ongoing project work, and should be completed whenever new tasks are contemplated or changed conditions are encountered.</i></p>			
Project Task:	Indian Head vegetation clearance of UXO sites 20 and 30 and geophysical survey of UXO sites 6, 9, 11, 20, 27 and 30.	Project/Task Manager: Margaret Kasim	
Project Number:	380785.PP.XO	Project Name: Geophysical surveying of Land UXO sites 6, 9, 11, 20, and 30, and Land/Water UXO Site 27.	
Evaluation Checklist		Yes	No
1.	Have the CH2MHILL staff listed in the original HASP changed?		
2.	Has a new subcontractor been added to the project?		
3.	Is any chemical or product to be used that is not listed in Attachment 2 of the plan?		
4.	Have additional tasks been added which were not originally addressed in Section 1.1 of the plan?		
5.	Have new contaminants or higher than anticipated levels of original contaminants been encountered?		
6.	Have other safety, equipment, activity or environmental hazards been encountered that are not addressed in Section 2.1 of the plan?		

If the answer is "YES" to Questions 1-3, an HSP revision is NOT needed. Please take the following actions:

- Confirm that staff's medical and training status is current – check training records at: <http://www.int.ch2m.com/hands> (or contact your regional SPA), and confirm subcontractor qualifications.
- Confirm with the project KA that subcontractor safety performance has been reviewed and is acceptable
- Confirm with H&S that subcontractor safety procedures have been reviewed and are acceptable.

If the answer is "YES" to Questions 4-6, an HSP revision MAY BE NEEDED.

Table 1 Hazard Analysis

(Refer to Section 2.0 and task specific AHA's for Hazard Controls)

POTENTIALHAZARDS	Project Activities								
	Geophysical Surveying	Vegetation Clearance							
Biological Hazards	X	X							
Chainsaws	X	X							
Chemical Hazard-Dermal/Inhalation	X	X							
Electrical Safety									
Field Vehicles	X	X							
Fire Prevention	X	X							
Hand & Power Tools	X	X							
Manual Lifting	X	X							
MEC/MPPEH	X	X							
Noise		X							
Visible Lighting	X	X							
Wild Animals	X	X							
Work Over Water	X								

2.0 Hazard Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. These practices and controls are to be implemented by the party in control of either the site or the particular hazard. CH2M HILL employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M HILL employees and subcontractors who do not understand any of these provisions should contact the RHSM for clarification.

The health and safety hazards posed by field activities have been identified for each project activity and are provided in the Hazard Analysis Table (Table 1). Hazard control measures for project-specific and general H&S hazards are provided in 2.1 and 2.2 of this section.

In addition to the controls specified in this section, Project-Activity Self-Assessment Checklists are contained in Attachment 4. These checklists are to be used to assess the adequacy of CH2M HILL and subcontractor site-specific safety requirements. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. Self-assessment checklists should be completed early in the project, when tasks or conditions change, or when otherwise specified by the RHSM. The self-assessment checklists, including documented corrective actions, should be made part of the permanent project records.

Applicable project activity self-assessment checklists (see Attachment 4) shall be completed weekly by a CH2M HILL representative during the course of the project depending on the work performed at the time.

2.1 Project-Specific Hazards

2.1.1 Munitions of Explosive Concern (MEC)

(Reference CH2M HILL SOP HSE 610, Explosives Usage and Munitions Response [MR])

- *MEC avoidance will be practice during all site visits and during the geophysical surveys. MEC avoidance will be provided by one UXO Technician III.*
- *No underwater work is authorized.*
- *All work will be performed in accordance with the approved Work Plan.*
- *Contact with MEC or MPPEH is prohibited.*

2.1.2 Chainsaws

Only chainsaws equipped with a spark arrestor and fully functioning chain brake or “safety chain” shall be used. Complete Chainsaw self assessment checklist (Attachment 4) at beginning of vegetation clearance work, and every 2 weeks thereafter for the duration of the chainsaw work. The following safety equipment shall be readily available while operating a chainsaw:

- Chainsaw operator’s manual
- Fully stocked first aid kit.
- Multipurpose fire extinguisher.

- Foreign voltage detector (FVD) when topping utility poles.
- Grounded extension cord approved for outdoor use and ground fault circuit interrupter (GFCI) for electrical-powered chainsaws.
- Approved safety gasoline container and funnel or flexible nozzle for refueling gasoline-powered chainsaws
- Sledge hammer and non-metallic wedges when necessary to prevent pinching of the chain.

PPE Requirements

The following personal protective equipment shall be worn while operating chainsaws:

- Safety glasses with side shields or face shield to prevent injury from wood chips, sawdust, or other flying objects.
- Hard hat with properly fitted suspension to prevent head injury from falling debris.
- Steel-toed safety shoes or boots to prevent foot injury from falling objects and accidental contact with the moving chain.
- Hearing protection to prevent permanent damage to hearing. Ear muffs or plugs will have a decibel noise reduction rating (NRR) assigned to them. The higher the rating, the greater the protection offered.
- Non-leather, fabric work gloves to prevent hand injury from abrasions, splinters and cuts.
- Clothing that is well-fitted and free of loose edges that could become entangled in the saw.
- Protective chaps or leggings that cover the area from the groin to about 2 inches above the ankles should be considered. These chaps are made from synthetic fabrics that are designed to prevent the running saw chain from coming in contact with your legs.

Safe Operation

The following safe operation guidelines shall be followed regardless of the purpose for using a chainsaw:

- Inspect the chainsaw prior to use.
- Chainsaws shall be held firmly with both hands, with thumbs and fingers encircling both chain saw handles.
- Stand slightly to the left side of the saw, out of the plane of the cutting chain and guide bar to reduce the risk of injury in the event of a kickback.
- Position saw so that it is between the waist and mid-chest level. Overreaching or cutting above the mid-chest height shall be avoided.
- Maintain a full throttle setting while cutting. Chainsaws are designed to be run at full speed.
- Always be aware of what is in the saw's downward path after the cut.
- Do not attempt to cut material that is larger than the guide bar of the saw.

- Avoid cuts that will cause the chainsaw to jam. Always cut into the compression wood first until the cut starts to close; then cut from the other side toward the compression cut.
- Use a non-metallic wedge to prevent the compression cut jamming on the blade.
- Chainsaws are designed to feed themselves into the wood and require only light pressure to cut efficiently. If extra force is required to keep cutting, the chain requires sharpening. Additional signs of a dull chain include a saw that is cutting crooked, results in fine sawdust instead of chips, or the smell of burnt wood. Do not use a dull chain.
- Bystanders and helpers shall be kept at a safe distance from operation.
- Do not operate a chainsaw when fatigued; take frequent breaks.
- Work slowly; don't rush.
- A fire extinguisher shall be present at all times when operating the chainsaw in forest or brushy areas.

Refueling the Engine

The fuel for gasoline-powered chainsaws shall be mixed in accordance with the manufacturer's recommendations as outlined in the chainsaw operator's manual. Fuel shall be stored and transported in an approved safety container. The following precautions should also be followed:

- The engine shall be shut off and allowed to cool before refueling; never refuel a hot engine.
- A fire extinguisher shall be present during fueling and refueling.
- Smoking around fueling or refueling operations shall be prohibited.
- A funnel or a flexible nozzle shall be used to avoid spilling fuel on the engine.

2.1.3 Field Vehicles

- Field vehicles may be personal vehicles, rental vehicles, fleet vehicles or project vehicles.
- Emergency kits are available in all NWR offices for personal and rental vehicles. Fleet vehicles are equipped with emergency supplies. It is a project responsibility to equip all project vehicles with emergency equipment.
- Maintain both a First Aid kit and Fire Extinguisher in the field vehicle at all times.
- Utilize a rotary beacon on vehicle if working adjacent to active roadway.
- Car rental must meet the following requirements:
 - Dual air bags
 - Antilock brakes
 - Be midsize or larger.
 - Familiarize yourself with rental vehicle features.
 - Mirror adjustments

- Seat adjustments
- Cruise control features, if offered.
- Pre-program radio stations.
- Always wear seatbelt while operating vehicle.
- Adjust headrest to proper position.
- Tie down loose items if utilizing a van.
- Pull off the road, put the car in park and turn on flashers before talking on a mobile phone.
- Close car doors slowly and carefully. Fingers can get pinched in doors or the truck.
- Park vehicle in a location where it can be accessed easily in the event of an emergency. If not possible, carry a phone.

2.1.4 Fire Prevention

- Fire extinguishers shall be provided so that the travel distance from any work area to the nearest extinguisher is less than 100 feet. When 5 gallons or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet. Extinguishers must:
 - be maintained in a fully charged and operable condition,
 - be visually inspected each month, and
 - undergo a maintenance check each year.
- The area in front of extinguishers must be kept clear.
- Post “Exit” signs over exiting doors, and post “Fire Extinguisher” signs over extinguisher locations.
- Combustible materials stored outside should be at least 10 feet from any building.
- Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.
- Flammable/combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet.

2.1.5 Hand and Power Tools

(Reference CH2M HILL, SOP HSE-210, *Hand and Power Tools*)

Below are the hazard controls and safe work practices to follow when personnel or subcontractors are using hand and power tools. Ensure the requirements in the referenced SOP are followed.

- Tools shall be inspected prior to use and damaged tools will be tagged and removed from service.
- Hand tools will be used for their intended use and operated in accordance with manufacturer’s instructions and design limitations;

- Maintain all hand and power tools in a safe condition.
- Use PPE (such as gloves, safety glasses, earplugs, and face shields) when exposed to a hazard from a tool.
- Do not carry or lower a power tool by its cord or hose.
- Portable power tools will be plugged into GFCI protected outlets; and
- Portable power tools will be Underwriters Laboratories (UL) listed and have a three-wire grounded plug or be double insulated.
- Disconnect tools from energy sources when they are not in use, before servicing and cleaning them, and when changing accessories (such as blades, bits, and cutters).
- Safety guards on tools must remain installed while the tool is in use and must be promptly replaced after repair or maintenance has been performed.
- Store tools properly in a place where they will not be damaged or come in contact with hazardous materials.
- If a cordless tool is connected to its recharge unit, both pieces of equipment must conform strictly with electrical standards and manufacturer's specifications.
- Tools used in an explosive environment must be rated for work in that environment (that is, intrinsically safe, spark-proof, etc.).
- Working with manual and pistol-grip hand tools may involve highly repetitive movement, extended elevation, constrained postures, and/or awkward positioning of body members (for example, hand, wrist, arm, shoulder, neck, etc.). Consider alternative tool designs, improved posture, the selection of appropriate materials, changing work organization, and sequencing to prevent muscular, skeletal, repetitive motion, and cumulative trauma stressors.

Machine Guarding

- Ensure that all machine guards are in place to prevent contact with drive lines, belts, chains, pinch points or any other sources of mechanical injury.
- Unplugging jammed equipment will only be performed when equipment has been shut down, all sources of energy have been isolated and equipment has been locked/tagged and tested.
- Maintenance and repair of equipment that results in the removal of guards or would otherwise put anyone at risk requires lockout of that equipment prior to work.

2.1.6 Manual Lifting

(Reference CH2M HILL SOP HSSE-112, *Manual Lifting*)

- Back injuries are the leading cause of disabling work and most back injuries are the result of improper lifting techniques or overexertion. Office or field tasks and activities involving manual lifting are to be identified and a program implemented to assist employees to mitigate the risks associated with manual lifting.
- When possible, the task should be modified to minimize manual lifting hazards.

- Effectiveness of manual handling control measures will be evaluated during assessments (HSE-114, Office & Warehouse Safety Program, or HSE-109, Audits).
- Manual handling incidents are reviewed as part of the HSE Program reviews, and the results influence program development, training, and education efforts.
- Lifting of loads weighing more than 40 pounds (18 kilograms) should be evaluated by the SC using the Lifting Evaluation Form contained in SOP HSSE-112.
- Using mechanical lifting devices is the preferred means of lifting heavy objects such as forklifts; cranes, hoists, and rigging; hand trucks; and trolleys.
- Personnel shall seek assistance when performing manual lifting tasks that appear beyond their physical capabilities.
- Physical differences make it difficult to set up safe lifting limits, unless extensive individual testing is performed. In general, the following steps must be practiced when planning and performing manual lifts: Assess the situation before you lift; ensure good lifting and body positioning practices; ensure good carrying and setting down practices.
- All employees must receive training for the correct procedures to lift safely using the computer-based health and safety training or project-specific training.

2.1.7 Noise

(Reference CH2M HILL SOP HSE-108, *Hearing Conservation*)

CH2M HILL is required to control employee exposure to occupational noise levels of 85 decibels, A-weighted, (dBA) and above by implementing a hearing conservation program that meets the requirements of the OSHA Occupational Noise Exposure standard, 29 CFR 1910.95. A noise assessment may be conducted by the RHSM or designee based on potential to emit noise above 85 dBA and also considering the frequency and duration of the task.

- Areas or equipment emitting noise at or above 90dBA shall be evaluated to determine feasible engineering controls. When engineering controls are not feasible, administrative controls can be developed and appropriate hearing protection will be provided.
- Areas or equipment emitting noise levels at or above 85 dBA, hearing protection must be worn.
- Employees exposed to 84 dBA or a noise dose of 50% must participate in the Hearing Conservation program including initial and annual (as required) audiograms.
- The RHSM will evaluate appropriate controls measures and work practices for employees who have experienced a standard threshold shift (STS) in their hearing.
- Employees who are exposed at or above the action level of 85 dBA are required to complete the online Noise Training Module located on CH2M HILL's virtual office.
- Hearing protection will be maintained in a clean and reliable condition, inspected prior to use and after any occurrence to identify any deterioration or damage, and damaged or deteriorated hearing protection repaired or discarded.
- In work areas where actual or potential high noise levels are present at any time, hearing protection must be worn by employees working or walking through the area.

- Areas where tasks requiring hearing protection are taking place may become hearing protection required areas as long as that specific task is taking place.
- High noise areas requiring hearing protection should be posted or employees must be informed of the requirements in an equivalent manner.

2.1.8 Visible Lighting

- While work is in progress outside construction areas shall have at least 33 lux (lx).
- Construction work conducted inside buildings should be provided with at least 55 lux light.
- The means of egress shall be illuminated with emergency and non-emergency lighting to provide a minimum 11 lx measured at the floor. Egress illumination shall be arranged so that the failure of any single lighting unit, including the burning out of an electric bulb will not leave any area in total darkness.

2.1.9 Working over Water

If any activities pose a risk to drowning do the following during the activity:

- Provide employees with an approved (USCG for U.S. operations) life jacket or buoyant work vest.
 - Employees should inspect life jackets or work vests daily before use for defects. Do not use defective jackets or vests.
- Post ring buoys with at least 90 feet of line next to the work area. If the work area is large, post extra buoys 200 feet or less from each other.
- Provide at least one life saving skiff, immediately available at locations where employees are working over or adjacent to water.
 - Ensure the skiff is in the water and capable of being launched by one person and is equipped with both motor and oars.
- Designate at least one employee on site to respond to water emergencies and operate the skiff at times when there are employees above water.
 - If the designated skiff operator is not within visual range of the water, provide him or her with a radio or provide some form of communication to inform them of an emergency.
 - Designated employee should be able to reach a victim in the water within three to four minutes.
- Ensure at least one employee trained in CPR and first aid is on site during work activities.

Boating Safety

- CH2M HILL employees will only pilot small boats in territorial waters or near coastlines on navigable waters. Commercial boating services will be conducted by professional marine operators and must be subcontracted.
- CH2M HILL employees who intend to operate a small boat during the course of the project shall first demonstrate to a designated Qualified Boat Operator that they are experienced in operating boats similar to those used for the project, that they possess basic skill necessary

to operate, maneuver, troubleshoot basic mechanical problems that may occur, and that they are knowledgeable of the requirements related SOPs, and the project Health and Safety Plan. The demonstration shall take the form of an operational sea trial developed by the Qualified Small Boat Trainer. A sea trial checklist is included in the Safety Coordinator Implementation Package (SCIP).

- Watercraft shall be licensed and identified in accordance with state or other applicable regulations.
- The boat operator shall complete a float plan prior to leaving the dock or shore. A copy of the float plan shall be left with a reliable individual or marina staff who will notify the coast guard if the vessel does not return according to the float plan schedule.
- Check all safety systems such as brakes, windshield wipers and lights. Tires must be in good condition and properly inflated. Make sure windshields and lights are free of obstructions such as dirt.
- U.S. Coast Guard-approved Type II personal flotation devices (PFDs), or life jacket, shall be provided for each employee and will be worn.
- PFDs will be inspected before and after each use. Defective equipment will not be used.
- A minimum of one Type IV ring buoy with 90 feet of 3/8-inch solid-braid polypropylene (or equal) rope will be provided for emergency rescue.
- The vessel shall be equipped with fire extinguishers or a fixed fire extinguishing systems.
- Safe means of boarding or leaving a boat or a platform will be provided to prevent slipping and falling.
- All gasoline engines, except outboard motors, installed in a boat must have an approved backfire flame arrestor (backfire preventor) fitted to the carburetor.
- The boat shall carry at least one operational air horn or similar sound signaling device.
- Visual distress signals shall be maintained onboard (e.g., flare, distress flag, distress light).
- Work requiring the use of a boat will not take place at night or during inclement weather.
- The boat must be operated according to U.S. Coast Guard regulations (speed, lighting, right-of-way, etc.).
- The engine should be shut off before refueling the generator; do not smoke while refueling.
- Sampling with a line/rope shall be done with the engine in neutral, or by other means, that effectively prevents propeller entanglement.
- Sampling line/rope that is loose on the deck shall be kept to a minimum, caution must be exercised to avoid entanglement, and the line/rope shall not be looped or wrapped around any part of a person.
- Marine Distress Communications information shall be posted near the vessel radio or telephone.
- If conditions of low or limit visibility is possible, boats shall be equipped with lighting (navigation and anchor).

2.2 General Hazards

2.2.1 General Practices and Housekeeping

- Site work should be performed during daylight hours whenever possible.
- Good housekeeping must be maintained at all times in all project work areas.
- Common paths of travel should be established and kept free from the accumulation of materials.
- Keep access to aisles, exits, ladders, stairways, scaffolding, and emergency equipment free from obstructions.
- Provide slip-resistant surfaces, ropes, and/or other devices to be used.
- Specific areas should be designated for the proper storage of materials.
- Tools, equipment, materials, and supplies shall be stored in an orderly manner.
- As work progresses, scrap and unessential materials must be neatly stored or removed from the work area.
- Containers should be provided for collecting trash and other debris and shall be removed at regular intervals.
- All spills shall be quickly cleaned up. Oil and grease shall be cleaned from walking and working surfaces.
- Review the safety requirements of each job you are assigned to with your supervisor. You are not expected to perform a job that may result in injury or illness to yourself or to others.
- Familiarize yourself with, understand, and follow jobsite emergency procedures.
- Do not fight or horseplay while conducting the firm's business.
- Do not use or possess firearms or other weapons while conducting the firm's business.
- Report unsafe conditions or unsafe acts to your supervisor immediately.
- Report occupational illnesses, injuries, and vehicle accidents.
- Do not remove or make ineffective safeguards or safety devices attached to any piece of equipment.
- Report unsafe equipment, defective or frayed electrical cords, and unguarded machinery to your supervisor.
- Shut down and lock out machinery and equipment before cleaning, adjustment, or repair. Do not lubricate or repair moving parts of machinery while the parts are in motion.
- Do not run in the workplace.
- When ascending or descending stairways, use the handrail and take one step at a time.
- Do not apply compressed air to any person or clothing.

- Do not wear steel taps or shoes with metal exposed to the sole at any CH2M HILL project location.
- Do not wear finger rings, loose clothing, wristwatches, and other loose accessories when within arm's reach of moving machinery.
- Remove waste and debris from the workplace and dispose of in accordance with federal, state, and local regulations.
- Note the correct way to lift heavy objects (secure footing, firm grip, straight back, lift with legs), and get help if needed. Use mechanical lifting devices whenever possible.
- Check toe work area to determine what problems or hazards may exist.

2.2.2 Personal Hygiene

- Keep hands away from nose, mouth, and eyes.
- Keep areas of broken skin (chapped, burned, etc.) covered.
- Wash hands with hot water and soap frequently prior to eating and smoking.

2.2.3 Drugs and Alcohol

(Reference CH2MHILL SOP HSE-105, *Drug-Free Workplace*)

The following situations pertaining to drugs and alcohol are prohibited:

- Use or possession of intoxicating beverages while performing CH2M HILL work
- Abuse of prescription or nonprescription drugs
- Regulations. Use or possession of illegal drugs or drugs obtained illegally
- Sale, purchase, or transfer of illegal or illegally obtained drugs
- Arrival at work under the influence of legal or illegal drugs or alcohol

2.2.4 Driving

- Always be aware of surroundings while operating a vehicle. Avoid intellectual stress & worries, talking on a cellular phone, eating, drinking, smoking, reading a map, adjusting controls or looking at a passenger while driving.
- Use prudent speed limits, assure that backup warning devices are working, be aware of blind spots or other hazards associated with low visibility, etc. Use a spotter if necessary.
- Do no drive while drowsy. Drowsiness can occur at any time, but is most likely after 18 hours or more without sleep.
- If in a motor vehicle accident, follow CH2M HILL vehicle accident guidance document (Attachment 4)

2.2.5 Hazard Communication

(Reference CH2M HILL SOP HSSE-107, *Hazard Communications*)

The Hazard Communication Coordinator is to perform the following:

- Complete an inventory of chemicals brought on site by CH2M HILL using Attachment 2.
- Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available.
- Request or confirm locations of Material Safety Data Sheets (MSDSs) from the client, contractors, and subcontractors for chemicals to which CH2M HILL employees potentially are exposed.
- Before or as the chemicals arrive on site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with the identity of the chemical and with hazard warnings, and store properly.
- Give employees required chemical-specific HAZCOM training using Attachment 3.
- Store all materials properly, giving consideration to compatibility, quantity limits, secondary containment, fire prevention, and environmental conditions.

2.2.6 Shipping and Transportation of Chemical Products

(Reference CH2M HILL's Procedures for Shipping and Transporting Dangerous Goods)

Chemicals brought to the site might be defined as hazardous materials by the U.S. Department of Transportation (DOT). All staff who ship the materials or transport them by road must receive CH2M HILL training in shipping dangerous goods. All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. Contact the RHSM or the Warehouse Coordinator for additional information.

2.2.7 Ultraviolet (UV) Radiation (sun exposure)

Health effects regarding UV radiation are confined to the skin and eyes. Overexposure can result in many skin conditions, including erythema (redness or sunburn), photoallergy (skin rash), phototoxicity (extreme sunburn acquired during short exposures to UV radiation while on certain medications), premature skin aging, and numerous types of skin cancer.

Acute overexposure of UV radiation to the eyes may lead to photokeratitis (inflammation of the cornea), also known as snow blindness. Symptoms include redness of the eyes and a gritty feeling, which progresses to pain and an inability to tolerate any kind of light. This condition can also occur when working in or around water and other UV radiation reflectors. In addition, long-term exposure to sunlight is thought to cause cataracts or clouding of the lens of the eye.

Limit Exposure Time

- Rotate staff so the same personnel are not exposed all of the time.
- Limit exposure time when UV radiation is at peak levels (approximately 2 hours before and after the sun is at its highest point in the sky).

- Avoid exposure to the sun, or take extra precautions when the UV index rating is high.

Provide Shade

- Take lunch and breaks in shaded areas.
- Create shade or shelter through the use of umbrellas, tents, and canopies.
- Fabrics such as canvas, sailcloth, awning material and synthetic shade cloth create good UV radiation protection.
- Check the UV protection of the materials before buying them. Seek protection levels of 95 percent or greater, and check the protection levels for different colors.

Clothing

- Reduce UV radiation damage by wearing proper clothing; for example, long sleeved shirts with collars, and long pants. The fabric should be closely woven and should not let light through.
- Head protection should be worn to protect the face, ears, and neck. Wide-brimmed hats with a neck flap or “Foreign Legion” style caps offer added protection.
- Wear UV-protective sunglasses or safety glasses. These should fit closely to the face. Wrap-around style glasses provide the best protection.

Sunscreen

- Apply sunscreen generously to all exposed skin surfaces at least 20 minutes before exposure, allowing time for it to adhere to the skin.
- Re-apply sunscreen at least every 2 hours, and more frequently when sweating or performing activities where sunscreen may be wiped off.
- Choose a sunscreen with a high sun protection factor (SPF). Most dermatologists advocate SPF 30 or higher for significant sun exposure.
- Waterproof sunscreens should be selected for use in or near water, and by those who perspire sufficiently to wash off non-waterproof products.
- Check for expiration dates, because most sunscreens are only good for about 3 years. Store in a cool place out of the sun.
- Remember—no sunscreen provides 100% protection against UV radiation. Other precautions must be taken to avoid overexposure.

2.2.8 Heat Stress

- Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50°F to 60°F should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons per day. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours.
- Acclimate yourself by slowly increasing workloads (e.g., do not begin with extremely demanding activities).

- Use cooling devices, such as cooling vests, to aid natural body ventilation. These devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.
- Avoid direct sun whenever possible, which can decrease physical efficiency and increase the probability of heat stress. Take regular breaks in a cool, shaded area. Use a wide-brim hat or an umbrella when working under direct sun for extended periods.
- Provide adequate shelter/shade to protect personnel against radiant heat (sun, flames, hot metal).
- Maintain good hygiene standards by frequently changing clothing and showering.
- Observe one another for signs of heat stress. Persons who experience signs of heat syncope, heat rash, or heat cramps should report it to their supervisor immediately to avoid progression of heat-related illness.

SYMPTOMS AND TREATMENT OF HEAT STRESS					
	Heat Syncope	Heat Rash	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool—but not cold—water. Call ambulance, and get medical attention immediately!

Monitoring Heat Stress

These procedures should be implemented when the ambient air temperature exceeds 70°F, the relative humidity is high (>50 percent), or when workers exhibit symptoms of heat stress.

The heart rate (HR) should be measured by the radial pulse for 30 seconds, as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 100 beats/minute, or 20 beats/minute above resting pulse. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 100 beats/minute at the beginning of the next rest period, the work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 100 beats/minute, or 20 beats/minute above resting pulse.

2.2.9 Cold Stress

- Be aware of the symptoms of cold-related disorders, and wear proper, layered clothing for the anticipated fieldwork. Appropriate rain gear is a must in cool weather.
- Consider monitoring the work conditions and adjusting the work schedule using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- Wind-Chill Index is used to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it should only be used as a guideline to warn workers when they are in a situation that can cause cold-related illnesses.
- NSC Guidelines for Work and Warm-Up Schedules can be used with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; workers should be monitored for symptoms of cold-related illnesses. If symptoms are not observed, the work duration can be increased.
- Persons who experience initial signs of immersion foot, frostbite, hypothermia should report it immediately to their supervisor/PM to avoid progression of cold-related illness.
- Observe one another for initial signs of cold-related disorders.
- Obtain and review weather forecast – be aware of predicted weather systems along with sudden drops in temperature, increase in winds, and precipitation.

SYMPTOMS AND TREATMENT OF COLD STRESS			
	Immersion (Trench) Foot	Frostbite	Hypothermia
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Re-warm area quickly in warm—but not hot—water. Have victim drink warm fluids, but not coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but not coffee or alcohol. Get medical attention.



Wind Chill Chart



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

Frostbite Times: 30 minutes (light blue), 10 minutes (medium blue), 5 minutes (dark blue)

Wind Chill (°F) = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})
 Where, T= Air Temperature (°F) V= Wind Speed (mph) Effective 11/01/01

2.3 Biological Hazards and Controls

2.3.1 Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings.

2.3.2 Poison Ivy and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Shrubs are usually 12 to 30 inches high, or can also be a tree-climbing vine, with triple leaflets and short, smooth hair underneath. Plants are red and dark green in Spring and Summer, with yellowing leaves anytime especially in dry areas. Leaves may achieve bright reds in Fall, but plants lose its (yellowed, then brown) leaves in Winter, leaving toxic stems. All parts of the plant remain toxic throughout the seasons. These plants contain urushiol (you-ROO-shee-ol), a colorless or pale yellow oil that oozes from any cut or crushed part of the plant, including the roots, stems and leaves and causes allergic skin reactions when contacted. The oil is active year round.

Become familiar with the identity of these plants (see below). Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.

Poison Ivy



Poison Sumac



Poison Oak



Contamination with poison ivy, sumac or oak can happen through several pathways, including:

- Direct skin contact with any part of the plant (even roots once above ground foliage has been removed).
- Contact with clothing that has been contaminated with the oil.
- Contact from removing shoes that have been contaminated (shoes are coated with urishol oil).
- Sitting in a vehicle that has become contaminated.
- Contact with any objects or tools that have become contaminated.
- Inhalation of particles generated by weed whacking, chipping, vegetation clearing.

If you must work on a site with poison ivy, sumac or oak the following precautions are necessary:

- Do not drive vehicles onto the site where it will come into contact with poison ivy, sumac or oak. Vehicles which need to work in the area, such as drill rigs or heavy equipment must be washed as soon as possible after leaving the site.
- All tools used in the poison ivy, sumac or oak area, including those used to cut back poison oak, surveying instruments used in the area, air monitoring equipment or other test apparatus must be decontaminated before they are placed back into the site vehicle. If on-site decontamination is not possible, use plastic to wrap any tools or equipment until they can be decontaminated.
- Personal protective equipment, including Tyvek coveralls, gloves, and boot covers must be worn. PPE must be placed into plastic bags and sealed if they are not disposed immediately into a trash receptacle.
- As soon as possible following the work, shower to remove any potential contamination. Any body part with suspected or actual exposure should be washed with “Tecnu” or other product designed for removing urushiol. If you do not have Tecnu wash with cold water. Do not take a bath, as the oils can form an invisible film on top of the water and contaminate your entire body upon exiting the bath.
- Tecnu may also be used to decontaminate equipment.

- Use IvyBlock or similar products to prevent poison oak, ivy and sumac contamination. Check with the closest CH2M HILL warehouse to see if these products are available. Follow all directions for application.

If you do come into contact with one of these poisonous plants and a reaction develops, contact your supervisor and the occupational nurse 1-866-893-2514.

2.3.3 Ticks

Every year employees are exposed to tick bites at work and at home putting them at risk of illness. Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size.

In some geographic areas exposure is not easily avoided. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray **only outside** of clothing with permethrin or permethrin and spray skin with only DEET; and check yourself frequently for ticks.

Where site conditions warrant (vegetation above knee height, tick endemic area) or when tasks warrant (e.g., having to sit/kneel in vegetation) that diminish the effectiveness of the other controls mentioned above, bug-out suits (obtained from MKE warehouse)/Tyvek shall be used. Bug-out suits are more breathable than Tyvek.

Take precautions to avoid exposure by including pre-planning measures for biological hazards prior to starting field work. Contact the MKE Warehouse for preventative equipment such as repellants, protective clothing and tick removal kits. Use the buddy system and perform tick inspections prior to entering the field vehicle. If ticks were not planned to be encountered and are observed, do not continue field work until these controls can be implemented.

See Tick Fact Sheet attached to this HSP for further precautions and controls to implement when ticks are present. Information includes the procedure for submitting a removed tick for testing. If bitten by a tick, follow the removal procedures found in the tick fact sheet, call the occupational nurse at 1-866-893-2514.

Be aware of the symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: a rash might appear that looks like a bullseye with a small welt in the center. RMSF: a rash of red spots under the skin 3 to 10 days after the tick bite. In both RMSF and Lyme disease, chills, fever, headache, fatigue, stiff neck, and bone pain may develop. If symptoms appear, again contact the occupational nurse at 1-866-893-2514.

Be sure to complete an Incident Report (either use the HITS system on the VO) or see Attachment 5 if you do come in contact with a tick. For more detailed information go to HSSE website or contact the RHSM.

2.3.4 Bees and Other Stinging Insects

Bee and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic. Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform your supervisor and/or buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention by notifying your supervisor and contacting Occ. Nurse at 1-866-893-2514 if a reaction develops.

2.3.5 Bloodborne Pathogens

(Reference CH2M HILL SOP HSSE-202, *Bloodborne Pathogens*)

Exposure to bloodborne pathogens may occur when rendering first aid or CPR, or when coming into contact with landfill waste or waste streams containing potentially infectious material (PIM).

- Employees trained in first-aid/CPR or those exposed to PIM must complete CH2M HILL's 1-hour bloodborne computer-based training module annually.
- Hepatitis B vaccine (HBV) is offered to employees who may be exposed to PIM when they complete training and within 10 working days of assignment. (Note: Employees whose exposure stems only from rendering first aid as a collateral duty receives the vaccine after exposure.)
- Employees who decline the HBV vaccine must sign the declination form (contact regional Safety Program Assistant [SPA]) indicating they declined the vaccination. Anyone who declines the vaccination and chooses to receive the vaccination at a later time may still receive the vaccination by contacting the SPA.
- Hepatitis B and tetanus vaccinations can be requested by completing the medical portion of the enrollment form, located under Tools & Forms at the HS&E web page, or by contacting the regional SPA.

2.3.6 Feral Dogs

Avoid all dogs – both leashed and stray. Do not disturb a dog while it is sleeping, eating, or caring for puppies. If a dog approaches to sniff you, stay still. An aggressive dog has a tight mouth, flattened ears and a direct stare. If you are threatened by a dog, remain calm, do not scream and avoid eye contact. If you say anything, speak calmly and firmly. Do not turn and run, try to stay still until the dog leaves, or back away slowly until the dog is out of sight or you have reached safety (e.g. vehicle). If attacked, retreat to vehicle or attempt to place something between you and the dog. If you fall or are knocked to the ground, curl into a ball with your hands over your head and neck and protect your face. If bitten, immediately scrub the bite site vigorously with soap and water. Report the incident to the local authorities. Seek medical attention as soon as possible.

2.3.7 Mosquito Bites

Due to the recent detection of the West Nile Virus in the Southwestern United States it is recommended that **preventative measures** be taken to reduce the probability of being bitten by mosquitoes whenever possible. Mosquito's are believed to be the primary source for exposure to the West Nile Virus as well as several other types of encephalitis. The following guidelines should be followed to reduce the risk of these concerns for working in areas where mosquitoes are prevalent.

- Stay indoors at dawn, dusk, and in the early evening.
- Wear long-sleeved shirts and long pants whenever you are outdoors.
- Spray clothing with repellents containing permethrin or DEET since mosquitoes may bite through thin clothing.
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35% DEET (N,N-diethyl-meta-toluamide). DEET in high concentrations (greater than 35%) provides no additional protection.

- Repellents may irritate the eyes and mouth, so avoid applying repellent to the hands.
- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's DIRECTIONS FOR USE, as printed on the product.
- Note: Vitamin B and "ultrasonic" devices are NOT effective in preventing mosquito bites.

Symptoms of Exposure to the West Nile Virus

Most infections are mild, and symptoms include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death.

The West Nile Virus incubation period is from 3-15 days.

Contact the project RHSM with questions, and immediately report any suspicious symptoms to your supervisor/PM.

2.4 Radiological Hazards and Controls

Refer to CH2M HILL's Core Standard, Radiological Control and Radiological Controls Manual for additional requirements.

Hazards	Controls
None Known	None Required

2.5 Contaminants of Concern

Contaminant	Location and Maximum ^a Concentration (ppm)	Exposure Limit ^b	IDLH ^c	Symptoms and Effects of Exposure	PIP ^d (eV)
Composition A, B, & C – Reference RDX and TNT	UK				
Cordite	UK	NL	NL	NL	NL
Dynamite - Nitroglycerine	UK	0.1 mg/m ³	75 mg/m ³	Throbbing headache; dizziness; nausea, vomiting	NL
Diphenylamine	UK	10 mg/m ³	NL	Irritation eyes, skin, mucous membrane; eczema; tachycardia, hypertension	7.40
Nitrocellulose	UK	NL	NL	NL	NL
Perchlorate	UK	NL	NL	NL	NL
RDX	UK	1.5 mg/m ³	NL	Irritation eyes, skin; headache, irritability, lassitude	NL
TNT	UK	0.5 mg/m ³	500 mg/m ³	Irritation skin, mucous membrane; liver damage, jaundice	10.59
Torpex – Reference RDX / TNT	UK				
PETN	UK	5	NL	Irritation eyes, respiratory system	NL
Footnotes: ^a Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), S (Surface Soil), SL (Sludge), SW (Surface Water). ^b Appropriate value of PEL, REL, or TLV listed. ^c IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen. ^d PIP = photoionization potential; NA = Not applicable; UK = Unknown.					
Potential Routes of Exposure					
Dermal: Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 4.		Inhalation: Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in Sections 4 and 5, respectively.		Other: Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before drinking or smoking).	

3.0 Project Organization and Personnel

3.1 CH2M HILL Employee Medical Surveillance and Training

(Reference CH2M HILL- SOPs HSSE-113, Medical Surveillance, and HSSE-110, Training)

3.1.1 Hazardous Waste Operations Training

All employees engaging in hazardous waste operations or emergency response shall receive appropriate training as required by 29 CFR 1910.120 and 29 CFR 1926.65. At a minimum, the training shall have consisted of instruction in the topics outlined in the 29 CFR 1910.120 and 29 CFR 1926.65. Personnel who have not met these training requirements shall not be allowed to engage in hazardous waste operations or emergency response activities.

3.1.1.1 Initial Training

General site workers engaged in hazardous waste operations shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations, unless otherwise noted in the above-referenced standards.

Employees who may be exposed to health hazards or hazardous substances at treatment, storage, and disposal (TSD) operations shall receive a minimum of 24 hours of initial training to enable the employee to perform their assigned duties and functions in a safe and healthful manner.

Employees engaged in emergency response operations shall be trained to the level of required competence in accordance with 29 CFR 1910.120.

3.1.1.2 Three-Day Actual Field Experience

General site workers for hazardous waste operations shall have received three days of actual experience (on-the-job training) under the direct supervision of a trained, qualified supervisor and shall be documented. If the field experience has not already been received and documented at a similar site, this supervised experience shall be accomplished and documented at the beginning of the assignment of the project.

3.1.1.3 Refresher Training

General site workers and TSD workers shall receive 8-hours of refresher training annually (within the previous 12-month period) to maintain qualifications for fieldwork. Employees engaged in emergency response operations shall receive annual refresher training of sufficient content and duration to maintain their competencies or shall demonstrate competency in those areas at least annually.

3.1.1.4 Eight-Hour Supervisory Training

On site management or supervisors who will be directly responsible for, or supervise employees engaged in hazardous waste site operations, will have received at least 8 hours of additional specialized training on managing such operations. Employees designated as SC-HW employees are considered 8-hour HAZWOPER Site Safety Supervisor trained.

The employees listed meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated "SC" have completed a 12-hour site safety coordinator course, and have documented requisite field experience. An SC with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in

exclusion or decontamination zones. Employees designated “FA-CPR” are currently certified by the American Red Cross, or equivalent, in first aid and CPR. At least one FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Pregnant employees are to be informed of and are to follow the procedures in CH2M HILL- SOP HSE-120, *Reproductive Health*, including obtaining a physician’s statement of the employee’s ability to perform hazardous activities before being assigned fieldwork.

Employee Name	Office	Responsibility	SC/FA-CPR
TBD			Level C SC/HW, FA-CPR*

* Safety coordinator must have boating experience.

3.2 Field Team Chain of Command and Communication Procedures

3.2.1 Client

Contact Name: Mr. Joe Rail Remedial Project Manager

Phone: 202-685-3105

Facility Contact Name: Mr. Nathan DeLong-Remedial Project Manager

Phone: 202/685-3279

3.2.2 CH2M HILL

Project Manager (PM): Margaret Kasim

Responsible Health and Safety Manager (RHSM): Mark Orman

Field Team Leader: TBD

Safety Coordinator (SC): TBD

The PM is responsible for providing adequate resources (budget and staff) for project-specific implementation of the HS&E management process. The PM has overall management responsibility for the tasks listed below. The PM may explicitly delegate specific tasks to other staff, as described in sections that follow, but retains ultimate responsibility for completion of the following in accordance with this SOP:

- Include standard terms and conditions, and contract-specific HS&E roles and responsibilities in contract and subcontract agreements (including flow-down requirements to lower-tier subcontractors)
- Select safe and competent subcontractors by:
 - obtaining, reviewing and accepting or rejecting subcontractor pre-qualification questionnaires
 - ensuring that acceptable certificates of insurance, including CH2M HILL as named additional insured, are secured as a condition of subcontract award
 - including HS&E submittals checklist in subcontract agreements, and ensuring that appropriate site-specific safety procedures, training and medical monitoring records are reviewed and accepted prior to the start of subcontractor's field operations
- Maintain copies of subcontracts and subcontractor certificates of insurance (including CH2M HILL as named additional insured), bond, contractors license, training and medical monitoring records, and site-specific safety procedures in the project file accessible to site personnel
- Provide oversight of subcontractor HS&E practices per the site-specific safety plan
- Manage the site and interfacing with 3rd parties in a manner consistent with our contract and subcontract agreements and the applicable standard of reasonable care
- Ensure that the overall, job-specific, HS&E goals are fully and continuously implemented

The CH2M HILL RHSM is responsible for:

- Review and accept or reject subcontractor pre-qualification questionnaires that fall outside the performance range delegated to the Contracts Administrator (KA)
- Review and accept or reject subcontractor training records and site-specific safety procedures prior to start of subcontractor's field operations
- Support the oversight of subcontractor (and lower-tier subcontractors) HS&E practices and interfaces with on-site 3rd parties per the site-specific safety plan
- Approving revision to PPE levels

The SC is responsible for verifying that the project is conducted in a safe manner including the following specific obligations:

- Verify this HSP is current and amended when project activities or conditions change.
- Verify CH2M HILL site personnel and subcontractor personnel read the HSP and sign Attachment 1, Employee Sign-Off Form prior to commencing field activities.
- Verify CH2M HILL site personnel and subcontractor personnel have completed any required specialty training (e.g., fall protection, confined space entry) and medical surveillance as identified in Section 2.
- Verify compliance with the requirements of this HSP and applicable subcontractor health and safety plan(s)

- Act as the project “Hazard Communication Coordinator” and perform the responsibilities outlined in Section 2
- Act as the project “Emergency Response Coordinator” and perform the responsibilities outlined in Section 9.
- Post OSHA job-site poster; the poster is required at sites where project field offices, trailers, or equipment-storage boxes are established.
- Verify that safety meetings are conducted and documented in the project file initially and as needed throughout the course of the project (e.g., as tasks or hazards change)
- Verify that project H&S forms and permits, found in Attachment 4 and 5, are being used as outlined in Section 2.
- Perform oversight and/or assessments of subcontractor HS&E practices per the site-specific safety plan and verify that project activity self-assessment checklists, found in Attachment 4, are being used as outlined in Section 2
- Verify that project files available to site personnel include copies of executed subcontracts and subcontractor certificates of insurance (including CH2M HILL as named additional insured), bond, contractors license, training and medical monitoring records, and site-specific safety procedures prior to start of subcontractor’s field operations
- Manage the site and interfacing with 3rd parties in a manner consistent with our contract/subcontract agreements and the applicable standard of reasonable care
- Coordinate with the RHSM regarding CH2M HILL and subcontractor operational performance, and 3rd party interfaces
- Ensure that the overall, job-specific, HS&E goals are fully and continuously implemented

The training required for the SC/HW is as follows:

- SC-Initial, SC_HW
- First Aid and CPR
-

The SC is responsible for contacting the Field Team Leader and Project Manager. In general, the Project Manager will contact the client. The RHSM should be contacted as appropriate.

3.2.3 CH2M HILL Subcontractors

(Reference CH2M HILL SOP HSSE-215, *Contracts, Subcontracts and HSSE Management Practices*)

Subcontractor: Geophysical Subcontractor TBD

Subcontractor Contact Name:

Telephone:

Subcontractor: Vegetation Clearance Subcontractor TBD

Subcontractor Contact Name:

Telephone:

Subcontractor: UXO avoidance Techs TBD

Subcontractor Contact Name:

Telephone:

The subcontractors listed above are required to submit their own Accident Prevention Plan, specific to this project. Other plans, such as Lead or Asbestos Abatement Compliance plans, may be required as well. Subcontractors are responsible for the health and safety procedures specific to their work, and are required to submit their plans to CH2M HILL for review before the start of field work.

Subcontractors are also required to prepare an Activity Hazard Analysis (AHA) before beginning each activity posing H&S hazards to their personnel using the AHA form provided in Attachment 5 as a guide. The AHA shall identify the principle steps of the activity, potential H&S hazards for each step and recommended control measures for each identified hazard. In addition, a listing of the equipment to be used to perform the activity, inspection requirements and training requirements for the safe operation of the equipment listed must be identified.

CH2M HILL should continuously endeavor to observe subcontractors' safety performance and adherence to their Accident Prevention Plan and AHAs. This endeavor should be reasonable, and include observing for hazards or unsafe practices that are both readily observable and occur in common work areas. CH2M HILL is not responsible for exhaustive observation for hazards and unsafe practices. Self-assessment checklists contained in Attachment 4 are to be used by CH2M HILL personnel to review subcontractor performance. CH2M HILL oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

Health and safety related communications with CH2M HILL subcontractors should be conducted as follows:

- Brief subcontractors on the provisions of this plan, and require them to sign the Employee Signoff Form included in Attachment 1.
- Request subcontractor(s) to brief project team on the hazards and precautions related to their work.
- When apparent non-compliance/unsafe conditions or practices are observed, notify the subcontractor safety representative and require corrective action – the subcontractor is responsible for determining and implementing necessary controls and corrective actions.
- When repeat non-compliance/unsafe conditions are observed, notify the subcontractor safety representative and stop affected work until adequate corrective measures are implemented.
- When an apparent imminent danger exists, immediately remove all affected CH2M HILL employees and subcontractors, notify subcontractor safety representative, and stop affected work until adequate corrective measures are implemented. Notify the PM and RHSM as appropriate.

- Document all oral health and safety related communications in project field logbook, daily reports, or other records.

4.0 Personal Protective Equipment (PPE)

(Reference CH2M HILL- SOP HSSE-117, *Personal Protective Equipment*)

- PPE must be worn by employees when actual or potential hazards exist and engineering controls or administrative practices cannot adequately control those hazards.
- A PPE assessment has been conducted by the RHSM based on project tasks (see PPE specifications below). Verification and certification of assigned PPE by task is completed by the RHSM or designee.
- The PPE initially identified for tasks may be changed based on field reconnaissance, results of
 - site monitoring, or additional hazard analysis. These changes must be reviewed by the RHSM prior to implementation.
- Employees must be trained to properly wear and maintain the PPE.
- In work areas where actual or potential hazards are present at any time, PPE must be worn by employees working or walking through the area.
- Areas requiring PPE should be posted or employees must be informed of the requirements in an equivalent manner.
- PPE must be inspected prior to use and after any occurrence to identify any deterioration or damage.
- PPE must be maintained in a clean and reliable condition.
- Damaged PPE shall not be used and must either be repaired or discarded.
- PPE shall not be modified, tampered with, or repaired beyond routine maintenance.

The table below outlines PPE to be used according to task based on project-specific hazard assessment. If a task other than the tasks described in this table needs to be performed, contact the RHSM so this table can be updated.

Project-Specific PPE Requirements^a

Task	Level	Body	Head	Respirator ^b
General site entry Geophysical surveying Vegetation clearance	D	Work clothes; sturdy leather work boots and gloves *Visible soil will be removed from boots prior to exiting work area.	Hardhat ^c Safety glasses with side shields Ear protection ^d	None required
No tasks on this job	Modified D	Work clothes or cotton coveralls Boots: Safety-toe, chemical-resistant boots OR Safety -toe, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat ^c Safety glasses with side shields Ear protection ^d	None required

Reasons for Upgrading or Downgrading Level of Protection with approval of the HSM

Upgrade ^f	Downgrade
<ul style="list-style-type: none"> • Request from individual performing tasks. • Change in work tasks that will increase contact or potential contact with hazardous materials. • Occurrence or likely occurrence of gas or vapor emission. • Known or suspected presence of dermal hazards. • Instrument action levels (Section 5) exceeded. 	<ul style="list-style-type: none"> • New information indicating that situation is less hazardous than originally thought. • Change in site conditions that decrease the hazard. • Change in work task that will reduce contact with hazardous materials.

^a Modifications are as indicated. CH2M HILL will provide PPE only to CH2M HILL employees.

^b No facial hair that would interfere with respirator fit is permitted.

^c Hardhat and splash-shield areas are to be determined by the SC.

^d Ear protection should be worn when conversations cannot be held at distances of 3 feet or less without shouting.

^f Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the RHSM, and an SC qualified at that level is present.

PPE Certification

I certify that the PPE requirements listed in the table above for the associated tasks are based upon the project-specific hazard assessment I performed.

Mark Orman	11/24/08	11/24/08
Name	Date of Certification	Date(s) of Project Hazard Assessment

4.1 Respiratory Protection

(Reference CH2M HILL SOP HSSE-121, *Respiratory Protection*)

- Respirator users must have completed appropriate respirator training within the past 12 months. Level C training is required for air-purifying respirators (APR) use and Level B training is required for supplied-air respirators (SAR) and self-contained breathing apparatus (SCBA) use. Specific training is required for the use of powered air-purifying respirators (PAPR).
- Respirator users must complete the respirator medical monitoring protocol and been approved for the specific type of respirator to be used.
- Tight-fitting facepiece respirator (negative or positive pressure) users must have passed an appropriate fit test within past 12 months.
- Respirator use shall be limited to those activities identified in this plan. If site conditions change that alters the effectiveness of the specified respiratory protection, the RHSM shall be notified to amend the written plan.
- Tight-fitting facepiece respirator users shall be clean-shaven and shall perform a user seal check before each use.
- Canisters/cartridges shall be replaced according to the change-out schedule specified in this plan. Respirator users shall notify the SC or RHSM of any detection of vapor or gas breakthrough. The SC shall report any breakthrough events to the RHSM for schedule upgrade.

- Respirators in regular use shall be inspected before each use and during cleaning
- Respirators in regular use shall be cleaned and disinfected as often as necessary to ensure they are maintained in a clean and sanitary condition.
- Respirators shall be properly stored to protect against contamination and deformation.
- Field repair of respirators shall be limited to routine maintenance. Defective respirators shall be removed from service.
- When breathing air is supplied by cylinder or compressor, the SC or RHSM shall verify the air meets Grade D air specifications.
- The SC or designee shall complete the H&S Self-Assessment Checklist – Respiratory Protection included in Attachment 4 of this plan to verify compliance with CH2M HILL's respiratory protection program.

5.0 Air Monitoring/Sampling

(Reference CH2M HILL SOP HSSE-207, Exposure Assessment for Airborne Chemical Hazards)

5.1 Air Monitoring Specifications

Not needed for geophysical surveying or vegetation clearance.

Instrument	Tasks	Action Levels ^a	Action to be Taken when Action Level reached	Frequency ^b	Calibration
Dust Monitor: Miniram model PDM-3 or equivalent	Dust monitoring under wind conditions with visible dust in air at UXO 9.	1.5 mg/m ³ >1.5 mg/m ³	Level D Level C	Initially and periodically during tasks	Zero Daily
Nose-Level Monitor^d	All	<85 dB(A) 85-120 dB(A) 120 dB(A)	No action required Hearing protection required Stop; re-evaluate	Initially and periodically during task	Daily

^a Action levels apply to sustained breathing-zone measurements above background.

^b The exact frequency of monitoring depends on field conditions and is to be determined by the SC; generally, every 5 to 15 minutes if acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time, measurement results, personnel monitored, and place/location where measurement is taken (e.g., "Breathing Zone/MW-3", "at surface/SB-2", etc.).

^c If the measured percent of O₂ is less than 10, an accurate LEL reading will not be obtained. Percent LEL and percent O₂ action levels apply only to ambient working atmospheres, and not to confined-space entry. More-stringent percent LEL and O₂ action levels are required for confined-space entry (refer to Section 2).

^d Noise monitoring and audiometric testing also required.

5.2 Calibration Specifications

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

Instrument	Gas	Span	Reading	Method
Dust Monitor: Miniram-PDM3	Dust-free air	Not applicable	0.00 mg/m ³ in "Measure" mode	Dust-free area OR Z-bag with HEPA filter

5.3 Air Sampling

Sampling, in addition to real-time monitoring, may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the HSM immediately if these contaminants are encountered.

5.3.1 Method Description

NA for this scope of work

5.3.2 Personnel and Areas

Results must be sent immediately to the RHSM. Regulations may require reporting to monitored personnel. Results reported to:

HSM: NA
Other: NA

6.0 Decontamination

(Reference CH2M HILL SOP HSSE-218, *Hazardous Waste Operations*)

The SC must establish and monitor the decontamination procedures and their effectiveness. Decontamination procedures found to be ineffective will be modified by the SC. The SC must ensure that procedures are established for disposing of materials generated on the site.

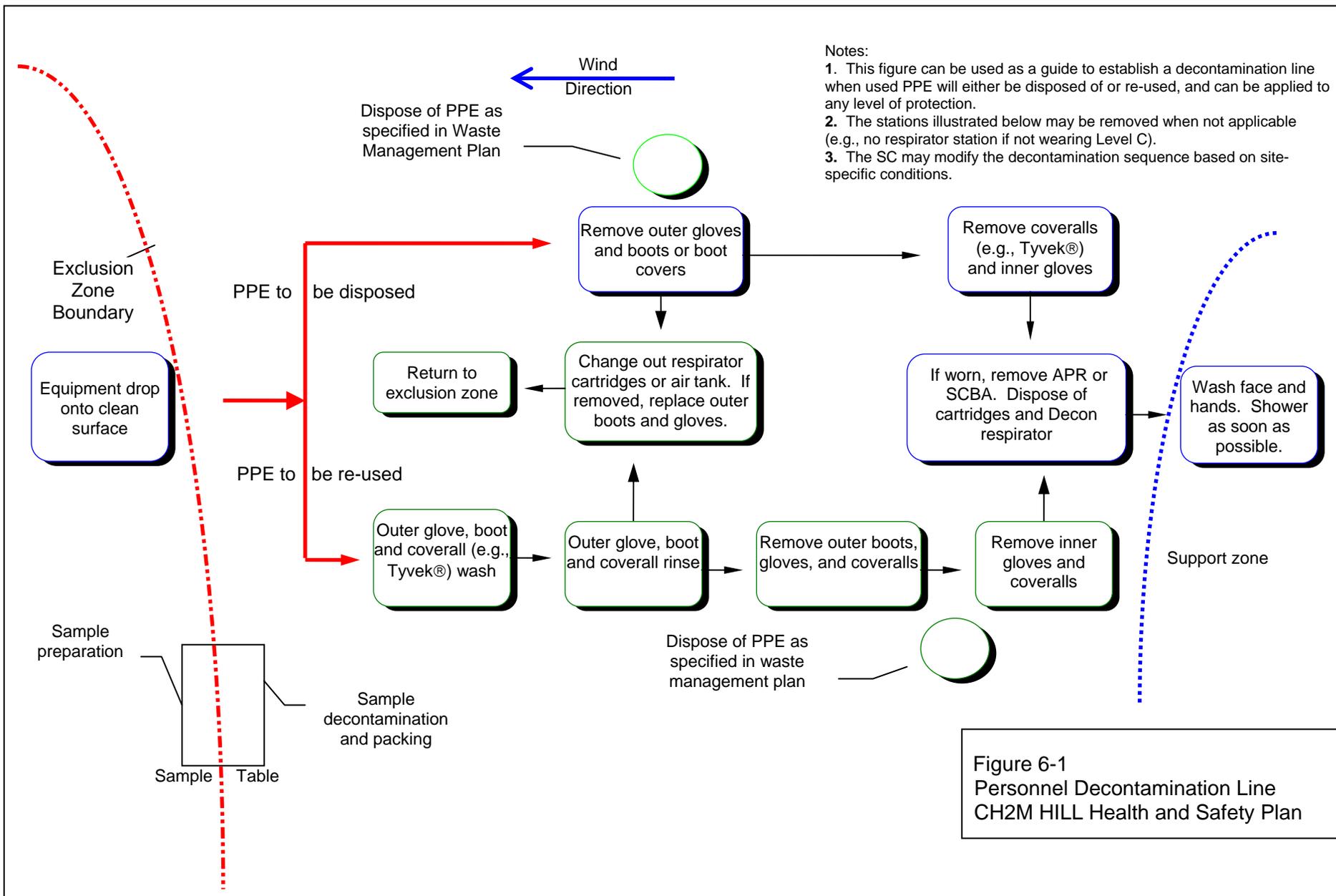
6.1 Decontamination Specifications (as applicable)

Personnel	Sample Equipment	Heavy Equipment
<ul style="list-style-type: none">• Boot wash/rinse• Glove wash/rinse• Outer-glove removal• Body-suit removal• Inner-glove removal• Respirator removal• Hand wash/rinse• Face wash/rinse• Shower ASAP• Dispose of PPE in municipal trash, or contain for disposal• Dispose of personnel rinse water to facility or sanitary sewer, or contain for offsite disposal	<ul style="list-style-type: none">• Wash/rinse equipment• Solvent-rinse equipment• Contain solvent waste for offsite disposal	<ul style="list-style-type: none">• Power wash• Steam clean• Dispose of equipment rinse water to facility or sanitary sewer, or contain for offsite disposal

6.2 Diagram of Personnel-Decontamination Line

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SC should establish areas for eating, drinking, and smoking. Contact lenses are not permitted in exclusion or decontamination zones.

Figure 6-1 illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the SC to accommodate task-specific requirements.



7.0 Spill Containment Procedures

Sorbent material will be maintained in the support zone. Incidental spills will be contained with sorbent and disposed of properly.

Spill kit will be kept on site for gasoline spills from chainsaw operations and refueling.

8.0 Site-Control Plan

8.1 Site-Control Procedures

(Reference CH2M HILL SOP HSSE-218, *Hazardous Waste Operations*)

- The SC will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing on site safety: general discussion of Health and Safety Plan, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies.
- The SC records attendance at safety briefings in a logbook and documents the topics discussed.
- Post the OSHA job-site poster in a central and conspicuous location in accordance with CH2M HILL- Core Standard, *OSHA Postings*.
- Establish support, decontamination, and exclusion zones. Delineate with flags or cones as appropriate. Support zone should be upwind of the site. Use access control at entry and exit from each work zone.
- Establish onsite communication consisting of the following:
 - Line-of-sight and hand signals
 - Air horn
 - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the “buddy system.”
- Initial air monitoring is conducted by the SC in appropriate level of protection.
- The SC is to conduct periodic inspections of work practices to determine the effectiveness of this plan – refer to Sections 2 and 3. Deficiencies are to be noted, reported to the HSM, and corrected.

8.2 Hazwoper Compliance Plan

(Reference CH2M HILL CS HSSE-220, *Written Plans and HSSE-218 Hazardous Waste Operations*)

Certain parts of the site work are covered by state or federal Hazwoper standards and therefore require training and medical monitoring. Anticipated Hazwoper tasks (Section 1.1.1) might occur consecutively or concurrently with respect to non-Hazwoper tasks. This section outlines procedures to be followed when approved activities specified in Section 1.1.2 do not require 24- or 40-hour training. Non-Hazwoper-trained personnel also must be trained in accordance with all other state and federal OSHA requirements.

- In many cases, air sampling, in addition to real-time monitoring, must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site, or while non-Hazwoper-trained staff is working in proximity to Hazwoper activities.

Other data (e.g., soil) also must document that there is no potential for exposure. The RHSM must approve the interpretation of these data. Refer to Sections 2 and 5.0 for contaminant data and air sampling requirements, respectively.

- When non-Hazwoper-trained personnel are at risk of exposure, the SC must post the exclusion zone and inform non-Hazwoper-trained personnel of the:
 - nature of the existing contamination and its locations
 - limitations of their access
 - emergency action plan for the site
- Periodic air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-Hazwoper-trained personnel (e.g., in an adjacent area) are not exposed to airborne contaminants.
- When exposure is possible, non-Hazwoper-trained personnel must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.

9.0 Emergency Response Plan

(Reference CH2M HILL SOP HSSE-106, *Emergency Planning*)

9.1 Pre-Emergency Planning

- The Emergency Response Coordinator (ERC) performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CH2M HILL onsite parties, the facility, and local emergency-service providers as appropriate.
- Review the facility emergency and contingency plans where applicable.
- Determine what onsite communication equipment is available (e.g., two-way radio, air horn).
- Determine what offsite communication equipment is needed (e.g., nearest telephone, cell phone).
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel.
- Field Trailers: Post “Exit” signs above exit doors, and post “Fire Extinguisher” signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases.
- Rehearse the emergency response plan before site activities begin, including driving route to hospital. Drills should take place periodically but no less than once a year.
- Brief new workers on the emergency response plan.
- The ERC will evaluate emergency response actions and initiate appropriate follow-up actions.

9.2 Emergency Equipment and Supplies

The ERC should mark the locations of emergency equipment on the site map and post the map.

Emergency Equipment and Supplies	Location
20 (or two 10) class A,B,C fire extinguisher	Site Vehicle
First aid kit	Site Vehicle

Emergency Equipment and Supplies	Location
Eye Wash	Site Vehicle
Potable water	Site Vehicle
Bloodborne-pathogen kit	Site Vehicle
Additional equipment (specify): Cell Phone	FTL / SC

9.3 Incident Response

In fires, explosions, or chemical releases, actions to be taken include the following:

- Notify appropriate response personnel.
- Shut down CH2M HILL operations and evacuate the immediate work area.
- Account for personnel at the designated assembly area(s).
- Assess the need for site evacuation, and evacuate the site as warranted.
- Implement HSE-111, Incident Notification, Reporting and Investigation.
- Notify and submit reports to clients as required in contract.

Small fires or spills posing minimal safety or health hazards may be controlled with onsite spill kits or fire extinguishers without evacuating the site. When in doubt evacuate. Follow the incident reporting procedures in Section 9.7.

9.4 Emergency Medical Treatment

Emergency medical treatment is needed when there is a life-threatening injury (such as severe bleeding, loss of consciousness, breathing/heart has stopped). When in doubt if an injury is life-threatening or not, treat it as needing emergency medical treatment.

- Notify 911 or other appropriate emergency response authorities as listed in Emergency Contacts at the front of this HSP.
- The ERC will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury, perform decontamination (if applicable) where feasible; lifesaving and first aid or medical treatment takes priority.
- Initiate first aid and CPR where feasible.
- Notify supervisor and if the injured person is a CH2M HILL employee. The supervisor will call the occupational nurse at 1-866-893-2514 and make other notifications as required by HSSE SOP-111, *Incident Notification, Reporting and Investigation*.
- Make certain that the injured person is accompanied to the emergency room.
- Follow the Serious Incident Reporting process in HSSE SOP-111, Incident Notification, Reporting and Investigation, and complete incident report forms in Attachment 5.
- Notify and submit reports to client as required in contract

9.5 Evacuation

- Evacuation routes, assembly areas, and severe weather shelters (and alternative routes and assembly areas) are to be specified on the site map.
- Evacuation route(s) and assembly area(s) will be designated by the ERC or designee before work begins.
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
- The ERC and a “buddy” will remain on the site after the site has been evacuated (if safe) to assist local responders and advise them of the nature and location of the incident.
- The ERC will account for all personnel in the onsite assembly area.
- A designated person will account for personnel at alternate assembly area(s).
- The ERC will follow the incident reporting procedures in Section 9.7.

9.6 Evacuation Signals

Signal	Meaning
Grasping throat with hand	Emergency-help me.
Thumbs up	OK; understood.
Grasping buddy's wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

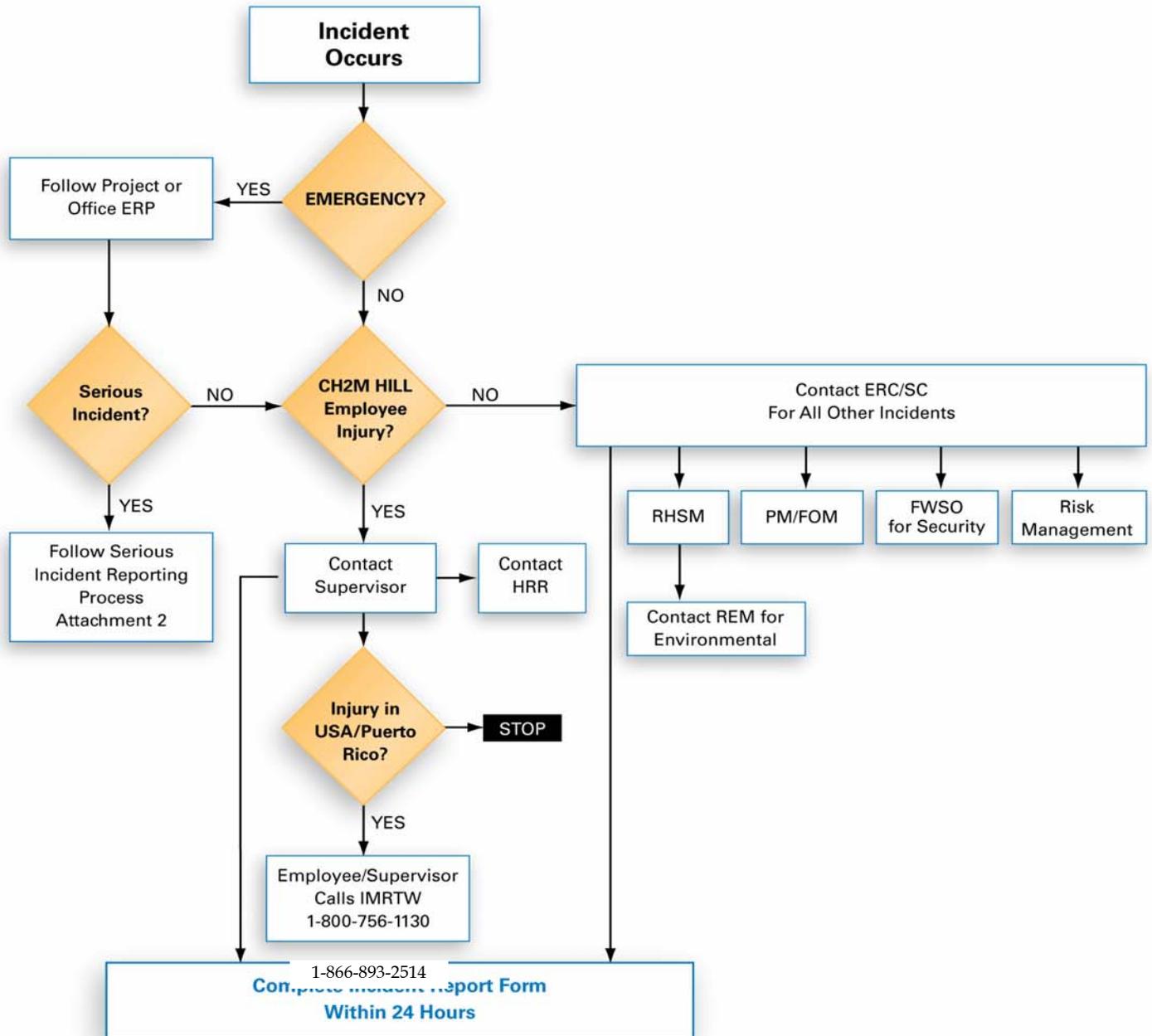
9.7 Incident Notification and Reporting

(Reference CH2M HILL SOP HSSE-111, *Incident Notification, Reporting and Investigation*)

- If you are injured at work, notify your supervisor immediately and contact the Injury Management/Return-to-Work toll free number (for US and Puerto Rico) 1-866-893-2514. All supervisors must contact their Human Resources Representative and complete the employee injury/illness in the Incident Report Form (IRF) in the HITS database within 24 hours of the incident
- Immediately notify the Project Manager (PM), Emergency Response Coordinator (ERC), and/or Responsible Health and Safety Manager (RHSM) for any project incident (fire, spill/release, injury/illness, near miss, property damage, or security-related)
- Report any **serious incidents** (life-threatening injury/illness, death, kidnap/missing person, terrorism, property damage greater than \$500K, significant environmental release) **immediately** to your ERC, PM, or RHSM. The Serious Incident Reporting number is 720-286-4911.
- For serious incidents, the Corporate Legal Department will determine who completes the IRF.
- For CH2M HILL subcontractor incidents, immediately notify the ERC and HSM to complete and submit an IRF.

- The RHSM will inform the Responsible Environmental Manager (REM) of any environmental incidents.
- Evaluation and follow-up of the IRF will be completed by the type of incident by the RHSM, REM, or FWSO. The Business Group (BG) HSE Lead will review all BG incidents and modify as required.
- Incident Investigations must be initiated and completed as soon as possible but no later than 72 hours after the incident.
- See the following flowcharts for Immediate Incident Reporting and Serious Incident Reporting.

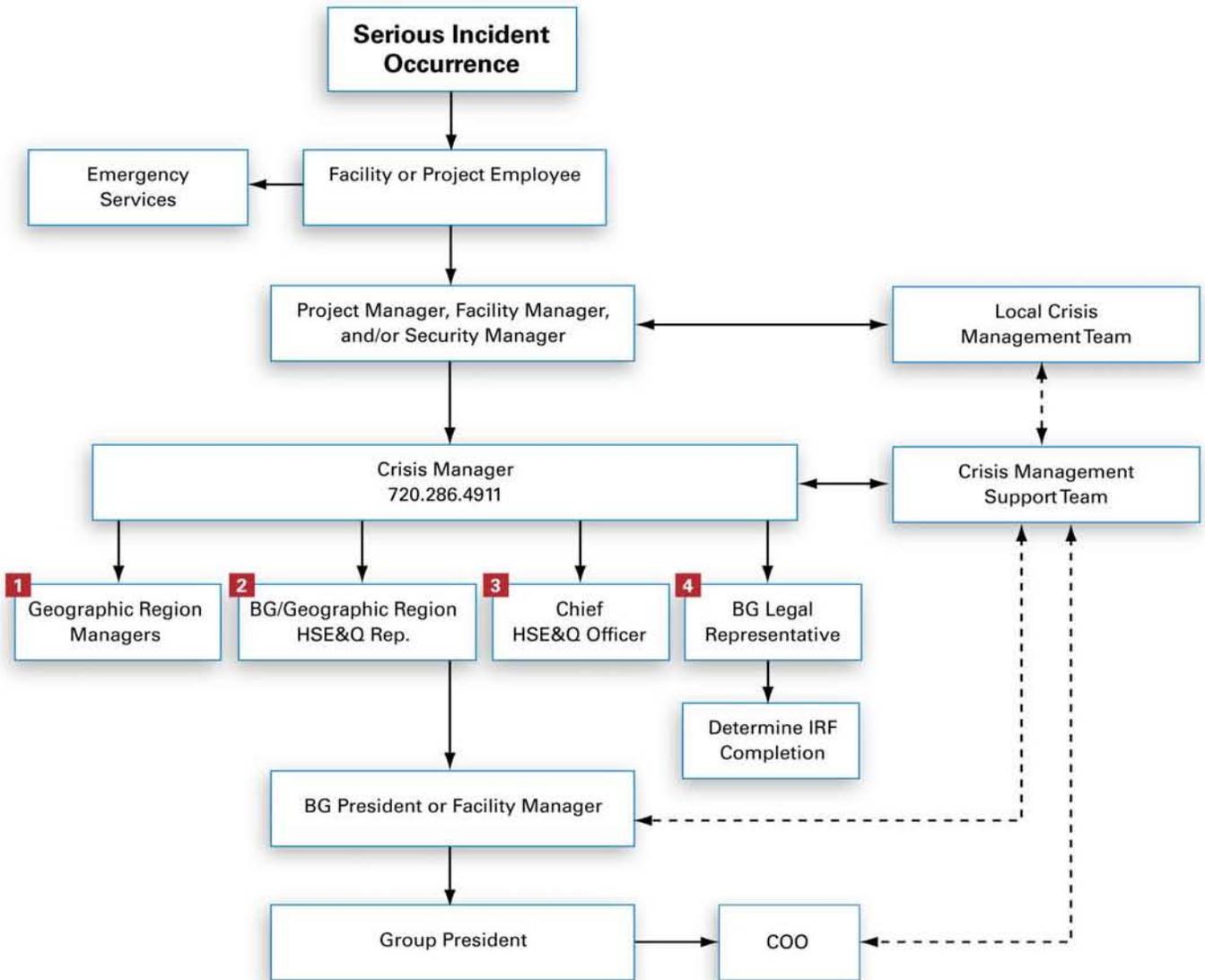
Attachment 1 CH2M HILL Immediate Incident Notification



ERC = Emergency Response Coordinator
(designated in Emergency Response Plan)
ERP = Emergency Response Plan
FOM = Facility Office Manager
FWSO = Firm Wide Security Operations
HRR = Human Resources Representative

IMRTW = Injury Management/Return-to-Work
PM = Project Manager
REM = Responsible Environmental Manager
RHSM = Responsible Health & Safety Manager
SC = Safety Coordinator

Attachment 2 CH2M HILL Serious Incident Notification


LEGEND:

→ Direct line of communication

← - - - → Indirect line of communication

DEFINITIONS:

Local Crisis Management Team: Team comprised of key facility, project and/or business group personnel. Team is assembled as necessary and as appropriate to effectively manage and respond to a crisis situation (serious incident) at/on scene.

Crisis Management Support Team: Team comprised of key corporate personnel. Team is assembled as necessary and as appropriate to effectively support, direct, and /or supplement a Local Crisis Management Team.

Crisis Manager: Corporate based Crisis Manager, contactable by pager 24/7.

10.0 Behavior Based Loss Prevention System

(Reference CH2M HILL SOP HSSE-103, *Behavior Based Loss Prevention System*)

A Behavior Based Loss Prevention System (BBLPS) is a system to prevent or reduce losses using behavior-based tools and proven management techniques to focus on behaviors or acts that could lead to losses.

The four basic Loss Prevention tools that will be used CH2M HILL projects to implement the BBLPS include:

- Activity Hazard Analysis (AHA)
- Pre-Task Safety Plans (PTSP)
- Loss Prevention Observations (LPO)
- Loss and Near Loss Investigations (NLI)

The SC or designated CH2M HILL representative onsite is responsible for implementing the BBLPS on the project site. The Project Manager remains accountable for its implementation. The SC or designee shall only oversee the subcontractor's implementation of their AHAs and PTSPs processes on the project.

10.1 Activity Hazard Analysis

An Activity Hazard Analysis (AHA) defines the activity being performed, the hazards posed and control measures required to perform the work safely. Workers are briefed on the AHA before doing the work and their input is solicited prior, during and after the performance of work to further identify the hazards posed and control measures required.

Activity Hazard Analysis will be prepared before beginning each project activity posing H&S hazards to project personnel using the AHA form provided in Attachment 5. The AHA shall identify the work tasks required to perform each activity, along with potential H&S hazards and recommended control measures for each work task. In addition, a listing of the equipment to be used to perform the activity, inspection requirements and training requirements for the safe operation of the equipment listed must be identified.

An AHA shall be prepared for all field activities performed by CH2M HILL and subcontractor activities during the course of the project. Hazard Controls (found in Sections 2.0 and its subsections of the HSP), the Hazard Analysis Table (Table 1), and applicable CH2M HILL CSs and SOPs should be used as a basis for preparing AHAs.

CH2M HILL subcontractors are required to provide AHAs specific to their scope of work on the project for acceptance by CH2M HILL. Each subcontractor shall submit AHAs for their field activities, as defined in their work plan/scope of work, along with their project-specific safety plan/accident prevention plan. Additions or changes in CH2M HILL or subcontractor field activities, equipment, tools or material to perform work or additional/different hazard encountered that require additional/different hazard control measures requires either a new AHA to be prepared or an existing AHA to be revised.

10.2 Pre-Task Safety Plans

Daily safety meetings are held with all project personnel in attendance to review the hazards posed and required H&S procedures/AHAs, that apply for each day's project activities. The PTSPs serve the same purpose as these general assembly safety meetings, but the PTSPs are held between the crew supervisor and their work crews to focus on those hazards posed to individual work crews. At the start of each day's activities, the crew supervisor completes the PTSP, provided in Attachment 5, with input from the work crew, during their daily safety meeting. The day's tasks, personnel, tools and equipment that will be used to perform these tasks are listed, along with the hazards posed and required H&S procedures, as identified in the AHA. The use of PTSPs, better promotes worker participation in the hazard recognition and control process, while reinforcing the task-specific hazard and required H&S procedures with the crew each day. The use of PTSPs is a common safety practice in the construction industry.

10.3 Safe Work Observations

Safe Work Observations (SWO's) shall be conducted by SC or designee for specific work tasks or operations comparing the actual work process against established safe work procedures identified in the project-specific HSP and AHAs. SWO's are a tool to be used by supervisors and field personnel to provide positive reinforcement for work practices performed correctly, while also identifying and eliminating deviations from safe work procedures that could result in a loss. The SC or designee shall perform at least one SWO each week for tasks/operations addressed in the project-specific HSP or AHA and forward to Margaret Dombrowski/MKE weekly. The SC or designee shall complete the SWO form in **Attachment 5** for the task/operation being observed.

10.4 Loss/Near Loss Investigations

Loss/Near Loss Investigations shall be performed for CH2M HILL and subcontractor incidents involving:

- Person injuries/illnesses and near miss injuries
- Equipment/property damage
- Spills, leaks, regulatory violations
- Motor vehicle accidents

The cause of loss and near loss incidents are similar, so by identifying and correcting the causes of near loss causes, future loss incidents may be prevented. The following is the Loss/Near Loss Investigation Process:

- Gather all relevant facts, focusing on fact-finding, not fault-finding, while answering the who, what, when, where and how questions.
- Draw conclusions, pitting facts together into a probable scenario.
- Determine incident root cause(s), which are basic causes on why an unsafe act/condition existed.
- Develop and implement solutions, matching all identified root causes with solutions.

- Communicate incident as a Lesson Learned to all project personnel.
- Filed follow-up on implemented corrective active action to confirm solution is appropriate.

The SC or designee shall perform an incident investigation, as soon as practical after incident occurrence during the day of the incident, for all Loss and Near Loss Incidents that occur on the project. Loss and Near Loss incident investigations shall be performed using the following incident investigation forms provided in **Attachment 5**

- Incident Report Form (IRF)
- Root Cause Analysis Form

All Loss and Near Loss incident involving personal injury, property damage in excess of \$1,000 or near loss incidents that could have resulted in serious consequences shall be investigated by completing the incident investigation forms and submitting them to the PM and RHSM within 24 hours of incident occurrence. A preliminary Incident Investigation and Root Cause Analysis shall be submitted to the Project Manager and RHSM within 24 hours of incident occurs. The final Incident Investigation and Root Cause Analysis shall be submitted after completing a comprehensive investigation of the incident.

11.0 Approval

This site-specific HSP has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

Original Plan

Written By: Stephen Brand

Date: 11/19/2008

Approved By: Mark Orman

Date: 11/21/08

Revisions

Revisions Made By: Stephen Brand

Date: 9/21/09

Revisions to Plan: Changed outdated LPO language to SWO format, added vehicle accident guidance document, knife policy, chainsaw self-assessment document, vegetation clearance subcontractor, UXO avoidance tech. subcontractor, updated work care contact and occupational nurse number.

Revisions Approved By: Mark Orman

Date: 9/22/09

12.0 Attachments

- Attachment 1: Employee Signoff Form – Health and Safety Plan
- Attachment 2: Chemical Inventory/Register Form
- Attachment 3: Chemical-Specific Training Form
- Attachment 4: Project Activity Self-Assessment Checklists/Permits
- Attachment 5: Behavior Based Loss Prevention Forms
- Attachment 6: Material Safety Data Sheets
- Attachment 7: Tick Fact Sheet
- Attachment 8: Vehicle Accident Guidance

CH2M HILL Health and Safety Plan
Attachment 1

Health and Safety Plan Employee Sign-off Form

CH2M HILL Health and Safety Plan
Attachment 2

Chemical Inventory/Register Form

CH2M HILL Health and Safety Plan
Attachment 3

Chemical-Specific Training Form

CH2MHILL

CHEMICAL-SPECIFIC TRAINING FORM

Refer to Standard Operating Procedure HSE-107 Attachment 1 for instructions on completing this form.

Location:	Project # :
HCC:	Trainer:

TRAINING PARTICIPANTS:

NAME	SIGNATURE	NAME	SIGNATURE

REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:

The HCC shall use the product MSDS to provide the following information concerning each of the products listed above.

- Physical and health hazards
- Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)
- Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants shall have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL's written hazard communication program shall be made available for employee review in the facility/project hazard communication file.

CH2M HILL Health and Safety Plan

Attachment 4

Project Activity Self-Assessment Checklists/Permits/Forms

- **Chainsaws**
- **Boating**
- **Vehicle Accident Guidance**
- **Knife Policy**

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project’s HSP/FSI.

This checklist is to be used at locations where: (1) CH2M HILL employees are operating chainsaws, and/or (2) CH2M HILL is providing oversight of a subcontractor operating a chainsaw.

Safety Coordinators may consult with chainsaw subcontractors when completing this checklist, but shall not direct the means and methods of chainsaw operations nor direct the details of corrective actions. Chainsaw subcontractors shall determine how to correct deficiencies, and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Project Name: _____ Project No.: _____
 Location: _____ PM: _____
 Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

Evaluate CH2M HILL employee exposures to chainsaw hazards
 Evaluate a CH2M HILL subcontractor’s compliance with chainsaw HS&E requirements
 Subcontractor Name: _____

- Check “Yes” if an assessment item is complete/correct.
 - Check “No” if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the excavation subcontractor. Section 2 must be completed for all items checked “No.”
 - Check “N/A” if an item is not applicable.
 - Check “N/O” if an item is applicable but was not observed during the assessment.
- Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-49.

<u>SECTION 1</u>		<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
SAFETY EQUIPMENT (2.3)					
1. Chainsaw equipped with spark arrestor and fully functioning chain brake		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Chainsaw operator’s manual readily available		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Fully stocked first aid kit and multipurpose fire extinguisher available		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Appropriate personal protective equipment available and worn		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Clothing free of loose edges that could become entangled in the saw		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PLANNING ACTIVITIES (2.5)					
6. Operators have read the chainsaw operator’s manual		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. If aerial lifts to be used, aerial lift training completed		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Daily safety briefing/meeting conducted with project personnel to discuss planned work		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Immediate area surrounding operation cleared of obstructions		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Companion maintained within calling distance of the chainsaw operator		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<u>SECTION 1 (Continued)</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
INSPECTION (3.1.1)				
11. Chain tension, sharpness, condition, and guide gap checked	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Chainsaw components checked for physical damage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Chain does not rotate at idle with chain brake off	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Chain brake and stop switch operating correctly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Throttle trigger can not be engaged until throttle trigger lock out pressed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
STARTING THE ENGINE (3.1.2)				
16. Chainsaw operator’s manual consulted for proper starting procedures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Saw placed on level ground with guide bar and chain off the ground	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Saw is not drop-started	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SAFE OPERATION (3.1.3)				
19. Chainsaw handles kept dry, clean, and free of oil or fuel mixture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Chainsaws held firmly with both hands and used right-handed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Operator standing to the left of the saw out of the plane of the chain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Saw used between the waist and mid-chest level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Full throttle maintained while cutting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Operator aware of position of guide bar tip, does not contact tip with anything being cut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Bumper spikes maintained as close to the object as possible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Operator aware of what is in the saw’s downward path after the cut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. No attempt to made to cut material that is larger than the guide bar of the saw	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Cuts avoided that will cause chain to jam	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Non-metallic wedges used to prevent compression cuts from jamming the blade	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Bystanders and helpers kept at a safe distance from operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Chainsaw not operated when fatigued	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Fire extinguisher present when operating the chainsaw in forest or brushy areas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ELECTRICAL CHAINSAW PRECAUTIONS (3.1.3)				
33. Extension cords approved for outdoor use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Electrical cords equipped with third-wire grounding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Ground fault circuit interrupter (GFCI) used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Electrical cord positioned carefully to avoiding cutting with saw or trip hazard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Saw switched to the off position before completing electrical connections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Saw unplugged before making adjustments and when not in use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
REFUELING THE ENGINE (3.1.4)				
39. Fuel mixed in accordance with the manufacturer's recommendations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Fuel stored and transported in an approved safety container	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Engine shut off and allowed to cool before refueling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Fire extinguisher present during fueling and refueling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Area around refueling site free from combustible materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. Smoking around fueling or refueling operations prohibited	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Funnel/flexible nozzle used to avoid spilling fuel on the engine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TRANSPORT AND STORAGE (3.1.5)				
46. Chainsaws carried with engine off and guide bar pointing to rear	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Chain guard attached or placed in carrying case prior to transporting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. Fuel tank drained and spark plug disconnected for long-term storage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. Chainsaw placed in scabbard or secured to platform prior to transporting in aerial lift	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<u>SECTION 1 (Continued)</u>	<u>Yes</u>	<u>No</u>	<u>N/A</u>	<u>N/O</u>
TOPPING UTILITY POLES (3.2.1)				
50. CH2M HILL only topping utility poles from an aerial lift platform	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. Aerial lifts operated safely (use aerial lift checklist in HS-41)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. Maximum length of pole section cut at one time does not exceed 2'	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. Pole tested for stray voltage with foreign voltage detector prior to cutting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. Wiring, staples, nails, and other hardware removed within 4" of cut path	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. Saw handled between chest and waist level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56. Personnel below pole safe distance from the fall area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
57. Cutting stopped leaving approximately one half inch of pole uncut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. Pole section removed manually by pulling cut section towards body	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59. Cut pole sections lowered by rope or placed in aerial lift platform	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60. Rough edges hammered over after last cut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TREE FELLING (3.2.2)				
61. CH2M HILL not felling trees beyond scope of SOP HS-49	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
62. Power company contacted prior to felling trees within two tree lengths of power lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
63. Underground services checked that could be damaged when tree strikes the ground	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64. Danger zone created two tree lengths from public areas, public removed from danger zone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
65. Personnel maintain a distance equal to two tree lengths of the tree being felled	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66. Intended direction of fall determined	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
67. Suitable escape path determined and maintained clear	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68. Equipment needed to prevent tree from sitting back on the saw determined and readily available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
69. Undercut notch cut on side of the tree in the direction of the fall line	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
70. Back cut started 1-2" inches above the undercut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
71. As tree starts to fall, saw shut off and operator steps into the escape path	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LIMBING STANDING TREES (3.2.3)				
72. CH2M HILL not operating chainsaws where overhead electrical power lines may be contacted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
73. Only subcontractors with special training permitted to work around electrical power lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
74. Branches/limbs not cut above shoulder height	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
75. If limbing from a ladder, ladder secured in position and operator independently secured	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
76. Chainsaws not used from rope and harness unless operator has received specific training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LIMBING FALLEN TREES (3.2.4)				
77. No dead branches/other debris hanging above work that may fall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
78. Personnel do not attempt to manually pull over elevated trees, mechanical equipment used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
79. Springpoles cut safely, avoiding springback	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
80. Small-size brush and saplings cut with hand saws or other cutting tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
81. Operator standing uphill of tree unless secured to prevent rolling/sliding downhill	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
82. Cuts made with operator standing on the opposite side of the tree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
83. Operator keeping sight of saw tip, avoiding kickback	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
84. Debris removed periodically to maintain clear vision and movement around tree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BUCKING TREES (3.2.5)				
85. Operator standing uphill of tree unless secured to prevent rolling/sliding downhill	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
86. Working from small end to larger to improve stability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
87. If tree on level ground, cutting from upper side and avoiding running chain into ground	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
88. If tree supported at one end, cutting from lower side one-third, then upper side	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
89. If tree supported at both ends, cutting from upper side one-third, then lower side	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Boat Operator Sea Trial:

Name: _____ Date: _____

Boat Type: _____ Size: _____

Boat Operator Task	Yes	NO	N/A
1. Review SOP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. File float plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Inspect boat (Boat checklist)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Check fuel level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Start boat engine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Get boat underway	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Initiate right and left turns	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Stop boat and back down	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Motor boat ahead full throttle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Reduce speed and return to pier/dock	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Land boat along side pier/dock	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Secure boat and shut down engine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Close out float plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

_____ has successfully demonstrated his/her ability to operate the above listed boat on (date)_____

Qualified Boat Operator Name: _____

Signature: _____

Health and Safety Self Assessment Checklist-BOATS

This self assessment is only to be used at locations where CH2M HILL controls the work. It is not to be used at locations where others control the work.

Project Name: _____ Project No.: _____
 Location: _____ PM: _____
 Auditor: _____ Title: _____ Date: _____

If an assessment item is complete/correct the "Yes" box should be checked. If an item is incomplete or deficient the "No" box should be checked. Items that are considered to be imminently dangerous must be corrected immediately or all exposed personnel must be removed from the hazard. All deficiencies shall be brought to the attention of the appropriate party that is responsible for correcting the deficiency. If an item is not applicable, the "N/A" box should be checked. If an item is applicable but was not observed during the assessment, the "N/O" box should be checked.

	Yes	No	NA	N/O
GENERAL				
1. Weather forecast checked.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. At Least one Team Member is trained in First Aid/CPR.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Lights, horn, battery, fuel, steering, bilge pump, anchor & propeller checked.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Daily safety briefing/ meeting conducted with crew	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Personal Floatation Devices (PFD's) inspected daily.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Fire extinguisher available, charged and accessible.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. First aid kit available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Project Instructions and H&S Plan available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Potable water available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Sunscreen & Bug Spray available	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Distress communications available (flare gun, air horn, Cell phone, CB)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. An oar is available on board the boat in the event of mechanical failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BOAT TRANSPORT				
13. Boat motor secured prior to boat transport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Turn signals and brake lights verified as operable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Safety chains available on trailer and secured in a criss-cross fashion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Trailer winch engaged	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Ball hitch seated and latch pin installed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Tools and equipment secured prior to boat movement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Personnel not allowed ride on boat as it is being towed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Safe distance is maintained with traveling around power lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Backup alarm or spotter used when backing boat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Boat is unhitched on a level and stable surface	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BOAT OPERATION				
23. Boat holds appropriate size load	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Personnel cleared during boat start-up	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Kill switch clearly identified and operational	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Personnel wearing appropriate PPE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. All personnel wearing PFD's	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Boat will not be used for recreational purposes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Boat Equipment Checklist

Boat Check List Item	Yes	No	N/A
State Numbering			
Personal Flotation Device			
Throwable PFD/Ring Bouy			
Visual Distress Signal			
Backfire Flame Arrestor			
Sound Producing Device			
Fire Extinguisher			
Navigation/ Anchor Lights			
Radio/Communications			
First Aid Kit			
Flashlight			
Tool Kit			
Mooring Lines			
Food and Water			
Binoculars			
Spare Batteries			
Spare Parts			
Spare Fuel			
AM/FM Radio			
Anchor and Tackle			
Alternate Propulsion			
Overall Boat Condition-Satisfactory			
Electrical Systems-Satisfactory			
Fuel Systems-Satisfactory			
File Float Plan			
Weather Forecast			

Inspected By:

Boat Operator:

Date:

Vehicle Accident Guidance

For All Vehicles--Call the Police

For any vehicle accident/damage, it is recommended that the local police (or site security/emergency services if working on a client site that provides such services) be called to determine if a report needs to be filed. In some instances, a report may not be required (during accident alerts, or in public parking lots). Document that the authorities were called and follow up with any guidance they give you. State requirements vary. If a report is filed, obtain a copy.

For Fleet Vehicles:

Definition: These are vehicles **rented for greater than 90 days** or rentals that are **leased** (either through ARI [Automotive Rental, Inc.] or leases from other companies [older fleet vehicles]).

Report the accident to the following:

Contact Company Insurance Carrier: Zurich (1-877-246-3478 or 1-800-987-3373).

Contact Corp. Insurance - Linda George/DEN at 720-286-2057.

Note: If you are an ES employee that happens to use an **OMI vehicle** on a project and get into an accident, you must also contact Michelle Garlington/DEN (720-286-4273).

For Rentals:

Report the accident to the following:

Call 1-800-VISA-911 (only if the car has been **rented for less than 31 days** – they provide some additional physical damage coverage in this time period).

Call Zurich (1-877-246-3478 or 1-800-987-3373). Carry available insurance cards which can be downloaded from the VO. For short-term rental (non CH2M Owned), carry the insurance card from the state where the driver's license was issued. For fleet vehicles, carry the insurance card from the state where the vehicle is insured.

https://communities.int.ch2m.com/legal/insurance/Shared%20Documents/AutoID_Cards.aspx?PageView=Shared

Call the rental company (Budget, National, Enterprise, etc.).

Call Linda Anderson/DEN at 720-286-2401.

For All Vehicles:

Notify Supervisor, (and PM/RHSM if working on a project site)

If you are injured, call 911 for emergency medical treatment or 1-866-893-2514 to contact the CH2M HILL Occupational Nurse/Physician for minor injuries. If you initially feel you have not been injured, contact the RHSM for guidance on whether calling the CH2M HILL Occupation Nurse/Physician is applicable.

Complete a HITS report on the VO.

Personally Owned Vehicles (POVs):

CH2M HILL does not provide auto insurance for POVs, it is responsibility of the owner. If you are in a vehicle accident conducting company business, contact the police as above, supervisor, and 911 or CH2M HILL's occupational nurse/physician as stated above. Complete a HITS report. Refer to the Employee Handbook/Policies, assistance for meeting personal insurance deductibles (up to \$500 is available).

If using your POV for extended project use, notify the PM to make sure a rental car is not needed. Check your insurance policy for guidance on using the POV for business use.

Knife Policy

Knives (fixed / utility) should not be used unless it has been demonstrated that a knife is the right tool for the job and an AHA or written procedure is in place and includes the following items.

Responsibilities

- Supervisors with assistance from the FTL/SC are responsible for funding and ensuring the correct tool is being used, employees wear the proper PPE when using knives, and they have reviewed this policy.
- Employees are responsible for having and utilizing the proper PPE while performing an activity requiring the use of a knife. Employees are also responsible for understanding the proper use of a knife.

Glove Requirements

- In general, Kevlar cut resistant gloves are to be worn when using a knife in an occupational setting. These can be obtained from the regional warehouses and most stores selling safety supplies.
- Other types of gloves may be required and will be identified within the AHA / written procedure. Example - Leather gloves may be worn when using the acetate sleeve cutter.

Training (Ref. VO for additional hand safety topics)

- All employees that will use a knife must be trained in the proper use.
- When using a knife always cut away from yourself.
- Many tasks using a utility knife require a knife edge but not a sharp point. For these tasks you can add protection against puncture wounds by using a rounded-tip blade.
- If you use a folding knife, it must be a locking blade type.
- Never use a knife that will fold under pressure.
- If you use a fixed blade knife, make sure there is a handle guard to keep your hand from slipping forward. Also, make sure the handle is dry and non- greasy/slippery to assure a better grip.
- When cutting, make the force of the cut carry the blade away from any part of your body. If you have a peculiar situation where this is not possible, protect yourself with a leather apron, or other material placed between you and the blade. Consider putting the material to be cut in a vise, or other holding device.
- If you carry a fixed blade knife, use a sheath or holder.
- Store utility knives safely, retract the blade or sheath an open blade before storing. Never, leave a knife with the blade exposed on the floor, on a pallet, on a work surface, or in a drawer or cabinet.
- Keep your knife sharp. A dull blade requires you to use more force to cut, and consequently increases the risk of slip or mistake.
- Knives used on the job, but not carried with you , must be properly stored when not in use
- Never use a defective knife.
- Utility knife blades are brittle and can snap easily. Don't bend them or apply side loads to them by using them to open cans or pry loose objects.

Training cont.

- Use the knife only to cut. It was not designed to work as a prybar, screw driver, hole punch, and other assorted things that make it seem so easy.
- If you do get cut, seek medical attention to treat the injury by notifying your supervisor and contacting Health Resources at 1-800-756-1130.

Examples of preferred tools and Kevlar cut resistant gloves



A safety spring provides for automatic blade "shoot-back" into the handle when contact w/cutting surface is lost

Stay focused on the cutting job! It only takes a second of inattention with a sharp blade to produce a serious cut. Letting the mind wander or talking with others while using a knife greatly increases the risk of an accident and injury. If you are interrupted while working with a knife, stop cutting, retract the blade, and place the knife down on a secure surface before dealing with the interruption. You should never continue cutting while distracted!

As always, utilize the hierarchy of controls and first attempt to engineer out the hazard and frequently ask ourselves do we have the right tool for the job.

CH2M HILL Health and Safety Plan
Attachment 5

Behavior Based Loss Prevention System Forms

Activity Hazard Analysis

Pre-Task Safety Plans

Loss Prevention Observation

Incident Report and Investigation

Activity:	Date:
	Project:
Description of the work:	Site Supervisor:
	Site Safety Officer:
	Review for latest use: Before the job is performed.

Work Activity Sequence (Identify the principal steps involved and the sequence of work activities)	Potential Health and Safety Hazards (Analyze each principal step for potential hazards)	Hazard Controls (Develop specific controls for each potential hazard)

Equipment to be used (List equipment to be used in the work activity)	Inspection Requirements (List inspection requirements for the work activity)	Training Requirements (List training requirements including hazard communication)

PRINT NAME

SIGNATURE

Supervisor Name: _____

Date/Time: _____

Safety Officer Name: _____

Date/Time: _____

Employee Name(s): _____

Date/Time: _____

CH2MHILL

Pre-Task Safety Plan (PTSP)

Project: _____ Location: _____ Date: _____		
Supervisor: _____ Job _____		
Activity: _____		
Task Personnel:		

List Tasks:		

Tools/Equipment Required for Tasks (ladders, scaffolds, fall protection, cranes/rigging, heavy equipment, power tools):		

Potential H&S Hazards, including chemical, physical, safety, biological and environmental (check all that apply):		
<input type="checkbox"/> Chemical burns/contact	<input type="checkbox"/> Trench, excavations, cave-ins	<input type="checkbox"/> Ergonomics
<input type="checkbox"/> Pressurized lines/equipment	<input type="checkbox"/> Overexertion	<input type="checkbox"/> Chemical splash
<input type="checkbox"/> Thermal burns	<input type="checkbox"/> Pinch points	<input type="checkbox"/> Poisonous plants/insects
<input type="checkbox"/> Electrical	<input type="checkbox"/> Cuts/abrasions	<input type="checkbox"/> Eye hazards/flying projectile
<input type="checkbox"/> Weather conditions	<input type="checkbox"/> Spills	<input type="checkbox"/> Inhalation hazard
<input type="checkbox"/> Heights/fall > 6 feet	<input type="checkbox"/> Overhead Electrical hazards	<input type="checkbox"/> Heat/cold stress
<input type="checkbox"/> Noise	<input type="checkbox"/> Elevated loads	<input type="checkbox"/> Water/drowning hazard
<input type="checkbox"/> Explosion/fire	<input type="checkbox"/> Slips, trip and falls	<input type="checkbox"/> Heavy equipment
<input type="checkbox"/> Radiation	<input type="checkbox"/> Manual lifting	<input type="checkbox"/> Aerial lifts/platforms
<input type="checkbox"/> Confined space entry	<input type="checkbox"/> Welding/cutting	<input type="checkbox"/> Demolition
Other Potential Hazards (Describe):		

CH2MHILL

Hazard Control Measures (Check All That Apply):

PPE <input type="checkbox"/> Thermal/lined <input type="checkbox"/> Eye <input type="checkbox"/> Dermal/hand <input type="checkbox"/> Hearing <input type="checkbox"/> Respiratory <input type="checkbox"/> Reflective vests <input type="checkbox"/> Flotation device	Protective Systems <input type="checkbox"/> Sloping <input type="checkbox"/> Shoring <input type="checkbox"/> Trench box <input type="checkbox"/> Barricades <input type="checkbox"/> Competent person <input type="checkbox"/> Locate buried utilities <input type="checkbox"/> Daily inspections	Fire Protection <input type="checkbox"/> Fire extinguishers <input type="checkbox"/> Fire watch <input type="checkbox"/> Non-spark tools <input type="checkbox"/> Grounding/bonding <input type="checkbox"/> Intrinsically safe equipment	Electrical <input type="checkbox"/> Lockout/tagout <input type="checkbox"/> Grounded <input type="checkbox"/> Panels covered <input type="checkbox"/> GFCI/extension cords <input type="checkbox"/> Power tools/cord inspected
Fall Protection <input type="checkbox"/> Harness/lanyards <input type="checkbox"/> Adequate anchorage <input type="checkbox"/> Guardrail system <input type="checkbox"/> Covered opening <input type="checkbox"/> Fixed barricades <input type="checkbox"/> Warning system	Air Monitoring <input type="checkbox"/> PID/FID <input type="checkbox"/> Detector tubes <input type="checkbox"/> Radiation <input type="checkbox"/> Personnel sampling <input type="checkbox"/> LEL/O2 <input type="checkbox"/> Other	Proper Equipment <input type="checkbox"/> Aerial lift/ladders/scaffolds <input type="checkbox"/> Forklift/heavy equipment <input type="checkbox"/> Backup alarms <input type="checkbox"/> Hand/power tools <input type="checkbox"/> Crane with current inspection <input type="checkbox"/> Proper rigging <input type="checkbox"/> Operator qualified	Welding & Cutting <input type="checkbox"/> Cylinders secured/capped <input type="checkbox"/> Cylinders separated/upright <input type="checkbox"/> Flash-back arrestors <input type="checkbox"/> No cylinders in CSE <input type="checkbox"/> Flame retardant clothing <input type="checkbox"/> Appropriate goggles
Confined Space Entry <input type="checkbox"/> Isolation <input type="checkbox"/> Air monitoring <input type="checkbox"/> Trained personnel <input type="checkbox"/> Permit completed <input type="checkbox"/> Rescue	Medical/ER <input type="checkbox"/> First-aid kit <input type="checkbox"/> Eye wash <input type="checkbox"/> FA-CPR trained personnel <input type="checkbox"/> Route to hospital	Heat/Cold Stress <input type="checkbox"/> Work/rest regime <input type="checkbox"/> Rest area <input type="checkbox"/> Liquids available <input type="checkbox"/> Monitoring <input type="checkbox"/> Training	Vehicle/Traffic <input type="checkbox"/> Traffic control <input type="checkbox"/> Barricades <input type="checkbox"/> Flags <input type="checkbox"/> Signs
Permits <input type="checkbox"/> Hot work <input type="checkbox"/> Confined space <input type="checkbox"/> Lockout/tagout <input type="checkbox"/> Excavation <input type="checkbox"/> Demolition <input type="checkbox"/> Energized work	Demolition <input type="checkbox"/> Pre-demolition survey <input type="checkbox"/> Structure condition <input type="checkbox"/> Isolate area/utilities <input type="checkbox"/> Competent person <input type="checkbox"/> Hazmat present	Inspections: <input type="checkbox"/> Ladders/aerial lifts <input type="checkbox"/> Lanyards/harness <input type="checkbox"/> Scaffolds <input type="checkbox"/> Heavy equipment <input type="checkbox"/> Cranes and rigging	Training: <input type="checkbox"/> Hazwaste <input type="checkbox"/> Construction <input type="checkbox"/> Competent person <input type="checkbox"/> Task-specific (THA) <input type="checkbox"/> Hazcom

Field Notes: _____

Name (Print): _____

Signature: _____

Date: _____

CH2MHILL

Safe Work Observation Form				
Project:		Observer:		Date:
Position/Title of worker observed:		Background Information/ comments:		
Task/Observation Observed:				
<ul style="list-style-type: none"> ❖ Identify and reinforce safe work practices/behaviors ❖ Identify and improve on at-risk practices/acts ❖ Identify and improve on practices, conditions, controls, and compliance that eliminate or reduce hazards ❖ Proactive PM support facilitates eliminating/reducing hazards (do you have what you need?) ❖ Positive, corrective, cooperative, collaborative feedback/recommendations 				
Actions & Behaviors	Safe	At-Risk	Observations/Comments	
Current & accurate Pre-Task Planning/Briefing (Project safety plan, STAC, AHA, PTSP, tailgate briefing, etc., as needed)			Positive Observations/Safe Work Practices:	
Properly trained/qualified/experienced				
Tools/equipment available and adequate				
Proper use of tools			Questionable Activity/Unsafe Condition Observed:	
Barricades/work zone control				
Housekeeping				
Communication				
Work Approach/Habits				
Attitude				
Focus/attentiveness			Observer's Corrective Actions/Comments:	
Pace				
Uncomfortable/unsafe position				
Inconvenient/unsafe location				
Position/Line of fire				
Apparel (hair, loose clothing, jewelry)			Observed Worker's Corrective Actions/Comments:	
Repetitive motion				
Other...				

HITS Incident Report Hardcopy (Phase 1 – Initial Entry)
Rev. 1, 12/03/2007

Phase 1 – Initial Entry

Type of Incident (May select more than one)

- Injury/Illness
- Property Damage
- Spill/Release
- Environment/Permit
- Near Miss
- Other

General Information Section

Preparer's Name: _____ **Preparer's Phone Number:** _____

Date of Incident: _____ **Time of Incident:** _____ AM / PM

What Business Group is accountable for this incident: _____

What Business Group SubGroup is accountable for this incident: _____

What CH2M HILL Company is accountable for this incident: _____

Where did the Incident occur?

- United States, Geographic Region: _____
- Canada, Province/Territory: _____
- International, County: _____

Location of Incident?

- Company Premises, CH2M HILL Office (use 3 letter office code if available): _____
- Project, Project name: _____
- In Transit

Traveling from: _____

Traveling to: _____

- At Home
- Other, Specify: _____

Describe the incident: _____

Describe how this event could have been prevented: _____

Provide Witness Information:

Name: _____ Phone: _____

Name: _____ Phone: _____

Name: _____ Phone: _____

Personnel Notified of Incident (Provide name, date and time):

CH2M HILL Personnel: _____

Client Personnel: _____

Additional Comments: _____

Injury/Illness Section [Complete only if Injury/Illness Incident type selected]

Who was injured?

- CH2M HILL Employee or CH2M HILL Temp Employee
- Subcontractor to CH2M HILL (Non-LLC Joint Venture Project)
- LLC Joint Venture Partner Employee
- LLC Joint Venture Project Subcontractor/Contractor
- Other

Name of Injured: _____ **Job Title:** _____

Employer Name: _____ **Supervisor of Employee:** _____

Complete for CH2M HILL Employee Injuries

Business Group of Injured Employee: _____

Has the employee called the Injury Management Administrator (1-800-756-1130)?

- Yes No Not Sure

Has the injured employee's supervisor been notified of this incident?

- Yes No Not Sure

Complete for Non-CH2M HILL Employee Injuries

Has the project safety coordinator been notified of this incident?

- Yes No Not Sure

Project Safety Coordinator: _____

Body Part Affected: _____

Injury/Illness (Result): _____

Describe treatment provided (if medication provided, identify whether over-the-counter or prescription): _____

Describe any work restriction prescribed (include dates and number of days): _____

Physician/Health Care Provider Information

Name: _____ **Phone:** _____

Was treatment provided away from the worksite?

- No
- Yes

Facility Name: _____

Address: _____

City: _____ Phone Number: _____

Was injured treated in an emergency room?

No Yes

Was injured hospitalized overnight as an in-patient?

No Yes

General Information Environmental Section [Complete only if Environment/Permit or Spill/Release Incident type selected]

Who had control of the area during the incident?

CH2M HILL, Company: _____

Subcontractor, Company: _____

Joint Venture Partner/Contractor/Subcontractor, Company: _____

Other, Company: _____

Relationship to CH2M HILL: _____

Property Damage Section [Complete only if Property Damage Incident type selected]

Property Damaged: _____

Property Owner: _____

Damage Description: _____

Estimated US Dollar Amount: _____

Spill or Release Section [Complete only if Spill/Release Incident type selected]

Substance: _____

Estimated Quantity: _____

Did the spill/release move off the property?: _____

Spill/Release From: _____

Spill/Release To: _____

Environment/Permit Section [Complete only if Environment/Permit Incident type selected]

Describe Environmental or Permit Issue: _____

Permit Type: _____

Permitted Level or Criteria (e.g., discharge limit): _____

Permit Name and Number (e.g., NPDES No. ST1234): _____

Substance and Estimated Quantity: _____

Duration of Permit Exceedence: _____

CH2M HILL Health and Safety Plan
Attachment 6

Material Safety Data Sheets

CHEVRON U S A -- CHEVRON 2-CYCLE OIL - OIL,2-CYCLE
MATERIAL SAFETY DATA SHEET

NSN: 915000F005683

Manufacturer's CAGE: 81230

Part No. Indicator: A

Part Number/Trade Name: CHEVRON 2-CYCLE OIL

=====
General Information
=====

Item Name: OIL,2-CYCLE

Company's Name: CHEVRON U S A INC

Company's Street: 575 MARKET ST

Company's P. O. Box: 7643

Company's City: SAN FRANCISCO

Company's State: CA

Company's Country: US

Company's Zip Code: 94120-2856

Company's Emerg Ph #: 800-231-0623 800-424-9300(CHEMTREC)

Company's Info Ph #: 800-582-3835 800-582-3835

Record No. For Safety Entry: 001

Tot Safety Entries This Stk#: 002

Status: SE

Date MSDS Prepared: 14APR93

Safety Data Review Date: 16JUN94

Supply Item Manager: CX

MSDS Preparer's Name: UNKNOWN

MSDS Serial Number: BTJYT

Specification Number: NONE

Spec Type, Grade, Class: NONE

Hazard Characteristic Code: N1

Unit Of Issue: NK

Unit Of Issue Container Qty: UNKNOWN

Type Of Container: UNKNOWN

Net Unit Weight: UNKNOWN

=====
Ingredients/Identity Information
=====

Proprietary: NO

Ingredient: SOLVENT,DEWAXED RESIDUAL OIL (PETROLEUM)

Ingredient Sequence Number: 01

Percent: UNKNOWN

NIOSH (RTECS) Number: 1004315SD

CAS Number: 64742-62-7

OSHA PEL: 5 MG/M3 (OIL MIST)

ACGIH TLV: 5 MG/M3 (OIL MIST)

Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: RESIDUAL OILS, HYDROTREATED

Ingredient Sequence Number: 02

Percent: UNKNOWN

NIOSH (RTECS) Number: 1003242SR

CAS Number: 64742-57-0

OSHA PEL: 5 MG/M3 (OIL MIST)

ACGIH TLV: 5 MG/M3 (OIL MIST)

Proprietary: NO

Ingredient: DISTILLATES, HYDROTREATED HEAVY PARAFFINIC

Ingredient Sequence Number: 03

Percent: UNKNOWN

NIOSH (RTECS) Number: PY8035500

CAS Number: 64742-54-7

OSHA PEL: 5 MG/M3 (OIL MIST)

ACGIH TLV: 5 MG/M3 (OIL MIST)

Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO

Ingredient: MINERAL OIL, PETROLEUM DISTILLATES, SOLVENT-DEWAXED HEAVY PARAFFINIC

Ingredient Sequence Number: 04

Percent: UNKNOWN

NIOSH (RTECS) Number: PY8038500

CAS Number: 64742-65-0

OSHA PEL: 5 MG/M3 (OIL MIST)

ACGIH TLV: 5 MG/M3 (OIL MIST)

Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO

Ingredient: HYDROTREATED LIGHT PETROLEUM DISTILLATE

Ingredient Sequence Number: 05

Percent: 1

Specific Gravity: 0.891

Decomposition Temperature: UNKNOWN

Evaporation Rate And Ref: UNKNOWN

Solubility In Water: NEGLIGIBLE

Percent Volatiles By Volume: NIL

Corrosion Rate (IPY): UNKNOWN

=====
Fire and Explosion Hazard Data
=====

Flash Point: NONE

Lower Explosive Limit: UNKNOWN

Upper Explosive Limit: UNKNOWN

Extinguishing Media: USE WATER FOG, CARBON DIOXIDE, FOAM, OR DRY CHEMICAL.
WATER OR FOAM MAY CAUSE FROTHING.

Special Fire Fighting Proc: WEAR FIRE FIGHTING PROTECTIVE EQUIPMENT AND A FULL FACED SELF CONTAINED BREATHING APPARATUS. COOL FIRE EXPOSED CONTAINERS WITH WATER SPRAY.

Unusual Fire And Expl Hazrds: COMBUSTION OR HEAT OF FIRE MAY PRODUCE HAZARDOUS DECOMPOSITION PRODUCTS AND VAPORS.

=====
Reactivity Data
=====

Stability: YES

Cond To Avoid (Stability): HIGH HEAT, OPEN FLAMES AND OTHER SOURCES OF IGNITION

Materials To Avoid: STRONG OXIDIZING AGENTS

Hazardous Decomp Products: AIRBORNE SOLID AND LIQUID PARTICULATES, CARBON MONOXIDE, OTHER UNIDENTIFIED HYDROCARBON PRODUCTS.

Hazardous Poly Occur: NO

Conditions To Avoid (Poly): NOT APPLICABLE
=====

Health Hazard Data
=====

D50-LC50 Mixture: LD 50 ORAL RAT IS UNKNOWN

Route Of Entry - Inhalation: NO

Route Of Entry - Skin: NO

Route Of Entry - Ingestion: NO

Health Haz Acute And Chronic: EYES:MAY CAUSE IRRITATION.SKIN:MAY CAUSE IRRITATION.INGEST:MAY CAUSE GI TRACT IRRITATION.INHAL:MAY CAUSE RESPIRATORY

IRRITATION,CNS EFFETS.

Carcinogenicity - NTP: NO

Carcinogenicity - IARC: NO

Carcinogenicity - OSHA: NO

Explanation Carcinogenicity: NONE OF THE INGREDIENTS IN THIS PRODUCT IS LISTED BY NTP, IARC OR OSHA AS A CARCINOGEN.

Signs/Symptoms Of Overexp: EYES: PAIN,TEARING,SWELLING,REDNESS,BLURRED VISION.

Med Cond Aggravated By Exp: BECAUSE OF ITS DEFATTING PROPERTIES, PROLONGED AND REPEATED SKIN CONTACT MAY AGGRAVATE AN EXISTING DERMATITIS.

Emergency/First Aid Proc: EYES: FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. IF IRRITATION PERSISTS, SEE DOCTOR. SKIN: WASH WITH SOAP. IF IRRITATION PERSISTS, SEE DOCTOR. INHALATION: REMOVE VICTIM TO FRESH AIR. GIVE OXYGEN/CPR IF NEEDED. SEE DOCTOR. INGESTION: DO NOT INDUCE VOMITING.

SEE DOCTOR. INJECTION: THIS IS A MEDICAL EMERGENCY. SEE DOCTOR IMMEDIATELY.

=====
Precautions for Safe Handling and Use
=====

Steps If Matl Released/Spill: REMOVE PERSONNEL. ELIMINATE IGNITION SOURCES. VENTILATE AREA. WEAR PROTECTIVE CLOTHING AND EQUIPMENT. DIKE AND

CONTAIN. ABSORB IN INERT MATERIAL AND PLACE IN APPROPRIATE DISPOSAL CONTAINER AND COVER. WASH AREA WITH SOAP AND WATER.

Neutralizing Agent: NONE

Waste Disposal Method: CONTACT YOUR LOCAL ENVIRONMENTAL OFFICER. DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS.

Precautions-Handling/Storing: STORE IN A COOL, DRY PLACE WITH ADEQUATE VENTILATION. KEEP AWAY FROM HEAT, OPEN FLAMES AND STRONG OXIDANTS. KEEP

CONTAINERS TIGHTLY CLOSED.

Other Precautions: AVOID EYE AND SKIN CONTACT. DO NOT BREATHE VAPORS.
=====

Control Measures
=====

Respiratory Protection: NONE NORMALLY REQUIRED. NIOSH/MSHA-APPROVED RESPIRATOR OR SCBA AS APPROPRIATE FOR EXPOSURE OF CONCERN.

Ventilation: MECHANICAL (GENERAL) VENTILATION.

Protective Gloves: NITRILE GLOVES.

Eye Protection: SPLASH GOGGLES IF MISTING.

Other Protective Equipment: PROTECTIVE CLOTHING AS REQUIRED TO MINIMIZE EXPOSURE FROM PROLONGED OR REPEATED CONTACT. EYE BATH AND SAFETY SHOWER.

Work Hygienic Practices: WASH THOROUGHLY AFTER HANDLING AND BEFORE EATING.

LAUNDRER CONTAMINATED CLOTHING BEFORE REUSE. DISCARD CONTAMINATED SHOES

Suppl. Safety & Health Data: NONE
=====

Transportation Data
=====

Trans Data Review Date: 94167

DOT PSN Code: ZZZ

DOT Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION

IMO PSN Code: ZZZ

IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION

IATA PSN Code: ZZZ

IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION

AFI PSN Code: ZZZ

AFI Prop. Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION

MMAC Code: NR

Additional Trans Data: NONE
=====

Disposal Data

=====
=====

Label Data

=====

Label Required: YES
Technical Review Date: 16JUN94
MFR Label Number: UNKNOWN
Label Status: F
Common Name: CHEVRON 2-CYCLE OIL
Signal Word: CAUTION!
Acute Health Hazard-Slight: X
Contact Hazard-Slight: X
Fire Hazard-Slight: X
Reactivity Hazard-None: X
Special Hazard Precautions: EYES:MAY CAUSE IRRITATION.SKIN:MAY CAUSE IRRITATION.INGEST:MAY CAUSE GI TRACT IRRITATION.INHAL:MAY CAUSE RESPIRATORY IRRITATION,CNS EFFETS. STORE IN A COOL, DRY PLACE WITH ADEQUATE VENTILATION. KEEP AWAY FROM HEAT, OPEN FLAMES AND STRONG OXIDANTS. KEEP CONTAINERS TIGHTLY CLOSED. FIRST AID: EYES: FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. IF IRRITATION PERSISTS, SEE DOCTOR. SKIN: WASH WITH SOAP. IF IRRITATION PERSISTS, SEE DOCTOR. INHALATION: REMOVE VICTIM TO FRESH AIR. GIVE OXYGEN/CPR IF NEEDED. SEE DOCTOR. INGESTION: DO NOT INDUCE VOMITING. SEE DOCTOR. INJECTION: THIS IS A MEDICAL EMERGENCY. SEE DOCTOR IMMEDIATELY.
Protect Skin: Y
Label Name: CHEVRON U S A INC
Label Street: 575 MARKET ST
Label P.O. Box: 7643
Label City: SAN FRANCISCO
Label State: CA
Label Zip Code: 94120-2856
Label Country: US
Label Emergency Number: 800-231-0623 800-424-9300(CHEMTREC)

=====

URL for this msds <http://siri.org>. If you wish to change, add to, or delete information in this archive please sent updates to dan@siri.org.

SINCLAIR OIL -- GASOLINE - GASOLINE,UNLEADED
MATERIAL SAFETY DATA SHEET

NSN: 9130012720983

Manufacturer's CAGE: 2X948

Part No. Indicator: A

Part Number/Trade Name: GASOLINE

=====
General Information
=====

Item Name: GASOLINE,UNLEADED

Company's Name: SINCLAIR OIL CORP

Company's Street: 550 E SOUTH TEMPLE

Company's P. O. Box: 30825

Company's City: SALT LAKE CITY

Company's State: UT

Company's Country: US

Company's Zip Code: 84130-0825

Company's Emerg Ph #: 801-524-2700/800-424-9300(CHEMTREC)

Company's Info Ph #: 801-524-2853/307-324-3404 MEDICAL

Record No. For Safety Entry: 037

Tot Safety Entries This Stk#: 072

Status: SE

Date MSDS Prepared: 01JAN92

Safety Data Review Date: 04DEC92

Supply Item Manager: KY

MSDS Serial Number: BPKZJ

Hazard Characteristic Code: F2

Unit Of Issue: GL

=====
Ingredients/Identity Information
=====

Proprietary: NO

Ingredient: CYCLOHEXANE (SARA III)

Ingredient Sequence Number: 01

Percent: 0.9-1.8

NIOSH (RTECS) Number: GU6300000

CAS Number: 110-82-7

OSHA PEL: 300 PPM

ACGIH TLV: 300 PPM, 9293

Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO

Ingredient: BENZENE (SARA III)

Ingredient Sequence Number: 02

Percent: 0.8-4.8

NIOSH (RTECS) Number: CY1400000

CAS Number: 71-43-2

OSHA PEL: 1PPM/5STEL;1910.1028
ACGIH TLV: 10 PPM; A2; 9293
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: TOLUENE (SARA III)
Ingredient Sequence Number: 03
Percent: 6.6-7.8
NIOSH (RTECS) Number: XS5250000
CAS Number: 108-88-3
OSHA PEL: 200 PPM/150 STEL
ACGIH TLV: 50 PPM; 9293
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: XYLENES (O-,M-,P- ISOMERS) (SARA III)
Ingredient Sequence Number: 04
Percent: 6- 10.4
NIOSH (RTECS) Number: ZE2100000
CAS Number: 1330-20-7
OSHA PEL: 100 PPM/150 STEL
ACGIH TLV: 100 PPM/150STEL;9293
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: NAPHTHALENE (SARA III)
Ingredient Sequence Number: 05
Percent: 0.1-1.2
NIOSH (RTECS) Number: QJ0525000
CAS Number: 91-20-3
OSHA PEL: 10 PPM/15 STEL
ACGIH TLV: 10 PPM/15 STEL; 9293
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: METHYL TERT-BUTYL ETHER (SARA III)
Ingredient Sequence Number: 06
Percent: 0 - 15
NIOSH (RTECS) Number: KN5250000
CAS Number: 1634-04-4
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: ETHYL ALCOHOL (ETHANOL)

Ingredient Sequence Number: 07
Percent: 0 - 10
NIOSH (RTECS) Number: KQ6300000
CAS Number: 64-17-5
OSHA PEL: 1000 PPM
ACGIH TLV: 1000 PPM; 9293
Other Recommended Limit: NONE RECOMMENDED

=====

Physical/Chemical Characteristics

=====

Appearance And Odor: CLEAR, BRONZE, RED OR PURPLE COLOR LIQUID - STRONG HYDROCARBON ODOR
Boiling Point: UNKNOWN
Melting Point: <-76F,<-60C
Vapor Pressure (MM Hg/70 F): 466 - 776
Specific Gravity: 0.7
Decomposition Temperature: UNKNOWN
Solubility In Water: NEGLIGIBLE
Corrosion Rate (IPY): UNKNOWN
Autoignition Temperature: >500F

=====

Fire and Explosion Hazard Data

=====

Flash Point: -45F,-43C
Lower Explosive Limit: 1.4%
Upper Explosive Limit: 7.6%
Extinguishing Media: USE WATER FOG, CARBON DIOXIDE, FOAM, DRY CHEMICAL OR HALON. WATER MAY BE INEFFECTIVE.
Special Fire Fighting Proc: WEAR FIRE FIGHTING PROTECTIVE EQUIPMENT & A FULL FACED SELF CONTAINED BREATHING APPARATUS/SUPPLIED-AIR RESPIRATOR.COOL FIRE EXPOSED CONTAINERS WITH WATER SPRAY.
Unusual Fire And Expl Hazrds: EXTREMELY FLAMMABLE LIQUID. VAPOR ACCUMULATION COULD FLASH AND/OR EXPLODE IF IT COMES IN CONTACT WITH OPEN FLAME.

=====

Reactivity Data

=====

Stability: YES
Cond To Avoid (Stability): HEAT, SPARKS, OPEN FLAMES, STATIC ELECTRICITY AND OTHER SOURCES OF IGNITION
Materials To Avoid: STRONG OXIDIZING AGENTS, HALOGENS, STRONG ACIDS, ALKALIES
Hazardous Decomp Products: CARBON MONOXIDE, CARBON DIOXIDE
Hazardous Poly Occur: NO

=====
Health Hazard Data
=====

LD50-LC50 Mixture: ORAL LD50 (RAT) IS UNKNOWN

Route Of Entry - Inhalation: YES

Route Of Entry - Skin: YES

Route Of Entry - Ingestion: NO

Health Haz Acute And Chronic: ACUTE/CHRONIC-HIGH VAPOR CONCENTRATIONS ARE IRRITATING TO THE EYES & THE RESPIRATORY TRACT.MAY CAUSE DIZZINESS, HEADACHE,ARE ANESTHETIC,MAY CAUSE UNCONSCIOUSNESS.PROLONGED/REPEATED LIQUID CONTACT WITH SKIN WILL DRY & DEFAT SKIN,LEADING TO IRRITATION & DERMATITIS.

CONTAINS BENZENE WHICH CAUSES BLOOD DISEASE,LEUKEMIA.

Carcinogenicity - NTP: YES

Carcinogenicity - IARC: YES

Carcinogenicity - OSHA: YES

Explanation Carcinogenicity: CONTAINS BENZENE.MAY CAUSE BLOOD DISEASES INCLUDING LEUKEMIA.VAPORS MAY CAUSE KIDNEY CANCER IN MALE RATS.

Signs/Symptoms Of Overexp: HIGH VAPOR CONCENTRATIONS ARE IRRITATING TO THE EYES & THE RESPIRATORY TRACT. MAY CAUSE DIZZINESS, HEADACHE, ARE ANESTHETIC, MAY CAUSE UNCONSCIOUSNESS & EVEN DEATH.

PROLONGED/REPEATED

LIQUID CONTACT WITH SKIN WILL DRY & DEFAT SKIN, LEADING TO IRRITATION & DERMATITIS. CONTAINS BENZENE WHICH CAUSES BLOOD DISEASE,LEUKEMIA

Med Cond Aggravated By Exp: BENZENE-INDIVIDUALS WITH LIVER DISEASE MAY BE MORE SUSCEPTIBLE TO TOXIC EFFECTS.HEXANE-INDIVIDUALS WITH NEUROLOGICAL DISEASE SHOULD AVOID EXPOSURE.PETROLEUM SOLVENT-THOSE WITH EXISTING DERMATITIS.

Emergency/First Aid Proc: CALL A PHYSICIAN IN ALL CASES.EYES: IMMEDIATELY FLUSH WITH WATER FOR 15 MINUTES,HOLDING EYELIDS OPEN.SKIN:WASH WITH SOAP &

WATER.INHALED:REMOVE TO FRESH AIR & PROVIDE CPR/OXYGEN IF NECESSARY.ORAL:DO

NOT INDUCE VOMITING.CALL A PHYSICIAN IMMEDIATELY.

=====
Precautions for Safe Handling and Use
=====

Steps If Matl Released/Spill: WEAR PROTECTIVE EQUIPMENTS.ELIMINATE ALL SOURCES OF IGNITION.USE EXPLOSION-PROOF TOOLS.SHUT OFF FUEL SOURCE.DIKE SPILL.PREVENT LIQUID FROM ENTERING SEWERS/WATERWAYS.RECOVER FREE LIQUID.ADD

SAND,EARTH OR OTHER ABSORBENT MATERIAL.TRANSFER TO CONTAINER.

Neutralizing Agent: NOT APPLICABLE

Waste Disposal Method: TREATMENT, STORAGE, TRANSPORTATION AND DISPOSAL MUST BE IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL LAWS AND

REGULATIONS.

Precautions-Handling/Storing: STORAGE-STORE IN ACCORDANCE WITH NATIONAL FIRE PROTECTION ASSOCIATION REGULATIONS.KEEP CONTAINERS CLOSED.

Other Precautions: "EMPTY" CONTAINERS RETAIN RESIDUE AND CAN BE DANGEROUS. DO NOT PRESSURIZE,CUT,WELD,BRAZE,SOLDER,DRILL,GRIND OR EXPOSE SUCH CONTAINERS TO HEAT,FLAME,SPARKS.THEY MAY EXPLODE AND CAUSE INJURY/DEATH.

AVOID REPEATED OR PROLONGED CONTACT WITH SKIN.

=====
Control Measures
=====

Respiratory Protection: NIOSH-APPROVED SELF-CONTAINED BREATHING APPARATUS OR ORGANIC VAPOR RESPIRATOR OR SUPPLIED-AIR RESPIRATOR, IF NEEDED.

Ventilation: LOCAL/MECHANICAL (GENERAL) VENTILATION - EXPLOSION PROOF, WELL GROUNDED EQUIPMENTS

Protective Gloves: RUBBER

Eye Protection: CHEMICAL SPLASH GOGGLES & FACE SHIELD

Other Protective Equipment: IMPERVIOUS CLOTHING TO AVOID SKIN AND EYE CONTACT. EYE WASH STATION & SAFETY SHOWER.

Work Hygienic Practices: AVOID CONTACT WITH EYES, SKIN OR CLOTHING. WASH HANDS AFTER USING PRODUCT. AVOID BREATHING VAPORS OR MISTS.

=====
Transportation Data
=====

Trans Data Review Date: 92339

DOT PSN Code: GTN

DOT Proper Shipping Name: GASOLINE

DOT Class: 3

DOT ID Number: UN1203

DOT Pack Group: II

DOT Label: FLAMMABLE LIQUID

IMO PSN Code: HRV

IMO Proper Shipping Name: GASOLINE

IMO Regulations Page Number: 3141

IMO UN Number: 1203

IMO UN Class: 3.1

IMO Subsidiary Risk Label: -

IATA PSN Code: RMF

IATA UN ID Number: 1203

IATA Proper Shipping Name: MOTOR SPIRIT

IATA UN Class: 3

IATA Label: FLAMMABLE LIQUID

AFI PSN Code: MUC

AFI Prop. Shipping Name: GASOLINE

AFI Class: 3

AFI ID Number: UN1203

AFI Pack Group: II

AFI Label: FLAMMABLE LIQUID

AFI Basic Pac Ref: 7-7

=====
Disposal Data
=====

=====
Label Data
=====

Label Required: YES

Technical Review Date: 04DEC92

MFR Label Number: UNKNOWN

Label Status: F

Common Name: GASOLINE

Signal Word: DANGER!

Acute Health Hazard-Severe: X

Contact Hazard-Severe: X

Fire Hazard-Severe: X

Reactivity Hazard-None: X

Special Hazard Precautions: ACUTE/CHRONIC-HIGH VAPOR CONCENTRATIONS ARE IRRITATING TO THE EYES & THE RESPIRATORY TRACT.MAY CAUSE DIZZINESS, HEADACHE,ARE ANESTHETIC,MAY CAUSE UNCONSCIOUSNESS.PROLONGED/REPEATED LIQUID CONTACT WITH SKIN WILL DRY & DEFAT SKIN,LEADING TO IRRITATION & DERMATITIS.

CONTAINS BENZENE WHICH CAUSES BLOOD DISEASE,LEUKEMIA.STORAGE-STORE IN ACCORDANCE WITH NATIONAL FIRE PROTECTION ASSOCIATION REGULATIONS.FIRST AID-

CALL A PHYSICIAN IN ALL CASES.EYES:IMMEDIATELY FLUSH WITH WATER FOR 15 MINUTES,HOLDING EYELIDS OPEN.SKIN:WASH WITH SOAP & WATER.INHALED:REMOVE TO FRESH AIR & PROVIDE CPR/OXYGEN IF NEEDED.ORAL:DO NOT INDUCE VOMITING.CALL A PHYSICIAN IMMEDIATELY

Protect Eye: Y

Protect Skin: Y

Protect Respiratory: Y

Label Name: SINCLAIR OIL CORP

Label Street: 550 E SOUTH TEMPLE

Label P.O. Box: 30825

Label City: SALT LAKE CITY

Label State: UT

Label Zip Code: 84130-0825

Label Country: US

Label Emergency Number: 801-524-2700/800-424-9300(CHEMTREC)

=====
URL for this msds <http://siri.org>. If you wish to change, add to, or delete information in this archive please sent updates to dan@siri.org

CH2M HILL Health and Safety Plan
Attachment 7

Tick Fact Sheet

Tick-Borne Pathogens — A Fact Sheet

Most of us have heard of Lyme disease or Rocky Mountain Spotted Fever (RMSF), but there are actually six notifiable tick-borne pathogens that present a significant field hazard. In some areas, these account for more than half of our serious field incidents. The following procedures should be applied during any field activity – even in places that are predominantly paved with bordering vegetation.

Hazard Recognition

An important step in controlling tick related hazards is understanding how to identify ticks, their habitats, their geographical locations, and signs and symptoms of tick-borne illnesses.

Tick Identification

There are five varieties of hard-bodied ticks that have been associated with tick-borne pathogens. These include:

- Deer (Black Legged) Tick (eastern and pacific varieties)
- Lone Star Tick
- Dog Tick
- Rocky Mountain Wood Tick

These varieties and their geographical locations are illustrated on the following page.

Tick Habitat

In eastern states, ticks are associated with deciduous forest and habitat containing leaf litter. Leaf litter provides a moist cover from wind, snow, and other elements. In the north-central states, is generally found in heavily wooded areas often surrounded by broad tracts of land cleared for agriculture.

On the Pacific Coast, the bacteria are transmitted to humans by the western black-legged (deer) tick and habitats are more diverse. For this region, ticks have been found in habitats with forest, north coastal scrub, high brush, and open grasslands. Coastal tick populations thrive in areas of high rainfall, but ticks are also found at inland locations.

Illnesses and Signs & Symptoms

There are six notifiable tick-borne pathogens that cause human illness in the United States. These pathogens may be transmitted during a tick bite – normally hours after attachment. The illnesses, presented in approximate order of most common to least, include:

- Lyme (bacteria)
- RMSF (bacteria)
- Ehrlichiosis (bacteria)
- STARI (Southern Tick-Associated Rash Illness) (bacteria)
- Tularemia (Rabbit Fever) (bacteria)
- Babesia (protozoan parasite)

Symptoms will vary based on the illness, and may develop in infected individuals typically between 3 and 30 days after transmission. Some infected individuals will not become ill or may develop only mild symptoms. These illnesses present with some or all of the following signs & symptoms: fever, headache, muscle aches, stiff neck, joint aches, nausea, vomiting, abdominal pain, diarrhea, malaise, weakness, small solid, ring-like, or spotted rashes. The bite site may be red, swollen, or develop ulceration or lesions. For Lyme disease, the bite area will sometimes resemble a target pattern. A variety of long-term symptoms may result if the illness is left untreated, including debilitating effects and death.



Deer Tick



Distribution of Deer Tick (dark green)



From Left: adult female, adult male, nymph, and larvae Deer Tick (cm scale)



Distribution of Pacific Deer Tick (dark green)



Lone Star Tick



Distribution of Lone Star Tick (Green)



Dog Tick



Yellow indicates approximate distribution area



Rocky Mountain Wood Tick



Yellow indicates approximate distribution area

Hazard Control

The methods for controlling exposure to ticks include, in order of most- to least-preferred:

- Avoiding tick habitats and ceasing operations in heavily infested areas
- Reducing tick abundance through habitat disruption or application of acaricide
- Personal protection through use of repellants and protective clothing
- Frequent tick inspections and proper hygiene

Vaccinations are not available and preventative antibiotic treatment after a bite is generally not recommended.

Avoidance and Reduction of Ticks

To the extent practical, tick habitats should be avoided. In areas with significant tick infestation, consider stopping work and withdrawing from area until adequate tick population control can be achieved. Stopping and withdrawing should be considered as seriously as entering an area without proper energy control or with elevated airborne contaminants – tick-borne pathogens present risk of serious illness!

In areas where significant population density or infestation exists, tick reduction should be considered. Tick reduction can be achieved by disrupting tick habitats and/or direct population reduction through the use of tick-toxic pesticides (Damminix, Dursban, Sevin, etc.).

Habitat disruption may include only simple vegetative maintenance such as removing leaf litter and trimming grass and brush. Tick populations can be reduced by between 72 and 100 percent when leaf litter alone is removed. In more heavily infested areas, habitat disruption may include grubbing, tree trimming or removal, and pesticide application (Damminix, Dursban, Sevin, etc.). This approach is practical in smaller, localized areas or perimeter areas that require occasional access. Habitat controls are to be implemented with appropriate health and safety controls, in compliance with applicable environmental requirements, and may be best left to the property owner or tenant or to a licensed pesticide vendor. Caution should be exercised when using chemical repellents or pesticides in or around areas where environmental or industrial media samples will be collected for analysis.

Personal Protection

After other prevention and controls are implemented, personal protection is still necessary to control exposure to ticks. Personal protection must include all of the following steps:

- Where site conditions warrant (vegetation above knee height, tick endemic area) or when tasks warrant (e.g., having to sit/kneel in vegetation) that diminish the effectiveness of the other controls mentioned above, bug-out suits (obtained from MKE warehouse)/Tyvek shall be used. Bug-out suits are more breathable than Tyvek.
- So that ticks may be easily seen, wear light-colored clothing. Full-body New Tyvek (paper-like disposable coveralls) may also be used
- To prevent ticks from getting underneath clothing tuck pant legs into socks or tape to boots
- Wear long-sleeved shirts, a hat, and high boots
- Apply DEET repellent to exposed skin or clothing per product label
- Apply permethrin repellent to the outside of boots and clothing before wearing, per product label
- Frequently check for ticks and remove from clothing
- At the end of the day, search your entire body for ticks (particularly groin, armpits, neck, and head) and shower

- To prevent pathogen transmission through mucous membranes or broken/cut skin, wash or disinfect hands and/or wear surgical-style nitrile gloves any time ticks are handled

Pregnant individuals and individuals using prescription medications should consult with their physician and/or pharmacists before using chemical repellents. Because human health effects may not be fully known, use of chemical repellents should be kept to a minimum frequency and quantity. Always follow manufacturers' use instructions and precautions. Wash hands after handling, applying, or removing protective gear and clothing. Avoid situations such as hand-to-face contact, eating, drinking, and smoking when applying or using repellents.

Remove and wash clothes per repellent product label. Chemical repellents should not be used on infants and children.

Vaccinations are generally not available for tick-borne pathogens. Although production of the LYMERix™ Lyme disease vaccination has been ceased, vaccination may still be considered under specific circumstances and with concurrence from the consulting physician.

Tick Check

A tick check should be performed after field survey before entering the field vehicle (you do not want to infest your field vehicle with ticks). Have your field partner check your back; the backs of your legs, arms, and neck; and your hairline. Shake off clothing as thorough as possible before entering the vehicle. Once the field day is complete, repeat this procedure and perform a thorough self check.

If a tick has embedded itself into the skin, remove the tick as described below.

Tick Removal

1. Use the tick removal kit obtained through the CH2M HILL Milwaukee warehouse, or a fine-tipped tweezers or shield your fingers with a tissue, paper towel, or nitrile gloves.



Tick Bites\Tick Remover.pdf

2. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with tweezers. Consult your healthcare provider if infection occurs.



3. Avoid squeezing, crushing or puncturing the body of the tick because its fluids (saliva, hemolymph, gut contents) may contain infectious organisms. Releasing these organisms to the outside of the tick's body or into the bite area may increase the chance of infectious organism transmission.
4. Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin. This precaution is particularly directed to individuals who remove ticks from domestic animals with unprotected fingers. Children, elderly persons, and immunocompromised persons may be at greater risk of infection and should avoid this procedure.
5. After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.

6. You may wish to save the tick for identification in case you become ill. Your doctor can use the information to assist in making an accurate diagnosis. Place the tick in a plastic bag and put it in your freezer. Write the date of the bite on a piece of paper with a pencil and place it in the bag.

Note: Folklore remedies such as petroleum jelly or hot matches do little to encourage a tick to detach from skin. In fact, they may make matters worse by irritating the tick and stimulating it to release additional saliva, increasing the chances of transmitting the pathogen. These methods of tick removal should be avoided. In addition, a number of tick removal devices have been marketed, but none are better than a plain set of fine tipped tweezers.

First-Aid and Medical Treatment

Tick bites should always be treated with first-aid. Clean and wash hands and disinfect the bite site after removing embedded tick. Individuals previously infected with Lyme disease does not confer immunity – re-infection from future tick bites can occur even after a person has contracted a tick-borne disease.

CH2M Hill has a protocol in place for employees who have experienced a tick bite due to work-related activities, to test all ticks that have been removed from them for the presence of *Borrelia burgdorferi*.

The employee should contact the Injury Management/Return To Work provider (IMRTW), WorkCare using the toll-free number 866-893-2514 to report the tick bite. WorkCare will follow-up with each CH2M Hill employee who reports a tick bite and is at risk of developing Lyme disease by monitoring for symptoms up to 45 days, and will refer the employee to a medical provider for evaluation and treatment as necessary

CH2M HILL Health and Safety Plan
Attachment 8

Vehicle Accident Guidance

Vehicle Accident Guidance

For All Vehicles--Call the Police

For any vehicle accident/damage, it is recommended that the local police (or site security/emergency services if working on a client site that provides such services) be called to determine if a report needs to be filed. In some instances, a report may not be required (during accident alerts, or in public parking lots). Document that the authorities were called and follow up with any guidance they give you. State requirements vary. If a report is filed, obtain a copy.

For Fleet Vehicles:

Definition: These are vehicles **rented for greater than 90 days** or rentals that are **leased** (either through ARI [Automotive Rental, Inc.] or leases from other companies [older fleet vehicles]).

Report the accident to the following:

Contact Company Insurance Carrier: Zurich (1-877-246-3478 or 1-800-987-3373).

Contact Corp. Insurance - Linda George/DEN at 720-286-2057.

Note: If you are an ES employee that happens to use an **OMI vehicle** on a project and get into an accident, you must also contact Michelle Garlington/DEN (720-286-4273).

For Rentals:

Report the accident to the following:

Call 1-800-VISA-911 (only if the car has been **rented for less than 31 days**— they provide some additional physical damage coverage in this time period).

Call Zurich (1-877-246-3478 or 1-800-987-3373). Carry available insurance cards which can be downloaded from the VO. For short-term rental (non CH2M Owned), carry the insurance card from the state where the driver's license was issued. For fleet vehicles, carry the insurance card from the state where the vehicle is registered.

https://communities.int.ch2m.com/legal/insurance/Shared%20Documents/AutoID_Cards.aspx?PageView=Shared

Call the rental company (Budget, National, Enterprise, etc.).

Call Linda Anderson/DEN at 720-286-2401.

For All Vehicles:

Notify Supervisor, (and PM/RHSM if working on a project site)

If you are injured, call 911 for emergency medical treatment or 1-866-893-2514 to contact the CH2M HILL Occupational Nurse/Physician for minor injuries. If you initially feel you have not been injured, contact the RHSM for guidance on whether calling the CH2M HILL Occupation Nurse/Physician is applicable.

Complete a HITS report on the VO.

Personally Owned Vehicles (POVs):

CH2M HILL does not provide auto insurance for POVs, it is responsibility of the owner. If you are in a vehicle accident conducting company business, contact the police as above, supervisor, and 911 or CH2M HILL's occupational nurse/physician as stated above. Complete a HITS report. Refer to the

Employee Handbook/Policies, assistance for meeting personal insurance deductibles (up to \$500 is available).

If using your POV for extended project use, notify the PM to make sure a rental car is not needed. Check your insurance policy for guidance on using the POV for business use.

Appendix E
Standard Operating Procedures

MRP – SOP – 0001
MUNITIONS RESPONSE PROGRAM (MRP)
STANDARD OPERATING PROCEDURE (SOP)
MUNITIONS AND EXPLOSIVES OF CONCERN (MEC) 0001
SURFACE & SUBSURFACE ANOMALY AVOIDANCE

1.0 OBJECTIVE:

Provide safe procedures to avoid Munitions and Explosives of Concern (MEC) during visitor/personnel escort, land survey, vegetation reduction, sediment sampling, soil boring, drilling, direct push technology-core sampling, or other environmental or construction activities conducted in an environment where the presence of MEC is suspected.

2.0 PURPOSE:

This SOP provides guidance, for avoiding surface military munitions (e.g., MEC, Unexploded Ordnance (UXO), Discarded Military Munitions (DMM), and Material Potentially Presenting an Explosive Hazard (MPPEH)), and subsurface anomalies.

3.0 APPLICABILITY:

This SOP applies MEC avoidance processes per Department of Army Engineering Pamphlet (EP) 75-1-2 Munitions and Explosives of Concern Support During Hazardous Toxic and Radioactive Waste (HTRW) and Construction Activities.

4.0 TECHNICAL GUIDANCE:

This SOP lists processes and procedures that comply with the following sources:

- DOD 6055.09-STD Ammunition and Explosives Safety Standards, February 2008;
- USN Environmental Restoration Program (MRP Chapter 12) August 2006;
- USN NAVSEA OP 5 Volume 1; Ammunition and Explosives Safety Ashore, July 2009;
- NOSSA Instruction 8023.11(series), Standard Operating Procedure Development
- USAF Manual 91-201 Explosive Safety Standards November 2008
- DA Pamphlet 385-64 Ammunition and Explosives Safety Standards October, 8, 2008
- DA Field Manual (FM) 21-16, Unexploded Ordnance (UXO) Procedures August, 1994
- DA Engineering Manual (EM) 1110-1-4009 Military Munitions Response Actions, June ,2007
- DA Engineering Pamphlet (EP) 1110-1-18 Military Munitions Response Process, April 2006
- DA Engineering Manual (EM) 385-1-97 Explosives, Health and Safety September 2008;
- **Note: Electronic copies for the sources listed above are available via CH2M HILL SUXOS Laptop Computer**

5.0 SOP VALIDATION RECORD:

SOP Title: MEC Anomaly Avoidance.....Work Instruction Identification/
SOP: # MRP-SOP-0001

Author: K. Lombardo Date: December 1, 2009.....Revision Date: None

Review: D Young, Date: December 11, 2009Approval; J. Bowles (Date OPEN)

Validation Date: December 14, 2009Process Observer: Kevin Lombardo,
December 14, 2009

6.0 HAZARDOUS MATERIALS:

Hazardous Chemicals: None; Product Name: N/A; Material Safety Data Sheets: N/A;
Health Hazards: N/A

7.0 EMERGENCY RESPONSE INFORMATION

Work Site Name (location) address/building # Street):

Nearest intersection (cross streets) or entrance gate:

Safe Area Rally Point (gate/building or intersection) Note: Rally Point should be upwind of work location:

UXO Qualified Technician Incident Commander: (name) _____

Personnel Injury or Medical Distress:

1. Summon Emergency Medical Services (EMS)
2. Administer First Aid and/or CPR
3. Notify Project Manager
4. PM implements CH2M HILL SOP 111, Incident Notification, Reporting, and Investigations.

Fire:

1. Evacuate personnel from the Munitions Response Site and Area to safe rally point
2. Notify Fire Department of "Work site Name," fire location, and personnel safe rally point
3. Obtain head count, ensuring all personnel are present and or accounted for.
4. Notify Project Manager
5. PM implements CH2M HILL SOP 111, Incident Notification, Reporting, and Investigations.

(Fire/Rescue radio call sign): _____ **Phone #** _____

Medical Services radio call sign: _____ **Phone #** _____

Range Control radio call sign: _____ **Phone #** _____

Project Manger POC: _____ **Phone #** _____

Identify local disaster warning system (radio, PA, phone, other): _____

Flag(s): _____

Warning Bells/Horns/Sirens/Lights/Strobes: _____

Public Address System: _____

Weather Radio Channel: _____

Other: _____

8.0 PERSONNEL ROLES AND RESPONSIBILITY

Note: Roles and responsibilities are dependent upon work plan direction; one or all roles and responsibilities may be applicable.

1. Project/Construction Manager (P/CM): Provides the necessary resources and personnel to safely and efficiently accomplish the scope of work. Ensures CH2M HILL unexploded ordnance (UXO) personnel shall be qualified in accordance with:
 - OPNAVINST 8020.14/MCO P8020.11 (series).
 - And are certified to perform the job assigned and that the certification is current. Contractors who perform those duties described in NAVSEA OP5, paragraph 2-3 involving ammunition and explosives shall comply with NAVMED P117 Article 15-107.
 - Prior to site operations, CH2M HILL will verify training, medical qualification statements by physicians, and conformance to substance abuse testing and reporting programs.
 - Shall confirm active explosive certification program conformance for personnel compliance to requirements for UXO personnel identified IAW DDESB Technical Paper (TP) 18, and monitors these personnel for conformance to the Bureau of Alcohol, Tobacco, Firearms, and Explosives, Safe Explosives Act 2003 Certification requirements for "Employee Possessor," and or "Responsible Person."
2. Senior UXO Supervisors or Unexploded Ordnance Technician III or II: Supervises the operational resources necessary to implement, and accomplish this procedure and requirements set forth within the Work, Health, Safety, Quality and Accident Prevention Plans. May stop work at anytime to prevent accidents, remedy unsafe conditions, stop an unsafe act, or question the safety of a process or procedure or

observe non conformance to this SOP and/or plans. Provides a Site Specific Tailgate Safety Briefing to include MEC, construction, industrial, environmental, and natural safety hazard awareness. Provides the plan of day. As applicable provide a Hazardous Materials briefing for items used, consumed, or required for this SOP. This person shall brief personnel on communications, security, emergency/medical response, evacuation, rally points, IAW with project instructors, and plans. This person shall inform personnel to prevent disclosure of classified work, site observations, or information. This person performs personnel escort, and anomaly avoidance.

3. Non-UXO Qualified Personnel are obligated to follow guidance within this SOP, Work, Health and Safety and Accident Prevention Plans.

9.0 PRE-OPERATIONAL CHECK LIST

1. () CH2M HILL Inc. ORE and Explosive Safety Submission Determination (ESSD) (Navy Projects)	2. () Project Task/Work/ Instructions
3. () Work Plan/ Accident Prevention Plan/ Health and Safety Plan, Quality Control Plan	4. () Personal Protective Equipment (PPE) IAW Safety Plan
5. () Emergency P.O.C List	6. () Directions and map to hospital
7. () Communications (2 methods)	8. () First aid/Fire Extinguisher/- (GPS/compasses optional)

10.0 ANOMALY DETECTION EQUIPMENT (as required by project instruction)

() Ferrous Metal Detector (Schonstedt GA 52CX or Ferex 4.021 MK 26 Mod 0 or equivalent), with extra batteries, carry case, & instruction manual (as required by project instructions)

() All Metals Detector (White Spectrum XLT or equivalent) with extra battery, carry case, & instruction manual (as required by project instructions)

() Down-hole Instrument Direct Push Technology – Schonstedt MG 230 Gradiometer maximum 2.12-inch "Outside Diameter" (OD) Probe Head - Extra batteries and instruction manual (as required by project instructions)

11.0 EXPLOSIVE ORDNANCE RECONNAISSANCE EQUIPMENT

WARNING

Direct physical contact with or movement of MEC or MPPEH is not authorized.

() Tape Measure, ruler, pen/paper, item for scale prospective (e.g. dollar bill),

() Camera (digital), with spare batteries (as required by project instructions)

() Small dry erase white board and dry erase marker for photograph item number, date, time, location, and description.

12.0 GENERAL INFORMATION	
CATEGORY MEC/Anomaly Avoidance	DIRECTIONS (S) = Safety, (O) = Operations, (Q) = Quality Control
<p>Note: (o) PM shall obtain MISS Utilities Check and or local Dig (intrusive) Permits prior to intrusive actions (such as use of direct push technology, drilling, and use of hand augers)</p> <p style="text-align: center;">(WARNING)</p> <p>Fire: (s) Do not attempt to fight a fire, evacuate area, move upwind or crosswind to safe rally point, notify fire department.</p> <p>Wildlife: (s) Aggressive/defensive - Avoid wildlife -withdraw from area</p> <p>Hunters: (s) Withdraw from area, retreat to vehicle, contact project authority</p> <p>CWM: (s) Evacuate upwind to safe rally point, mark area on map, contact PM</p> <p>Severe Weather (lighting, winds, and storms): (s) Evacuate to vehicle, follow PM guidance</p>	
13.0 SAFETY	
Munitions Response Group Safety Officer	Dan Young/NVR - Dan.Young@ch2m.com Telephone (Office): (251) 962 - 2963 Telephone (Cellular): (251) 752 - 0148
Safety Plan, Accident Prevention Plan and Activity Hazard Analysis	(s) All field personnel require reading, compliance, and acknowledging they understand and comprehend the safety information contained within these plans, SOP and AHA; attesting through signature and date
Visitors access to work location	(s) All visitors (contract/transient/witness) require a safety briefing, wearing of PPE IAW site specific safety plan, and conformance to UXO Technician instructions.
Safety Meeting:	(s) Each morning - Project Personnel shall participate in a tailgate safety briefing, discussing the operational activities (plan of the day), MEC/HTRW hazards/risks, safety controls, and emergency procedures; daily weather forecast, work activity OSHA PPE

	<p>level, insect/ poisonous plant avoidance, and heat/cold stress prevention. Personnel shall sign and date, the safety briefing acknowledgment form; confirming individual participation, understanding, and comprehension prior to operations. Personnel who do not participate in the safety briefing or, understand, or comprehend the safety briefing may not access work areas.</p>
<p>Safety Pre-field operations check list</p>	<p>(s) (<input type="checkbox"/>) First Aid Kit (serviceable and supplies within shelf life)</p> <p>(s) (<input type="checkbox"/>) Fire Extinguisher 10BC (or greater) (charged/indicator green)</p> <p>(s) (<input type="checkbox"/>) Water (minimum 1 liter per person)</p> <p>(s) (<input type="checkbox"/>) Cell phone/identified alternate land line location/or two/way Radio</p> <p>(s) (<input type="checkbox"/>) Identification of wind direction, and rally points</p> <p>(s) (<input type="checkbox"/>) PPE IAW Activity Hazard Analysis</p> <p>(s) (<input type="checkbox"/>) Vehicles unlocked; keys in announced location</p> <p>(s) (<input type="checkbox"/>) Insect repellent/sun screen (available)</p>
<p>Equipment Check-out:</p> <ol style="list-style-type: none"> 1) Schonstedt - GA52CX magnetometer or equivalent 2) White's (E series) Spectrum model XLT Metal Detector or equivalent 3) Schonstedt gradiometer MG 230 for Down-hole or underwater search or equivalent 4) Forster Ferex 4.021 models K,L, & W or MK 26 MOD 0 magnetometer for down-hole or underwater search or equivalent 	<p>(o) Assemble/inspect, IAW manufacture instructions</p> <p>(o) Test geophysical instruments against a known source (ferrous or non-ferrous) for instrument response.</p> <p>(o) Source (ferrous) Schedule 40, 2-inch x 5-inch steel pipe or equivalent</p> <p>(q) Pass/Fail - instrument shall detect source on surface at 12-inches above item/fail non-detect - replace instrument</p> <p>(o) Source on surface (non-ferrous) 3/4-inch x 6-inch Brass Pipe nipple (aka) couple fitting or equivalent</p> <p>(q) Pass/Fail - instrument shall detect source on surface at 6-inches above item/fail non-detect - replace instrument</p>

	<p>(q) Name of individual recording geophysical instrument source test results by instrument manufacturer with: type, model, serial number, by the date of daily equipment check. Record results for pass/fail source test with remarks. Reject and replace geophysical instruments that do not pass quality control source test.</p>
<p>14.0 SITE ACCESS</p>	
<p>WARNING:</p> <p>UXO Technician(s) shall not make physical contact with MEC, or commercial explosives. UXO Technicians assigned to implement this SOP shall not intentionally move MEC or explosives, incendiaries, smokes, propellants, or commercial explosives.</p> <p>NOTE:</p> <p>If MEC, to include Unexploded Ordnance (UXO), Discarded Military Munitions, (DMM) or Material Potentially Presenting an Explosive Hazard (MPPEH) are encountered, the UXO Technician shall respond IAW 3R training, avoid such items, and notify Project Manger IAW site-specific project instructions.</p>	<ul style="list-style-type: none"> (o) Implement 3R (R, R, R) process, and procedures. (o) Recognize MEC, UXO, DMM, and or MPPEH; offset mark anomaly location with flag, ribbon, paint, stakes, other location identifier (o) Retreat from MEC location and avoid MEC location (o) Report & record MEC location in logbook and contact Project Manager IAW project instructions to request additional guidance. <p>Note:</p> <p>MR Safety may instruct UXO Qualified Technician to perform a zero contact Explosive Ordnance Reconnaissance of the item requesting information for type by function, condition, filler, and nomenclature (if visually possible), supported by photographs of the item.</p>
<p>15.0 EXPLOSIVE ORDNANCE RECONNAISSANCE (EOR)</p>	
<p>EXPLOSIVE ORDNANCE RECONNAISSANCE</p> <p>Reconnaissance involving the investigation, detection, location, marking, initial identification, and reporting of suspected MPPEH in order to determine future action</p>	
<p>EOR Method</p> <p>UXO Qualified Technician is required prior to performing an Explosive Ordnance Reconnaissance to review Department of the Army, Field Manual (FM) 21-16, Unexploded Ordnance (UXO) Procedures, August 1994 – A copy can be obtained from:</p>	<ul style="list-style-type: none"> (o) Use general Explosive Ordnance Disposal (EOD) safety precautions until munition type, fuzing , condition, and filler are identified (o) Upon identification, of type by function, fuzing, and condition use general EOD safety precautions for the category of munition (e.g.

<p>WWW.UXOINFO.COM or from CH2M HILL MR Operations, Kevin Lombardo/WDC</p>	<p>Rocket; avoid approach to the front and rear of item, etc).</p> <p>(s) Approach Unexploded Ordnance (UXO) 45° to the rear</p> <p>(s) Do not cast shadows over UXO fuze</p> <p>(s) Remain cognizant to avoid dispensed wires, filaments, or other items that could initiate movement</p> <p>(s) Remain cognizant of Electromagnetic Hazardous Radiation, to Ordnance (HERO) precautions.</p>
<p>Information Recovery</p>	<p>(o) Photograph item from each vantage point. Identify each photograph with item name, view (side, front, rear, etc.), and distance from camera to item, (f-stop & shutter speed and film speed if applicable). It is required that a photograph log be kept for each item. Use a ruler in photo to demonstrate perspective of the item.</p> <p>(o) Close-up photograph fuze, markings, nose, tail, and or markings</p>
<p>16.0 PERSONNEL ESCORT</p>	
<p>Personnel Escort</p> <p>A minimum of one UXO qualified Technician(II) shall escort non-UXO qualified site personnel conducting access to a Munitions Response Area or Site</p> <p>The UXO qualified person shall visually search the surface of walking paths, roads, and parking areas to locate, mark, and avoid MEC during walking, driving, or setting-up equipment.</p>	<p>(o) Establish a wind streamer of tape/ribbon (flag) within/near the project site to observe wind direction.</p> <p>(o) A UXO Technician shall visually search the surface area, for MEC/HTRW to avoid such items. The UXO Technician may augment the visual search with the application of a geophysical instrument to detect surface/subsurface ferrous and or non-ferrous anomaly sources for the purpose of anomaly avoidance</p> <p>(o/s) When escorting non-qualified UXO personnel, a UXO Technician shall lead, and non-UXO qualified personnel shall follow along a path identified by the UXO Technician.</p> <p>(o) The UXO Technician shall identify surface hazards (MPPEH) and avoid such hazards. The location of a hazard requires, the UXO Technician to communicate the location to non-UXO qualified persons for avoidance around the item.</p> <p>(s) Communication can be by hand signals (pointing), or marking with flags, tape, ribbon, paint, stakes, or other means identified during a safety briefing.</p>

	<p>(s) Essential Personnel Limits - MR Escorts are a minimum of one UXO qualified Technician II or above, to no more than six (6) non-qualified persons.</p> <p>(s) Non UXO qualified personnel shall not approach and avoid a marked MPPEH or HTRW hazard.</p>
17.0 MEC AVOIDANCE SUPPORT LAND SURVEY, SEDIMENT SAMPLING, GROUNDWATER COLLECTION, ENDANGERED SPECIES SAMPLING/MONITORING	
Applicable to Visitors, Land Survey, Sediment Sampling, Groundwater Collection, Endangered Species Sampling/Monitoring	
<p>WARNING:</p> <p>Subsurface intrusive acts could initiate MEC, through physical contact, movement, or shock.</p>	<p>(o) A UXO Technician shall search each intrusive point from the surface with a magnetometer and or all metals detector in accordance with the instruments manufactures instructions, to locate ferrous and/or non-ferrous subsurface anomalies. Location of such subsurface anomalies requires the placement of an offset marker (pin flag a minimum of 12-inches) to the north of the greatest signal strength for the anomaly.</p> <p>(s) For land survey and sampling activities where detection of an anomaly occurs, an alternative location free of ferrous and non-ferrous anomalies is required to proceed with intrusive activities.</p> <p>(q) The UXO Technician shall note within the daily logbook the rejection of the primary location and selection of the alternative location, with a written description of direction and feet/inches for the offset location from the primary point.</p>
<p>NOTE:</p> <p>Personnel performing subsurface intrusive activities for the purpose of land survey and environmental sampling require a UXO Technician to search the subsurface with either or both (dependant on MEC site-specific history) a magnetometer and/or all metals detector to confirm the subsurface is free of ferrous and or non-ferrous anomalies.</p> <p>A UXO Technician shall mark the boundaries /limits for ingress/egress access from a safe area (i.e.: road) to the work activity location or provide escort to and from the work activity location.</p>	
18.0 VEGETATION REDUCTION MEC AVOIDANCE (MANUAL/MECHANICAL)	
<p>WARNING:</p> <p>DO not apply vegetation cutting</p>	<p>(o) A UXO Technician shall escort vegetation reduction personnel, perform a visual and/or magnetometer and/or all metals detection instrument search of surface</p>

<p>closer than six-inches to ground surface.</p> <p>Vegetation reduction actions that occur less than six-inches above ground surface, may result in movement, or shock to MEC, resulting in an unintentional detonation or functioning as designed of the item.</p>	<p>access routes, walking paths, and vegetation reduction locations for MEC/HTRW and or obstruction hazards.</p> <p>(o) The UXO Technician shall operate a magnetometer and or all metals detection instrument to locate surface anomalies with potential to be a hazard to vegetation reduction crews.</p> <p>(o) The UXO Technician shall perform a visual surveillance of the surface to locate surface hazards (MEC, HTRW) or obstructions to equipment, mark the location and instruct vegetation reduction crews to avoid the location.</p> <p>(s) The UXO Technician shall remain away from the immediate operating radius of powered equipment and remain alert for flying debris</p> <p>(s) The UXO Technician shall wear high visibility outerwear, use hearing, and eye protection, and avoid swing radius of powered equipment.</p>
--	---

Warning :

Personnel performing vegetation reduction activities shall not operate equipment closer than 6-inches to the ground thus, all brush cutting equipment (chain saws, weed whackers, string trimmers, brush cutters, bush hogs, hydro-ax, or debarking equipment) shall operate six-inches or greater above ground.

19.0 MEC AVOIDANCE (DOWN HOLE)

<p>WARNING:</p> <p>When applying MEC avoidance procedures for drilling or the use of direct push technology, the steel mass of drill rigs and DPT power plants will influence gradiometers, and magnetometer reporting instruments. Thus, drill rigs and DPT equipment shall be withdrawn a minimum of ten feet from intrusive points while performing down-hole avoidance search.</p>	<p>(o) Prior to drilling, the UXO Technician will conduct a visual reconnaissance of access paths and drilling area. The reconnaissance will include locating the designated sampling or drilling location(s) ensuring that the locations do not have surface MEC, or MPPEH, and magnetometers or all metal detection search do not indicate the presence of subsurface anomalies. If detection of subsurface anomalies occurs, at the sampling point, the sampling point is abandoned. Once the designated sampling point has been determined free of anomalies, an access route for the sampling crew’s vehicles is searched. The access path requires twice the width of the widest vehicle and marking along the sides with flags, ribbon, engineer tape, stakes, or equivalent to define limits.</p> <p>(s) If an observation of MEC or MPPEH should occur, the UXO Technician shall mark the item, avoid it, and notify the PM for either military EOD or UXO Contractor</p>
---	--

	<p>support.</p> <p>(o) A UXO Technician will clear each work site for drilling/DPT and clearly mark the safe to walk, and drill or DPT, boundaries. Each drill/DPT safe area will be large enough to accommodate the drilling equipment and provide a work area for the crews. As a minimum, the safe area will be a rectangle, with a side dimension equal to twice the length of the largest vehicle or piece of equipment for use on site.</p>
NOTE:	
(p) Drilling and application of DPT may require an ingress route and pad turning radius, twice the width, and length of the mechanical equipment.	
NOTE:	
MEC may exist within the subsurface up to 30 feet below ground surface, dependant on site-specific history. Refer to project instruction to determine maximum depth for down-hole MEC avoidance support.	
The UXO Technician is required to escort personnel and remain with personnel when sampling/drilling at an MRP or MEC/MPPEH suspect site.	(o) Soil bore holing may be by hand auger, power-auger, drilling, or direct push technology (DPT). A UXO Technician will examine, prior to sampling/drilling, the borehole location with a down-hole gradiometer or magnetometer, a minimum of every one (1) foot, to the deepest sampling depth or a maximum of 30 feet below ground surface to ensure avoidance of anomalies, or to depth identified within the project instruction.
WARNING: Drilling equipment may produce injury from snapping cables, pinch points, chain failures or falling booms, derricks, and drill piping. Avoid the immediate operational radius of drillers when supporting efforts.	<p>(o) Drilling down-hole monitoring requires at a minimum of one (1) foot increments of search, during the actual well drilling operation. This will require the withdrawal of the drill rod or augers from the hole and moving the drill rig a minimum of 10 feet or enough feet away from the drill-hole location to prevent the metal in the rig from influencing the magnetometer/ gradiometer.</p> <p>(o) The UXO Technician shall perform down-hole monitoring for anomalies at each location identified within the project instruction.</p>
20.0 ACTIVITY COMPLETION	
Completion of documentation:	<p>() Project site logs to Project Manager</p> <p>() Tail gate safety meeting log to Project Manager</p> <p>() Equipment check-out report to Project Manager</p> <p>() Quality control reports to Project Manager</p>

21.0 EQUIPMENT	
ITEM	QUANTITY
Cellular telephone	1
Dow-hole (only) Magnetometer/Gradiometer capable of down-hole operations to 30 feet	1 or (as required by Project instruction)
Magnetometer capable of monitoring to a depth of two-feet below ground surface for ferrous items	1 or (as required by Project instruction)
All metals detector capable of monitoring to a depth of 6-inches below ground surface for non-ferrous items	Optional
Multi colors of marking flags, ribbon, and tape	As determined by SUXOS
Batteries	Two day supply for instruments
First -aid Kit (25 person)	1 within the work area
Water	Minimum 1 liters per person in work area
Camera/Tape Measure/Ruler/Calipers/Paper Pencil	As determined by SUXOS
Hand tools, (hammer, general purpose tools, etc.)	Assorted As determined by SUXOS
<p>MINIMUM PERSONAL PROTECTIVE EQUIPMENT: IAW with Safety Plan and AHA or a minimum of OSHA LEVEL “D”</p> <p>Coveralls (or long pants, sleeved shirt)</p> <p>Boots (level “D”)</p> <p>Cover (cap, floppy, skull)</p> <p>Gloves (leather)</p> <p>Safety Eye protection (as required by AHA)</p> <p>Hard hats (when working in an area with a potential for head injury or heavy equipment e.g. drill rig)</p> <p>Because this is a possible HTRW operation, the MR Supervisor will direct the required explosive safety site PPE conditions.</p>	
<p>SPECIAL TRAINING AND REFRESHER REQUIREMENTS:</p> <p>UXO Technicians will be qualified at a minimum Level II designation and be graduates of the U.S. Naval School of Explosive Ordnance Disposal or other DOD DEDSB TP 18 approved course or school/course of instruction, Hazard Waste Operations IAW 29CFR 1910.120 (e) &</p>	

(f) and medical clearance physical authorization to perform work.

**WAIVERS, EXEMPTIONS, SPECIFIC AUTHORIZATIONS, OR APPROVED
DEVIATIONS THAT APPLY TO THIS OPERATION: None**

ACTIVITY HAZARD ANALYSIS

Safe Work Method Statement/ Job Hazard Analysis		
Company Name: CH2M HILL		Project Name/#: SOP MRP 0001- MEC Anomaly Avoidance
Work Activity/Task: MEC Anomaly Avoidance		Principal Contractor: CH2M HILL
Date: December 09, 2009		Note: Sign off to be provided at Tool Box talk
Prepared by: Dan Young		Supervisor: TBD by project location
Signature:		Safety Coordinator (SC): TBD by project location
All metals detection equipment, metal detection instruments, magnetometry equipment, gradiometers, and military ordnance detection equipment, plant & equipment required: - machinery: maintenance checks provided and recorded by subcontractor or operator: suitably qualified and competent, with health, safety, and environment (HS&E) training		Training Requirements 29 CFR 1910.120 (e) & (f); DDESB TP 18 minimum qualifications for Unexploded Ordnance Technicians; OPNAVINST 8020.14/MCO P8020.11 (series) and are certified to perform the job assigned and certification is current. NAVSEA OP5, paragraph 2-3 involving ammunition and explosives shall comply with NAVMED P117 Article 15-107. Prior to site operations, CH2M HILL will verify training, medical qualification statements by physicians, and conformance to substance abuse testing and reporting programs. CH2M HILL has an active explosive certification program and monitors these personnel for conformance to the Bureau of Alcohol, Tobacco, Firearms, and Explosives, Safe Explosives Act 2003 Certification requirements for "Employee Possessor," and or "Responsible Person." 3R training for non-UXO qualified Personnel. (in addition to those in project's written safety plan: - OHS Construction Induction - Waste Management for waste streams and materials
Job Step	Potential Hazard	Controls
Forms/Permits	Unknown client-specific hazards. MEC Surface/Subsurface	UXO qualified personnel, SOP MR 0001, 3Rs Training for Non-UXO qualified personnel, Metal (ferrous/nonferrous) detection equipment, DA EP 75-1-2. Well driller license, drill rig permit •Well installation or abandonment notification •Dig/drill permit obtained, where required by client facility •Water withdrawal permit obtained, where required
Site Setup	Striking underground utilities, impact with MEC	•Location of underground utilities and installations identified •Daily briefing Avoid Surface and Subsurface MEC through the Sue MR SOP 0001 – MEC Anomaly Avoidance
	Striking overhead utilities	•Locate and take appropriate precautions with required distances from power lines •Lower mast and secure during travel

	Physical environmental hazards	<ul style="list-style-type: none"> •Use of appropriate personal protective equipment (PPE) where required. Safety boots, hard hats, safety glasses and hearing protection are mandatory. Respirators when chemical hazards exist. No loose-fitting clothing, rings, watches, etc.; long hair to be restrained close to the head.
	Dermal or inhalation exposure to contaminants	<ul style="list-style-type: none"> •Investigate history of area; determine nature and degree of contaminants that could be present •Conduct air monitoring for potential hazardous atmospheres as described in the project’s written safety plan. •Use respirators and other PPE as prescribed in the project’s written safety plan

Job Step	Potential Hazard	Controls
Site Setup (Continued)	Fire /Explosion	<ul style="list-style-type: none"> • No smoking around the drill rig – MR SOP-0001 MEC Anomaly Avoidance
	Struck by vehicles	<ul style="list-style-type: none"> •Follow traffic control plan •Wear high-visibility warning vests
	Drill rig travel	<ul style="list-style-type: none"> •Ensure stable ground and adequate footing for machinery. Adequate ground preparation to support loads and accommodate waste materials. •Drill rig travel will be conducted with mast secured in its lowered position •Tools and equipment secured prior to rig movement •Only personnel seated in cab are to ride on the rig vehicle •Ensure clearance of overhead power lines •Use alarm or spotter when reversing rig
	Illegal offsite impacts	<ul style="list-style-type: none"> • Excavation area checked for wetlands, endangered species, cultural/historic resources
	Spread of contamination from contaminated drill cuttings	<ul style="list-style-type: none"> •Manage cuttings in accordance with all project plans

Drilling Activities	Rotating machinery parts of drill rig MEC- surface/Subsurface – physical contact	<ul style="list-style-type: none"> •Daily inspection of drill rig & equipment •Ensure appropriate guards are installed or suitable barriers to forewarn personnel of dangers •Personnel clear during set up, clear of rotating parts •Loose clothing, long hair, and jewelry to be safely secured •Hands or feet should not be used to move cuttings away from auger •Rig in neutral and augers stopped rotating before cleaning •Kill switch installed, clearly identified and operational •Rig placed in neutral when operator not at controls •Pressurized lines and hoses secured from whipping hazards <p>Advance Drill/bore hole/DPT in one foot increments applying MR SOP 0001-MEC Anomaly Avoidance Procedures</p>
	Hoisting operations	<ul style="list-style-type: none"> •Ensure all personnel are clear of operation to a suitable safe distance
	Overturning of drill rig	<ul style="list-style-type: none"> •Establish drill pad if necessary •Drill rig level and stabilized
	Securing ropes and cables	<ul style="list-style-type: none"> •Ensure security to stable fixture. Do not wrap around any part of the body. •Drill rig ropes in clean, sound condition

Preparing Field Log Books

I. Purpose

To provide general guidelines for entering field data into log books during site investigation and remediation field activities.

II. Scope

This is a general description of data requirements and format for field log books. Log books are needed to properly document all field activities in support of data evaluation and possible legal activities.

III. Equipment and Materials

- Log book
- Indelible pen

IV. Procedures and Guidelines

Properly completed field log books are a requirement of much of the work we perform under the Navy CLEAN contract. Log books are legal documents and, as such, must be prepared following specific procedures and must contain required information to ensure their integrity and legitimacy. This SOP describes the basic requirements for field log book entries.

A. PROCEDURES FOR COMPLETING FIELD LOG BOOKS

1. Field notes commonly are kept in bound, orange-covered logbooks used by surveyors and produced, for example, by Peninsular Publishing Company and Sesco, Inc. Pages should be water-resistant and notes should be taken only with water-proof, non-erasable permanent ink, such as that provided in Sanford Sharpie® permanent markers.
2. On the inside cover of the log book the following information should be included:
 - Company name and address
 - Log-holders name if log book was assigned specifically to that person

- Activity or location
 - Project name
 - Project manager's name
 - Phone numbers of the company, supervisors, emergency response, etc.
3. All lines of all pages should be used to prevent later additions of text, which could later be questioned. Any line not used should be marked through with a line and initialed and dated. Any pages not used should be marked through with a line, the author's initials, the date, and the note "Intentionally Left Blank."
 4. If errors are made in the log book, cross a single line through the error and enter the correct information. All corrections shall be initialed and dated by the personnel performing the correction. If possible, all corrections should be made by the individual who made the error.
 5. Daily entries will be made chronologically.
 6. Information will be recorded directly in the field log book during the work activity. Information will not be written on a separate sheet and then later transcribed into the log book.
 7. Each page of the log book will have the date of the work and the note takers initials.
 8. The final page of each day's notes will include the note-takers signature as well as the date.
 9. Only information relevant to the subject project will be added to the log book.
 10. The field notes will be copied and the copies sent to the Project Manager or designee in a timely manner (at least by the end of each week of work being performed).

B. INFORMATION TO BE INCLUDED IN FIELD LOG BOOKS

1. Entries into the log book should be as detailed and descriptive as possible so that a particular situation can be recalled without reliance on the collector's memory. Entries must be legible and complete.
2. General project information will be recorded at the beginning of each field project. This will include the project title, the project number, and project staff.
3. Scope: Describe the general scope of work to be performed each day.
4. Weather: Record the weather conditions and any significant changes in the weather during the day.

5. Tail Gate Safety Meetings: Record time and location of meeting, who was present, topics discussed, issues/problems/concerns identified, and corrective actions or adjustments made to address concerns/problems, and other pertinent information.
6. Standard Health and Safety Procedures: Record level of personal protection being used (e.g., level D PPE), record air monitoring data on a regular basis and note where data were recording (e.g., reading in borehole, reading in breathing zone, etc). Also record other required health and safety procedures as specified in the project specific health and safety plan.
7. Instrument Calibration; Record calibration information for each piece of health and safety and field equipment.
8. Personnel: Record names of all personnel present during field activities and list their roles and their affiliation. Record when personnel and visitors enter and leave a project site and their level of personal protection.
9. Communications: Record communications with project manager, subcontractors, regulators, facility personnel, and others that impact performance of the project.
10. Time: Keep a running time log explaining field activities as they occur chronologically throughout the day.
11. Deviations from the Work Plan: Record any deviations from the work plan and document why these were required and any communications authorizing these deviations.
12. Health and Safety Incidents: Record any health and safety incidents and immediately report any incidents to the Project Manager.
13. Subcontractor Information: Record name of company, record names and roles of subcontractor personnel, list type of equipment being used and general scope of work. List times of starting and stopping work and quantities of consumable equipment used if it is to be billed to the project.
14. Problems and Corrective Actions: Clearly describe any problems encountered during the field work and the corrective actions taken to address these problems.
15. Technical and Project Information: Describe the details of the work being performed. The technical information recorded will vary significantly between projects. The project work plan will describe the specific activities to be performed and may also list requirements for note taking. Discuss note-taking expectations with the Project Manager prior to beginning the field work.
16. Any conditions that might adversely affect the work or any data

obtained (e.g., nearby construction that might have introduced excessive amounts of dust into the air).

17. Sampling Information; Specific information that will be relevant to most sampling jobs includes the following:
 - Description of the general sampling area – site name, buildings and streets in the area, etc.
 - Station/Location identifier
 - Description of the sample location – estimate location in comparison to two fixed points – draw a diagram in the field log book indicating sample location relative to these fixed points – include distances in feet.
 - Sample matrix and type
 - Sample date and time
 - Sample identifier
 - Draw a box around the sample ID so that it stands out in the field notes
 - Information on how the sample was collected – distinguish between “grab,” “composite,” and “discrete” samples
 - Number and type of sample containers collected
 - Record of any field measurements taken (i.e. pH, turbidity, dissolved oxygen, and temperature, and conductivity)
 - Parameters to be analyzed for, if appropriate
 - Descriptions of soil samples and drilling cuttings can be entered in depth sequence, along with PID readings and other observations. Include any unusual appearances of the samples.

C. SUGGESTED FORMAT FOR RECORDING FIELD DATA

1. Use the left side border to record times and the remainder of the page to record information (see attached example).
2. Use tables to record sampling information and field data from multiple samples.
3. Sketch sampling locations and other pertinent information.
4. Sketch well construction diagrams.

V. Attachments

Example field notes.