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SITE SPECIFIC WORK PLAN ADDENDUM OFF BASE SURFACE DANGER ZONES  
EXPANDED SITE INSPECTION MCB CAMP LEJEUNE NC  
1/1/2013  
CH2MHILL

**Site-Specific Work Plan Addendum  
Off-Base Surface Danger Zones  
Expanded Site Inspection**

**Marine Corps Installations East—Marine Corps Base Camp Lejeune  
Jacksonville, North Carolina**

**Contract Task Order WE26**

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# Contents

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<b>Acronyms and Abbreviations</b> .....	<b>vii</b>
<b>1. Introduction</b> .....	<b>1-1</b>
1.1 Site Background.....	1-1
1.2 Expanded Site Inspection Objective and Scope.....	1-2
1.2.1 Objective.....	1-2
1.2.2 Scope of Work .....	1-2
1.3 Work Plan Organization.....	1-2
1.4 Site Location and Description .....	1-3
1.5 Site History.....	1-4
1.6 2010 PA/SI Summary .....	1-6
1.7 Geologic Setting.....	1-7
<b>2. Technical Management Plan</b> .....	<b>2-1</b>
2.1 Munitions Response Guidance, Regulations, and Policy.....	2-1
2.2 MEC Contingency Procedures .....	2-1
2.3 Chemical Warfare Materiel Contingency Procedures .....	2-1
2.4 Project Personnel, Organization, and Schedule .....	2-1
2.4.1 Project Organization.....	2-1
2.4.2 Project Personnel.....	2-1
2.4.3 Project Schedule .....	2-2
2.5 Technical Approach .....	2-2
2.5.1 Project Planning.....	2-2
2.5.2 Stakeholder Involvement .....	2-3
2.5.3 Site Investigation .....	2-4
2.5.4 Geographical Information System.....	2-4
2.5.5 Expanded Site Investigation and After Action Report Deliverables .....	2-4
<b>3. Field Investigation Plan</b> .....	<b>3-1</b>
3.1 Investigation Approach.....	3-1
3.1.1 Phased Approach.....	3-1
3.1.2 Application of 2010 Terrestrial DGM Data .....	3-2
3.1.3 Application of 2010 AGS Data .....	3-2
3.1.4 AOI Selection Criteria.....	3-3
3.1.5 Investigation Limitations .....	3-3
3.2 Planning .....	3-5
3.3 Mobilization.....	3-5
3.3.1 General Mobilization Activities.....	3-5
3.3.2 Command Post .....	3-6
3.3.3 Kickoff and Safety Meeting.....	3-6
3.4 Buried Utility Clearance .....	3-6
3.5 Site Reconnaissance .....	3-6
3.6 Phase I Anomaly Evaluation and Intrusive Investigation.....	3-6
3.7 Vegetation Clearing .....	3-8
3.8 Phase II Anomaly Evaluation and Intrusive Investigation.....	3-8
3.8.1 Area A: North of Rocket Range Target .....	3-8
3.8.2 Area B: Northwest of Rocket Range Target.....	3-8
3.8.3 Area C: West of Rocket Range Target.....	3-8
3.8.4 Area D: Southwest Portion of Sanders Island.....	3-9

3.8.5	Area E: ICW Islands .....	3-9
3.8.6	Area F: Active Dredge Spoil Area on ICW-7 .....	3-9
3.8.7	Area G: Private Property within Bear Creek .....	3-9
3.8.8	Area H: Anomaly in Bear Creek .....	3-10
3.8.9	Area I: Bear Inlet .....	3-10
3.8.10	Area J: Southeast Portion of Sanders Island .....	3-10
3.8.11	Area K: Eastern End of Sanders Island .....	3-10
3.8.12	Area L: Southwest Portion of NCDOA Property .....	3-10
3.8.13	Area M: South-Central Portion of Sanders Island .....	3-11
3.8.14	Area N: Southern Portion of NCDOA Property .....	3-11
3.8.15	Area O: Channel Island SW of ICW-7 .....	3-11
3.8.16	Area P: Northern Portion of NCDOA Property .....	3-11
3.8.17	Area Q: Anomalies North of Sanders Island .....	3-11
3.8.18	Area R: Anomalies South of Sanders Island .....	3-11
3.8.19	Area S: Anomalies North of Sanders Island .....	3-12
3.9	MEC Intrusive Investigation and Removal Operations .....	3-12
3.9.1	Anomaly Reacquisition .....	3-12
3.9.2	Anomaly Re-location and Area-wide “Mag and Dig” Approaches .....	3-12
3.9.3	Anomaly Excavation .....	3-13
3.10	Geospatial Information and Electronic Submittals .....	3-14
3.11	Site Restoration and Demobilization .....	3-14
<b>4.</b>	<b>MEC and MPPEH Disposal .....</b>	<b>4-1</b>
4.1	MEC and MPPEH Disposition .....	4-1
4.2	Controlled Detonation .....	4-1
4.2.1	Overall Demolition Safety Precautions .....	4-1
4.2.2	Operations in Populated and Sensitive Areas .....	4-1
4.3	MPPEH Disposal .....	4-2
<b>5.</b>	<b>Post-detonation Sampling .....</b>	<b>5-1</b>
5.1	TR-02-1 Surface Soil Sampling – Inside Crater .....	5-1
5.2	Incremental Surface Soil Sampling – Outside Crater .....	5-1
5.3	Sample Analysis .....	5-1
5.4	Analytical Requirements and Sample Handling .....	5-1
5.4.1	Sample Preservation and Handling .....	5-1
5.4.2	Quality Assurance and Quality Control .....	5-1
5.4.3	Sample Identification System .....	5-1
5.4.4	Sample Packaging and Shipping .....	5-2
<b>6.</b>	<b>Explosives Management Plan .....</b>	<b>6-1</b>
<b>7.</b>	<b>Explosives Siting Plan .....</b>	<b>7-1</b>
<b>8.</b>	<b>Quality Control Plan .....</b>	<b>8-1</b>
<b>9.</b>	<b>Environmental Protection Plan .....</b>	<b>9-1</b>
9.1	Endangered and Threatened Species within the Project Site .....	9-1
9.2	Migratory Birds within the Project Site .....	9-2
9.3	Wetlands within the Project Site .....	9-2
9.4	Dune Grasses within the Project Site .....	9-3
9.5	Cultural and Archaeological Resources within the Project Site .....	9-3
9.6	Water Resources within the Project Site .....	9-3
9.7	Coastal Zones within the Project Site .....	9-3

9.8	Vegetation to be Removed within the Project Site .....	9-4
9.9	Existing Waste Disposal Sites within the Project Site .....	9-4
9.10	Compliance with Applicable or Relevant and Appropriate Requirements.....	9-4
9.11	Detailed Procedures and Methods to Protect and/or Mitigate the Resources and Sites Identified.....	9-4
<b>10.</b>	<b>References.....</b>	<b>10-1</b>

## Appendixes

A	Site Safety and Health Plan
B	Uniform Federal Policy/Quality Assurance Project Plan
C	Standard Operating Procedures

## Tables

2-1	Project Personnel Contact Information
3-1	Proposed Investigation Areas, Relative Criteria, and Sequence of Actions
4-1	Exclusion Zone Parameters
9-1	Species Potentially Occurring on or Adjacent to MCIEAST-MCB CAMLEJ, in Onslow County, Listed as Threatened, Endangered, or of Special Concern by USFWS

## Figures (presented at the end of each section)

1-1	MCIEAST – MCB CAMLEJ Location Map
1-2	Off-Base SDZs Area
1-3	Off-Base SDZs Current and Historical Range Locations
1-4	PA/SI AGS and Terrestrial DGM Anomaly Locations
2-1	Project Schedule
3-1	Anomaly Investigation Approaches
3-2	Retained High Priority AGS Anomaly Locations
3-3	Phase I and II Proposed AOIs
3-4	Bear Creek Inlet Landforms – 2006, 2009, and 2011
3-5	Phase I Proposed Investigation Areas
3-6	Phase II Proposed AOIs
3-7	Phase II Proposed AOIs – SW Portion of MRA
3-8	Phase II Proposed AOIs – ICW Islands
3-9	Phase II Proposed AOIs – ICW Island 7 Area
3-10	Phase II Proposed AOIs – Northern Portion of Bear Creek
3-11	Phase II Proposed AOIs – Bear Inlet
3-12	Phase II Proposed AOIs – NCDOA Properties
4-1	Off-Base SDZs MRS Divisions
4-2	MRS 1 – Primary ESQD Arcs
4-3	MRS 1 – Contingency ESQD Arcs
4-4	MRS 2 – Primary ESQD Arcs
4-5	MRS2- Contingency ESQD Arcs

# Acronyms and Abbreviations

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AAR	After Action Report
AGS	aerial geophysical survey
AOI	area of interest
AP	armor-piercing
ASR	Archives Search Report
BEM	Buried Explosion Module
bgs	below ground surface
BIP	blow-in-place
BT	Bomb Target
CAMA	Coastal Area Management Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action—Navy
CRREL	Cold Regions Research and Engineering Laboratory
CWM	chemical warfare materiel
DDESB	Department of Defense Explosives Safety Board
DGM	digital geophysical mapping
DoD	Department of Defense
DoDI	Department of Defense Instruction
ERDC	Engineer Research and Development Center
ESI	expanded site inspection
ESQD	explosive safety quantity distance
ESS	Explosives Safety Submission
EZ	exclusion zone
G-7	Direct Fire Artillery Range
GIS	geographical information system
GP	general purpose
GPS	global positioning system
H&S	Health and Safety
HE	high explosive
HEAT	high explosive anti-tank
HEP	high explosive-plastic
HFD	hazardous fragmentation distance
ICW	Intracoastal Waterway
IDW	investigation-derived waste
lb(s)	pound(s)
MARCORSYSCOM	Marine Corps Systems Command
MBTA	Migratory Bird Treaty Act
MCAS	Marine Corps Air Station
MCIEAST-MCB CAMLEJ	Marine Corps Installations East-Marine Corps Base Camp Lejeune
MDAS	material documented as safe
MEC	munitions and explosives of concern
MFD-H	maximum fragmentation distance-horizontal
MG	machine gun
MGFD	munition with the greatest fragmentation distance

mm	millimeter
MPP	Master Project Plans
MPPEH	material potentially presenting an explosive hazard
MR	munitions response
MRA	Munitions Response Area
MRP	Munitions Response Program
MRS	munitions response site
MRSIMS	Munitions Response Site Information Management System
MS/MSD	matrix spike/matrix spike duplicate
NAVFAC	Naval Facilities Engineering Command
NCDENR	North Carolina Department of Environment and Natural Resources
NCDOA	North Carolina Department of Administration
NOSSA	Naval Ordnance Safety and Security Activity
PA/SI	Preliminary Assessment/Site Inspection
PM	Project Manager
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QCP	Quality Control Plan
RR-1	Rocket Range Number 1
SDZ	Surface Danger Zone
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
SUXOS	Senior Unexploded Ordnance Supervisor
TOW	tube-launched optically-tracked wire-guided
TP	target practice
TP-T	target practice—tracer
UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USMC	U.S. Marine Corps
UXO	unexploded ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
UXOSO	Unexploded Ordnance Safety Officer
WP	white phosphorus

# Introduction

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Marine Corps Installations East-Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ) is conducting an expanded site inspection (ESI) of its former range Surface Danger Zones (SDZs) that have encroached upon off-Base property. The ESI is being conducted following the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. The project is being conducted by CH2M HILL under the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, Comprehensive Long-term Environmental Action—Navy (CLEAN) Contract N62470-11-D-8012, Contract Task Order WE26.

## 1.1 Site Background

Due to potential hazards associated with historical range activities within the Off-Base SDZs, a Munitions Response Program (MRP) preliminary assessment/site inspection (PA/SI) was conducted within the Munitions Response Area (MRA) in 2010 to evaluate the potential presence or absence of munitions and explosives of concern (MEC) and potential environmental impacts to environment media that may have resulted from the former range activities.

The PA/SI findings are documented in the *Focused Preliminary Assessment/Site Inspection Off-Base Surface Danger Zones Report* (CH2M HILL, 2011a), and a summary of the PA/SI findings related to the presence of MEC are provided in Section 1.5 of this Work Plan Addendum. The ESI is intended to fulfill the recommendation of the 2011 PA/SI report for the Off-Base SDZs MRA. The PA/SI recommended that an intrusive investigation be conducted on a representative portion of the identified terrestrial-based geophysical anomalies to further evaluate the presence or absence of MEC.

This Work Plan Addendum was developed in accordance with the following applicable documents:

- *Site-Specific Work Plan Addendum for Preliminary Assessment/Site Inspection Off-Base Surface Danger Zones* (CH2M HILL, 2009a)
- *MCB Camp Lejeune Munitions Response Program Master Project Plans, Marine Corps Base Camp Lejeune, North Carolina (herein referred to as the MRP Master Project Plan [MPP])* (CH2M HILL, 2008a)
- *Master Project Plan, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina (herein referred to as the MPP)* (CH2M HILL, 2008b)

In conjunction with this Work Plan Addendum, a **Site Safety and Health Plan (SSHP)** and an **Explosives Safety Submission (ESS) Amendment No. 1 (ESS-128) (CH2M HILL, 2013)** have been developed to guide the safe performance of this work. The SSHP is provided in **Appendix A**. Due to the potential presence of MEC at this site, MEC avoidance techniques provided in the SSHP will be employed during the non-intrusive field investigation activities. The SDZ ESS was amended, and the amendment will be submitted to Marine Corps Systems Command (MARCORSYSCOM) and the Department of Defense Explosives Safety Board (DDESB) under separate cover for review and approval. The ESS amendment was produced to fulfill the Naval Ordnance Safety and Security Activity (NOSSA) Instruction 8020.15C, which requires that each ESS be updated within 3 years from the date of DDESB approval (NOSSA, 2011). The SDZ ESS Amendment was prepared in support of demolition activities in the event that MEC is found during field investigation activities and in support of future MEC intrusive investigation activities. The original SDZ ESS (CH2M HILL, 2009b) has been reviewed and approved by MARCORSYSCOM and the DDESB for conformance with all applicable Marine Corps, Department of the Navy, and Department of Defense (DoD) requirements for the safe handling of MEC and explosives. MARCORSYSCOM and DDESB will review the ESS Amendment No. 1 before the field investigation begins.

Documentation and processing of field data, laboratory data, and investigation results will be completed in accordance with Section 7.2 of the MRP MPP (CH2M HILL, 2008a). This project will require the administration of a

central project file. Project data and records will be managed in accordance with Section 7.3 of the MRP MPP (CH2M HILL, 2008a).

## 1.2 Expanded Site Inspection Objective and Scope

### 1.2.1 Objective

The objective of the ESI is to further evaluate the potential presence or absence of MEC and material potentially presenting an explosive hazard (MPPEH) within the Off-Base SDZs MRA that are associated with the geophysical anomalies identified during the 2010 PA/SI and may have resulted from former range activities. The ESI will be considered complete once the following activities are accomplished:

- Investigation work to further evaluate the potential presence or absence of MEC/MPPEH within the MRA is safely completed
- Investigation findings have been evaluated regarding potential additional site actions within the Off-Base SDZs
- Stakeholder acceptance of the ESI report is achieved

The overall ESI approach, application of existing data, and rationale for fulfilling the project objectives are presented in Section 3.1 of this Work Plan Addendum.

### 1.2.2 Scope of Work

This Work Plan Addendum presents the site-specific activities to be performed in accordance with the MRP MPP to accomplish the previously described objective. The overall project approach is to complete the ESI for the Off-Base SDZs MRA, which would further evaluate the potential presence or absence of MEC/MPPEH that may remain at the site, while protecting human health and the environment. The results of this work will be documented in an ESI report.

Project activities will be conducted using a phased field effort approach (see Section 3.1) and will include:

- Conducting a site reconnaissance action/site visit to evaluate the accessibility of the proposed anomaly investigation areas (see Section 3.5), assess health and safety requirements, and refine the logistics associated with the proposed field effort.
- Clearing vegetation, where necessary and permissible, to facilitate access within the investigation area.
- Conducting a Phase I anomaly evaluation and intrusive investigation (see Section 3.6) along the banks of accessible waterways to assess the validity of the aerial geophysical survey (AGS) anomaly exclusion process (see Section 3.1.2) and evaluating the type of metallic material generally present along the waterways within the MRA.
- Conducting a Phase II anomaly evaluation and intrusive investigation within areas of interest (AOIs) within the Off-Base SDZs and in the vicinity of select terrestrial digital geophysical mapping (DGM) and high-priority AGS anomalies identified within the MRA (see Section 3.8).
- Managing the MEC/MPPEH disposal process through controlled detonations and associated media sampling, and managing material documented as safe (MDAS) and any investigation-derived waste (IDW), as required.

## 1.3 Work Plan Organization

This Work Plan Addendum is divided into sections providing information on the detailed approach, including procedures to be employed during the execution of the ESI. Supporting documentation that details specific procedures for the execution of the ESI are provided in the appendixes to this Work Plan Addendum.

This addendum is organized as follows:

- **Section 1, Introduction**, provides general information about this Work Plan Addendum, describes the Off-Base SDZs MRA, summarizes the history of the site, and presents the project objectives and scope of work.

- **Section 2, Technical Management Plan**, identifies the technical approach, methods, and operational procedures that will be used to execute the ESI.
- **Section 3, Field Investigation Plan**, identifies the technical approach, methods, and operational procedures that will be used to execute the field investigation activities, including mobilization and demobilization, vegetation clearing (if required), site reconnaissance, and intrusive investigation activities.
- **Section 4, MEC and MPPEH Disposal**, identifies the technical approach, methods, and operational procedures that will be used to execute the demilitarization of MEC and MPPEH (if required).
- **Section 5, Post-detonation Sampling**, provides details regarding the sampling procedures to be implemented after the completion of detonation activities (if required).
- **Section 6, Explosives Management Plan**, provides details for management of explosives in accordance with applicable regulations.
- **Section 7, Explosives Siting Plan**, provides explosives safety criteria for planning and siting explosives operations.
- **Section 8, Quality Control Plan (QCP)**, provides details of the approach, methods, and operational procedures to be employed for quality control (QC) during the project.
- **Section 9, Environmental Protection Plan**, describes the approach, methods, and operational procedures to be employed to protect the natural environment during the performance of all tasks.
- **Section 10, References**, lists the references cited in the preceding sections.
- **Appendix A, Site Safety and Health Plan**, provides an interface with CH2M HILL's overall Health and Safety (H&S) program. The SSHP also contains the MEC avoidance procedures that will be used to protect onsite personnel from MEC that may be present at the site.
- **Appendix B, Uniform Federal Policy /Quality Assurance Project Plan (UFP/QAPP)**, references the measurement data acquisition, assessment oversight, and data review processes that will be used to carry out tasks associated with this Work Plan Addendum.
- **Appendix C, Standard Operating Procedures (SOPs)**, provides the SOPs to be referenced and adhered to during the course of project work.

## 1.4 Site Location and Description

MCIEAST-MCB CAMLEJ encompasses approximately 236 square miles of land in Onslow County, North Carolina, adjacent to the southern boundary of the city of Jacksonville. MCIEAST-MCB CAMLEJ is bordered by the Atlantic Ocean to the east, U.S. Route 17 to the west, and State Route 24 to the north. It is bisected by the New River, which flows into the Atlantic Ocean in a southeasterly direction (**Figure 1-1**).

The Off-Base SDZs MRA borders the southeastern boundary of MCIEAST-MCB CAMLEJ and is adjacent to the Atlantic Ocean (**Figure 1-2**). The area encompasses approximately 1,632 acres composed of roughly 173 acres of upland terrain (roughly 10 percent of the area is above mean high tide) and approximately 1,459 acres of tidal channels, coastal wetlands, surface water, and salt marsh. Much of the upland areas are heavily vegetated with trees and dense undergrowth. There are approximately 59 acres of intertidal areas in the vicinity of Bear Inlet (refer to Figure 1-2). There are no permanent residences or commercial buildings within the Off-Base SDZs MRA.

Most of the upland area within the Off-Base SDZs MRA, consisting of approximately 127 of the 173 acres, is on the western portion of Bear Island (refer to Figure 1-2), which is part of Hammocks Beach State Park. The remainder of the upland area occurs as small hammocks (islands) along the Atlantic Intracoastal Waterway (ICW; referred to as ICW Islands) and as small upland areas on Sanders Island (refer to Figure 1-2). These ICW Islands were reportedly created from received dredge spoils associated with periodic maintenance of the ICW.

An active engineered dredge management area is on the westernmost ICW Island within the Off-Base SDZs MRA. The center of this island includes a depression or basin, surrounded by sand berms, which contains the recently dredged material. Following deposition of dredge spoils within this basin, water can drain into an adjacent dewatering pond via a corrugated metal pipe and outlet system. The outer slopes of the berms are reinforced with erosion control netting secured into the sand with metal staples approximately 6 inches in length.

Property owners within the Off-Base SDZs MRA consist of the following (refer to **Figure 1-2**):

- **Heirs of D. J. Sanders**—Approximately 300 acres of coastal wetlands and waterways roughly 1,800 feet north of Bear Inlet.
- **North Carolina Department of Administration (NCDOA)**—Approximately 225 acres of state-owned coastal wetlands roughly 3,300 feet northeast of Bear Inlet.
- **North Carolina Department of Environment and Natural Resources (NCDENR)** – Approximately 190 acres of Hammocks Beach State Park adjacent to Bear Inlet.
- **Carrie E. Freshwater and Clifton T. and Dolores B. Humphrey**—Approximately 1 acre in size for each piece of property and adjacent to one another. The properties are within the Bear Creek area in the northern extent of the Off-Base SDZs MRA.
- The remainder of the Off-Base SDZs MRA consists of waterways or coastal wetlands, including roughly 45 acres of un-owned small islands along the ICW.

## 1.5 Site History

A detailed review of historical information relating to past uses of the Off-Base SDZs MRA may be found in Appendix A of the *Site-Specific Work Plan Addendum* (CH2M HILL, 2009a). A summary of the history of MCIEAST-MCB CAMLEJ is presented in the MRP MPP (CH2M HILL, 2008a).

The Off-Base SDZs MRA consists of portions of the following former ranges (**Figure 1-3**):

- Rocket Range Number 1 (RR-1) (Archives Search Report [ASR] #2.33)
- Direct Fire Artillery Range (G-7) (ASR #2.61)
- G-6 Artillery Range (ASR #2.62)
- Impact Area N-1 (ASR 2.207), which includes Bomb Target (BT)-3

The area within the current Off-Base SDZs MRA was used jointly by MCIEAST-MCB CAMLEJ and Marine Corps Air Station (MCAS) Cherry Point. The danger zones related to activities within MCIEAST-MCB CAMLEJ are primarily from land-based artillery ranges, and the danger zones related to MCAS Cherry Point were used for airborne strafing, rocket firing, and bombing.

The following sections summarize the available information pertaining to these four former ranges.

### **Rocket Range Number 1 (ASR #2.33)**

The former RR-1 may have affected approximately 1,564 acres, the most acreage of any historical SDZ within the MRA. This aviation range was used for rocket firing from 1945 to 1947 (USACE, 2001a). The approximate center point of RR-1 is within the Browns Island BT-5, which was one of the 10 MCAS Cherry Point targets and eventually became part of the current Impact Area N-1 (refer to **Figure 1-3**).

According to the Final Range Identification and Preliminary Range Assessment, the following munitions may have been used at RR-1 (USACE, 2001a):

- 2.25-inch aircraft rocket, sub-caliber
- 5-inch aircraft rocket, armor-piercing (AP)
- 5-inch aircraft rocket, high explosive (HE)
- 5-inch aircraft rocket, high explosive anti-tank (HEAT)

- 5-inch aircraft rocket, white phosphorus (WP)
- 11.75-inch aircraft rocket, general purpose (GP)

### **G-7 Direct Fire Artillery Range (ASR #2.61)**

G-7 was used from approximately 1945 to 2001 for various types of direct-fire activities (USACE, 2001a). While an active firing range is still used at this firing location, the SDZs have been configured to remain within the bounds of MCIEAST-MCB CAMLEJ (MCB CamLej, 2009). Camp training orders and Base orders from 1946 to 1994 identified this area for various direct-fire activities, including tanks, landing vehicles tracked, field artillery, recoilless rifles, and machine guns (MGs). Base Order P11102.1K (December 1, 1986) identified the G-7 range for use by 105-millimeter (mm) tank guns, field artillery, MGs, and 25mm cannon using all types of ammunition except high velocity projectiles exceeding 25,000 yards seaward. Base Order P3570.1 (June 2, 1994) identified the G-7 range for use with .50-caliber, 5.56mm, 7.62mm, 25mm target practice (TP), 105mm, 120mm, and 40mm practice (MK19 and M203) ammunition.

The munitions listed below may have been used at the G-7 range (USACE, 2001a):

- Small arms (.50-caliber, 5.56mm, 7.62mm)
- 25mm : Target practice-tracer (TP-T)
- 37mm: HE; AP TP
- 40mm: HE, gun; and grenade, practice
- 57mm recoilless rifle: TP; HE; WP; and HEAT
- 75mm Howitzer, HE; and WP
- 75mm gun, HE; AP; and WP
- 75mm recoilless rifle, HEAT; WP; HE; and high explosive-plastic (HEP)
- 76mm gun, HE; HEAT; WP; and AP
- 90mm recoilless rifle, HE; and HEAT
- 90mm gun, HE; AP; WP; and HEAT
- 105mm howitzer, HE; smoke; WP; illumination; and HEAT
- 105mm gun, HEAT; HE; WP; and TP
- 106mm recoilless rifle, HEAT
- 120mm gun, HEAT; and TP
- 155mm howitzer and gun, HE; WP; and illumination

### **G-6 Artillery Range (ASR #2.62)**

The preliminary range assessment states that the G-6 Artillery Range was used from approximately 1950 to 1960, and that various types of artillery were assumed to have been fired on this range (USACE, 2001a). The ASR describes G-6 as a tank gunnery range and lists munitions types as the following:

- 105mm tank main gun, artillery (direct fire)
- MGs (including vehicle-mounted weapons)
- M16, 25mm cannon, and tube-launched optically-tracked wire-guided (TOW) missiles (1986)
- .50-caliber, 5.56mm, 7.62mm, 20mm (TP)
- 25mm TP-T or AP discarding sabot-tracer
- 105mm, 155mm, 120mm, 40mm grenade (practice or multiple projectile round [1994])

In addition to the previously listed items, the following items may have been used at this range:

- 75mm howitzer, HE, and WP
- 105mm howitzer, HE, WP, and illumination
- 155mm howitzer, HE, WP, and illumination

### Impact Area N-1/BT-3 (ASR #2.207)

Impact Area N-1 represents the main beach impact area from Brown's Inlet to Bear Inlet that has been used from World War II to the present day. Impact Area N-1 coincides with several historical ranges and danger zones, including:

- RR-1
- Strafing Target 2
- BT-3/BT-5
- G-6 Artillery Range
- G-7

Impact Area N-1 was used for various artillery firing points and anti-tank activities. The ASR states that the impact area included historical bombing, strafing, and rocket targets that received various aerial rockets and bombs. In 1944, the pre-Bomb Disposal School conducted at MCIEAST-MCB CAMLEJ reportedly dropped seven 500-pound (lb) GP bombs on Browns Island as part of a training exercise, where some of the bombs were rigged not to explode (USACE, 2001a).

In 1945 the BT-5 is described as a 3-mile by 6-mile "rectangle including all of the entrance to Bear Inlet, extending westward to a point approximately 1,000 yards east of Brown's Inlet, and extending seaward approximately 5½ miles from Bear Inlet" (USACE, 2001b). Aerial MG ranges (MG-1 to MG-3) were established in September 1945 over an area encompassing BT-5 and the entire Off-Base SDZs MRA (USACE, 2001c).

Training in the 1960s included the use of mortars, tank and anti-tank guns, rockets, and 106mm recoilless rifles. A Base training order from 1985 stated that BT-3 and the N-1 Impact Area were the same (USACE, 2001a). BT-3 was authorized for aircraft ordnance of less than 250 lbs of trinitrotoluene equivalency; all types of artillery; all types of mortars; all ground weapons authorized for Ranges G-7, G-6, and G-5; and TOW missiles fired from rotary-wing aircraft (USACE, 2001a).

To summarize, the following items may have been used at the N-1 range:

- Rockets: 2.75-inch, 3.5-inch, 5-inch, and 11.75-inch
- Artillery: 37mm, 57mm, 90mm, 105mm
- Mortars: 60mm, 81mm, 4.2mm (all types)
- 75mm cannon
- Recoilless rifle (all types unless specified): 57mm, 75mm, 90mm, 105mm (HEP-T), 106mm
- Antiaircraft guns (all types): 37mm, 40mm, 90mm, 120mm
- Tank gun (all types): 90mm, 105mm (all types except toxics), 120mm
- 40mm grenades
- Howitzer (all types except toxics): 75mm, 105mm, 8inch, 155mm (howitzer/gun)
- TOW missile
- HE bombs (old style): 100-lb, 250-lb, 500-lb
- HE bombs (low drag): 250-lb, 500-lb
- Practice bombs

## 1.6 2010 PA/SI Summary

During the 2010 PA/SI, a total of 2,059 anomalies were identified through AGS and terrestrial DGM field studies (**Figure 1-4**). The areas of greatest anomaly densities were found near the mouth of Bear Inlet and at the convergence of Bear Creek and the ICW. Most of the anomalies were identified within or very close to water channels running through the site, which may be an indication of deposits of non-range-related material (such as trash and debris). Terrestrial DGM was conducted across 27 acres of the site, with sections of the intertidal zone showing few to no geophysical anomalies. Additional information may be found in the *Focused Preliminary Assessment/Site Inspection Off-Base Surface Danger Zones Report* (CH2M HILL, 2011a).

Intrusive investigation and removal was conducted on 183 anomalies from the 200-acre portion of Bear Island that lies within the MRA. One MEC and three MPPEH items were indentified during the Bear Island investigation, as follows:

MEC:

- One MK 45 Mod 0 aircraft flare

MPPEH:

- One jet-assisted take off bottle
- Three expended bomb dummy units
- One 25mm cartridge case

The candle portion of the MK 45 Mod 0 Aircraft Flare (MEC) was still intact and unexpended, but the parachute had been deployed and was not present. The flare was deemed safe to move and was destroyed by a controlled, intentional detonation on the island. Post-detonation soil sampling was conducted in the detonation crater to evaluate if the demolition operation affected the soil (CH2M HILL, 2011a). In addition, surface soil, subsurface soil, and groundwater samples were collected from Bear Island during the PA/SI and analyzed for explosive residues, metals, and perchlorate (CH2M HILL, 2011a). The PA/SI showed that no unacceptable risks were identified to human and/or ecological receptors from exposure to these environmental media, and therefore, no further environmental investigations were recommended for the Bear Island site.

However, an intrusive investigation of the geophysical anomalies identified in areas outside of Bear Island was not conducted during the 2010 PA/SI. Therefore, based on the discovery of MEC and MPPEH on Bear Island, an intrusive investigation of a representative portion of the identified geophysical anomalies was recommended to further evaluate the presence or absence of MEC in the Off-Base SDZs MRA (CH2M HILL, 2011a).

## 1.7 Geologic Setting

Within the Off-Base SDZs MRA, sand dunes formed by aeolian and fluvial processes dominate the surficial geological setting, with large sand ridges to the southeast (Bear Island). Tidal and wave actions continually change the channels and inlet areas within the estuarine marsh areas, resulting in constantly changing sand bars and mud banks.

The shallow soils (0 to 15 feet below ground surface [bgs]) within upland areas generally consist of fine- to medium-grained sand. The sediment in the Bear Inlet area consists of fine sands with little to no fines. However, the sediment within the tidal marsh areas and in the northern portion of Bear Creek is primarily composed of silts and clays.



- Legend**
- Highways
  - Off-Base SDZs
  - Installation Boundary

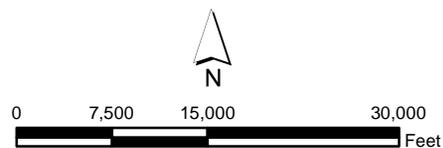
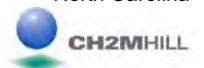
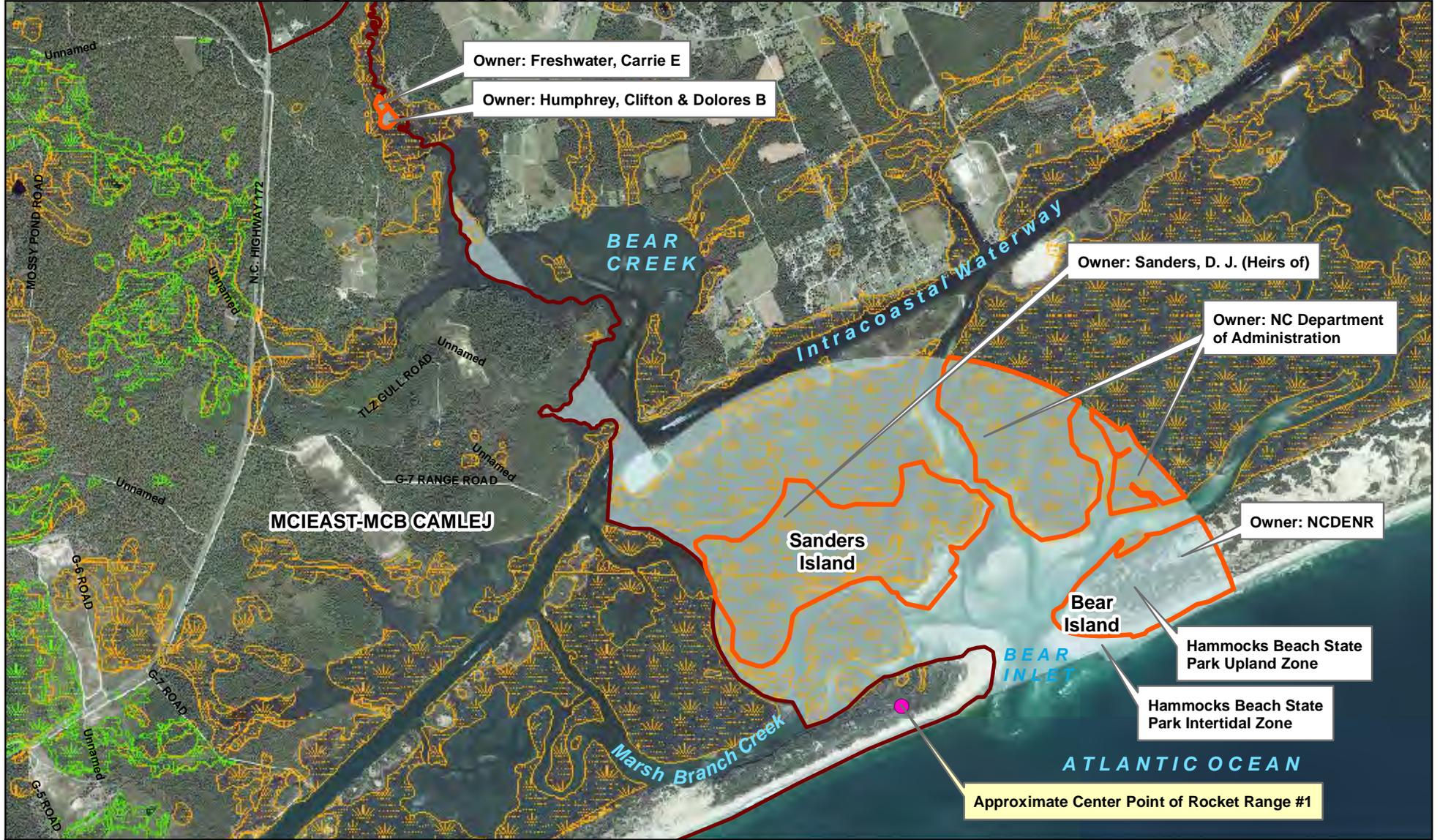


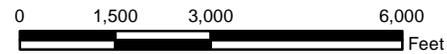
Figure 1-1  
MCIEAST-MCB CAMLEJ Location Map  
Expanded Site Inspection Work Plan  
Off-Base Surface Danger Zones  
MCIEAST-MCB CAMLEJ  
North Carolina





**Legend**

- Center Point of Rocket Range #1
- Encroached Private Property
- Installation Boundary
- Jurisdictional Wetlands
- Coastal Wetlands
- Off-Base SDZs



1 inch = 3,000 feet (1:36,000)

Figure 1-2  
 Off-Base SDZs Area  
 Expanded Site Inspection Work Plan  
 Off-Base Surface Danger Zones  
 MCIEAST-MCB CAMLEJ  
 North Carolina





**Legend**

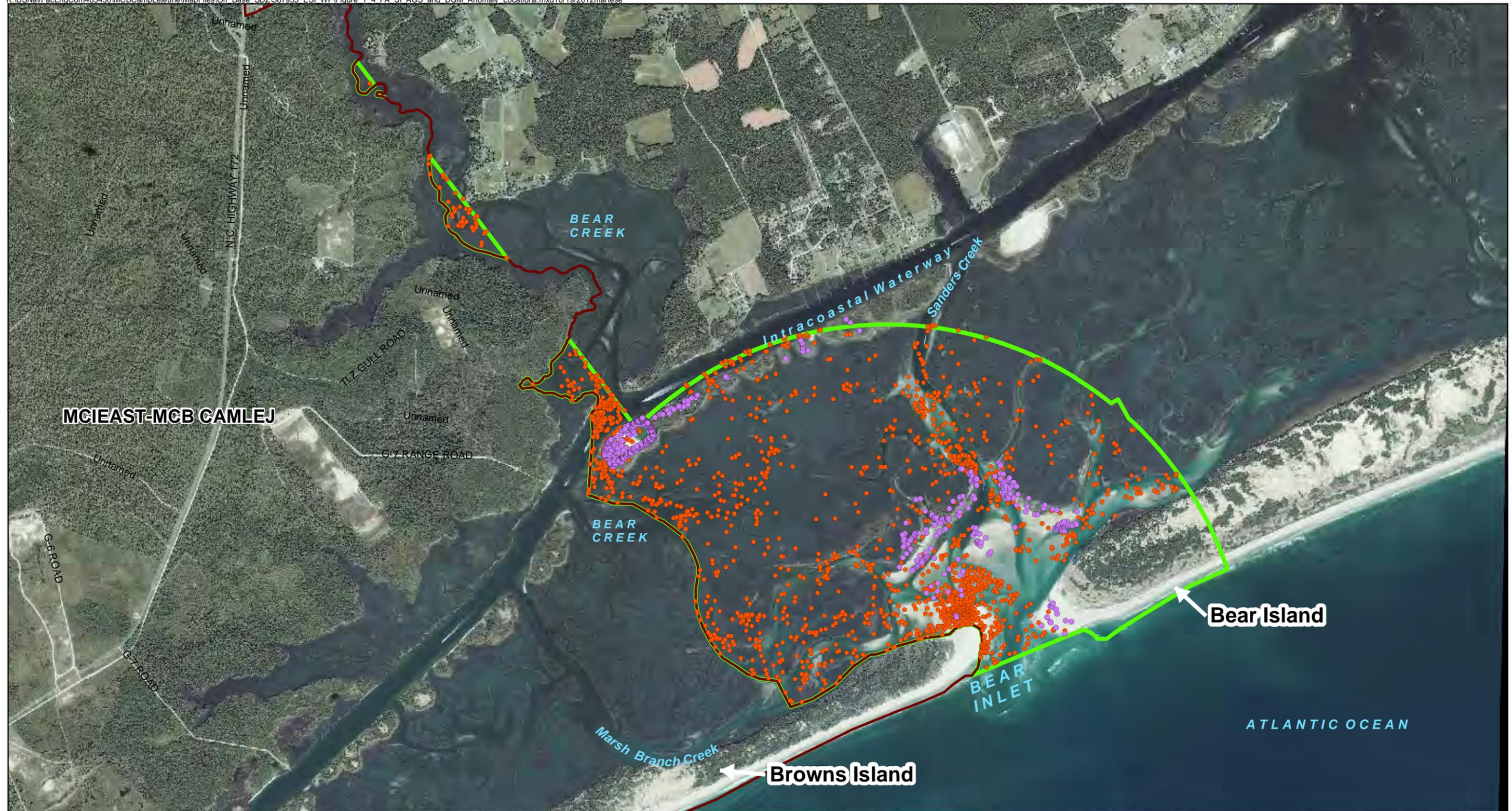
-  Coastal Wetlands
-  Installation Boundary
-  Surface Water Body Area
-  Off-Base SDZs



1 inch = 6,000 feet

Figure 1-3  
 Off-Base SDZs Current and Historical Range Locations  
 Expanded Site Inspection Work Plan  
 Off-Base Surface Danger Zones  
 MCIEAST-MCB CAMLEJ  
 North Carolina





- Legend**
- Terrestrial DGM Anomalies
  - AGS Anomalies (Sky Research)
  - ▭ Off-Base SDZs
  - ▭ Installation Boundary

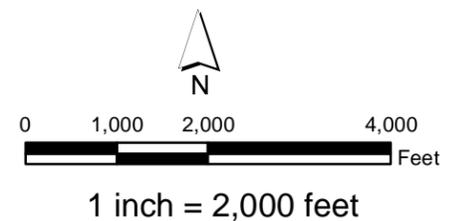


Figure 1-4  
PA/SI AGS and Terrestrial DGM Anomaly Locations  
Expanded Site Inspection Work Plan  
Off-Base Surface Danger Zones  
MCI EAST-MCB CAMLEJ  
North Carolina

# Technical Management Plan

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This Technical Management Plan identifies the technical approach, methods, and operational procedures that will be used to execute the ESI.

## 2.1 Munitions Response Guidance, Regulations, and Policy

The munitions response (MR) field activities at the Off-Base SDZs MRA will be conducted in accordance with the guidance documents, regulations, and polices described in Section 2.1 of the MRP MPP (CH2M HILL, 2008a).

## 2.2 MEC Contingency Procedures

Based on the documented history of DoD activities at the Off-Base SDZs MRA, it is anticipated that if MEC is discovered during field activities, it can be destroyed onsite. Therefore, alternatives to onsite disposal are not identified in this Work Plan Addendum. If MEC items are discovered that cannot be identified, MEC contingency procedures will be conducted in accordance with Section 2.2 of the MRP MPP (CH2M HILL, 2008a).

## 2.3 Chemical Warfare Materiel Contingency Procedures

Based on the documented history of DoD activities at the Off-Base SDZs MRA, it is not anticipated that chemical warfare materiel (CWM) will be discovered. However, if CWM is encountered, all work will immediately cease and CWM contingency procedures will be conducted in accordance with Section 2.3 of the MRP MPP (CH2M HILL, 2008a).

## 2.4 Project Personnel, Organization, and Schedule

This section describes the project organization and key personnel involved with implementing the work described in the Work Plan.

### 2.4.1 Project Organization

The key organizations involved in this project are NAVFAC, MCIEAST-MCB CAMLEJ, NCDENR, the U.S. Environmental Protection Agency (EPA), and CH2M HILL. Project execution will be conducted by CH2M HILL and its subcontractors.

### 2.4.2 Project Personnel

The roles and responsibilities of the project key personnel are discussed in Section 2.4 of the MRP MPP (CH2M HILL, 2008a). Contact information for key project personnel is shown in **Table 2-1**.

TABLE 2-1  
Project Personnel Contact Information  
*Off-Base SDZs Work Plan Addendum*  
*MCIEAST-MCB CAMLEJ*  
*Jacksonville, North Carolina*

Name/Title/Organization	Mailing Address	Telephone/Fax/E-mail
Phil Smith Program Manager CH2M HILL	5701 Cleveland Street. Suite 101 Virginia Beach, VA 23462	757- 671-8311 (office) 757-497-6885 (fax) <a href="mailto:Philip.Smith@ch2m.com">Philip.Smith@ch2m.com</a>
Matt Louth Activity Manager CH2M HILL	5701 Cleveland Street Suite 200 Virginia Beach, VA 23462	757-671-6240 (office) 703-376-5988 (fax) <a href="mailto:Matt.Louth@ch2m.com">Matt.Louth@ch2m.com</a>
Keith LaTorre Project Manager (PM) CH2M HILL	2095 Lakeside Centre Way Suite 200 Knoxville, TN 37922	865-769-3204 (office) 865-323-3300 (cell) 865-560-2802 (fax) <a href="mailto:keith.latorre@ch2m.com">keith.latorre@ch2m.com</a>

TABLE 2-1  
**Project Personnel Contact Information**  
*Off-Base SDZs Work Plan Addendum*  
**MCIEAST-MCB CAMLEJ**  
**Jacksonville, North Carolina**

Name/Title/Organization	Mailing Address	Telephone/Fax/E-mail
Thomas M. Roth, P.E. Senior Technical Consultant CH2M HILL	2607 LaVista Road Decatur, GA 30033-1728	404-474-7640 (office) 404-259-6674 (cell) 770-604-9183 (fax) <a href="mailto:Tom.Roth@ch2m.com">Tom.Roth@ch2m.com</a>
Carl Woods, C.I.H. Program H&S Manager	CH2M HILL 10123 Alliance Road Suite 300 Cincinnati, OH 45242	513-889-5771 (office) 513- 319-5771 (fax) <a href="mailto:carl.woods@ch2m.com">carl.woods@ch2m.com</a>
Tim Garretson Senior MR Technical Consultant (Navy CLEAN) CH2M HILL	9428 Baymeadows Road Suite 300 Jacksonville, FL 32256	904- 374-5633 (office) 757- 287-5222 (cell) <a href="mailto:timothy.garretson@ch2m.com">timothy.garretson@ch2m.com</a>
George DeMetropolis, PhD Corporate MR Safety and QC Officer CH2M HILL	CH2M HILL 402 W. Broadway, Suite 1450 San Diego, CA 92101	619-687-0120, Ext. 37239 (office) 619-564-9627 (cell) <a href="mailto:George.DeMetropolis@ch2m.com">George.DeMetropolis@ch2m.com</a>

### 2.4.3 Project Schedule

Figure 2-1 presents a detailed project schedule, including key milestones.

## 2.5 Technical Approach

### 2.5.1 Project Planning

This task includes project management, meetings, Work Plan Addendum preparation, and subcontractor procurement.

Project management includes all work necessary for controlling the project budget and schedule. This includes monthly status reports and invoicing, as well as all other administrative tasks needed for project performance.

Meetings are planned throughout the course of this project. The meetings will be held to discuss proposed work, present investigation findings, and discuss project status. The meetings are planned to be held at MCIEAST-MCB CAMLEJ, a CH2M HILL office, or at other locations as necessary.

Up to three versions of this Work Plan Addendum will be prepared under this task. A draft document will be submitted electronically for NAVFAC and MCIEAST-MCB CAMLEJ review. A revised draft final Work Plan Addendum will be submitted to NAVFAC, MCIEAST-MCB CAMLEJ, USEPA, and NCDENR for review upon incorporating comments from NAVFAC and MCIEAST-MCB CAMLEJ. After comments are considered, the Work Plan Addendum will be finalized.

Anticipated subcontractor services include anomaly intrusive investigation and removal work, boat transportation, and – if necessary – vegetation clearance, MEC demolition, laboratory analysis, and IDW management.

## 2.5.2 Stakeholder Involvement

### PA/SI

As part of the preparations for the PA/SI in 2009 and 2010, CH2M HILL, MCIEAST-MCB CAMLEJ, and NAVFAC completed the following stakeholder outreach activities:

- Notified state and local elected officials about the discovery of historical off-Base SDZs and the planned investigation
- Called affected property owners, then mailed letters and conducted individual meetings with them
- Obtained right-of-entry agreements from affected property owners, allowing MCIEAST-MCB CAMLEJ and NAVFAC to conduct field surveys and investigative work on their properties
- Mailed fact sheets to local organizations and the general public
- Coordinated with the Hammocks Beach State Park Manager to provide information to park visitors
- Held a public open house to present information about the upcoming investigation
- Advertised the public meeting, upcoming investigation, and a point of contact for questions and comments in public notices and press releases
- Developed key messages for use in responding to public and media inquiries

### ESI

Various stakeholder outreach activities will be conducted as part of the ESI. Stakeholders for the investigation include affected property owners, regulators, local government representatives, watermen (boaters, guides, fishermen, and so forth), and other local businesses, interested non-governmental organizations, and the general public. The primary outreach objectives are:

- Working closely and cooperatively with affected property owners
- Ensuring that appropriate information reaches the correct audiences and is presented in a way that is concise, consistent, accessible, accurate, and easy to understand
- Providing for a two-way exchange of information with stakeholders during the investigation
- Educating the public about munitions safety

Updated right-of-entry agreements for the properties where ESI field work is proposed were signed in January-February 2012. These agreements are effective for three years and will expire in July/February 2015. The *Community Outreach Strategy for the Investigation of Off-Base Surface Danger Zones (SDZs) at Marine Corps Installations East-Marine Corps Base Camp Lejeune* (CH2M HILL, 2011b) describes specific planned activities, timing, and materials needed. This document was first prepared in 2009 for the PA/SI and is updated as needed. Primary outreach activities being planned for the ESI are:

- Providing updates to local officials, affected property owners, and state agencies responsible for public lands and waters in the former Off-Base SDZs investigation area
- Notifying persons (if any) whose homes or businesses lie within established exclusion zones (EZs) and who might need to be evacuated during intrusive work or controlled detonations
- Distributing fact sheets, press releases, and public notices to keep the public informed
- Making information available in local libraries and on a public website

Stakeholder outreach activities will comply with the requirements of CERCLA and the Munitions Site Response Prioritization Protocol (32 Code of Federal Regulations 179) and will be sufficiently flexible to respond to the concerns and information needs of various stakeholders, throughout the MR process for the former Off-Base SDZs MRA.

### **2.5.3 Site Investigation**

All planned field investigation activities will be performed under this task. The scope of the field investigation and the technical approach are presented in Section 3. The primary field activity is intrusive investigation of selected AGS and terrestrial DGM anomalies or areas within the Off-Base SDZs MRA containing identified anomalies.

### **2.5.4 Geographical Information System**

All global positioning system (GPS) digital data will be created using a software platform that will allow it to be loaded directly into the geographical information system (GIS). The main purpose of the GIS is to associate the intrusive investigation data with their correct geographical locations.

CH2M HILL will also provide the GIS data for uploading into the existing MCIEAST-MCB CAMLEJ GIS. These data will include ArcView project and shape files that best delineate the area on the basis of uses, site conditions, and other information gathered during the study.

### **2.5.5 Expanded Site Investigation and After Action Report Deliverables**

A draft ESI report and an After Action Report (AAR), if necessary, will be prepared to document the findings of the field investigation. The reports will summarize the site history, field activities completed, and intrusive investigation findings.

The draft ESI report will be submitted electronically for concurrent review by NAVFAC and MCIEAST-MCB CAMLEJ. Following receipt of review comments, CH2M HILL will issue a revised draft ESI report to NAVFAC, MCIEAST-MCB CAMLEJ, USEPA, and NCDENR for review. Following receipt of comments regarding the draft document, CH2M HILL will issue a final ESI report.

The draft AAR, if needed, will be submitted to MCIEAST-MCB CAMLEJ for review. Following receipt of review comments, a revised draft AAR will be submitted to MARCORSYSCOM for review. CH2M HILL will then issue a revised draft AAR to MARCORSYSCOM for distribution to the DDESB for review. Following receipt of all comments, a final AAR will be issued.

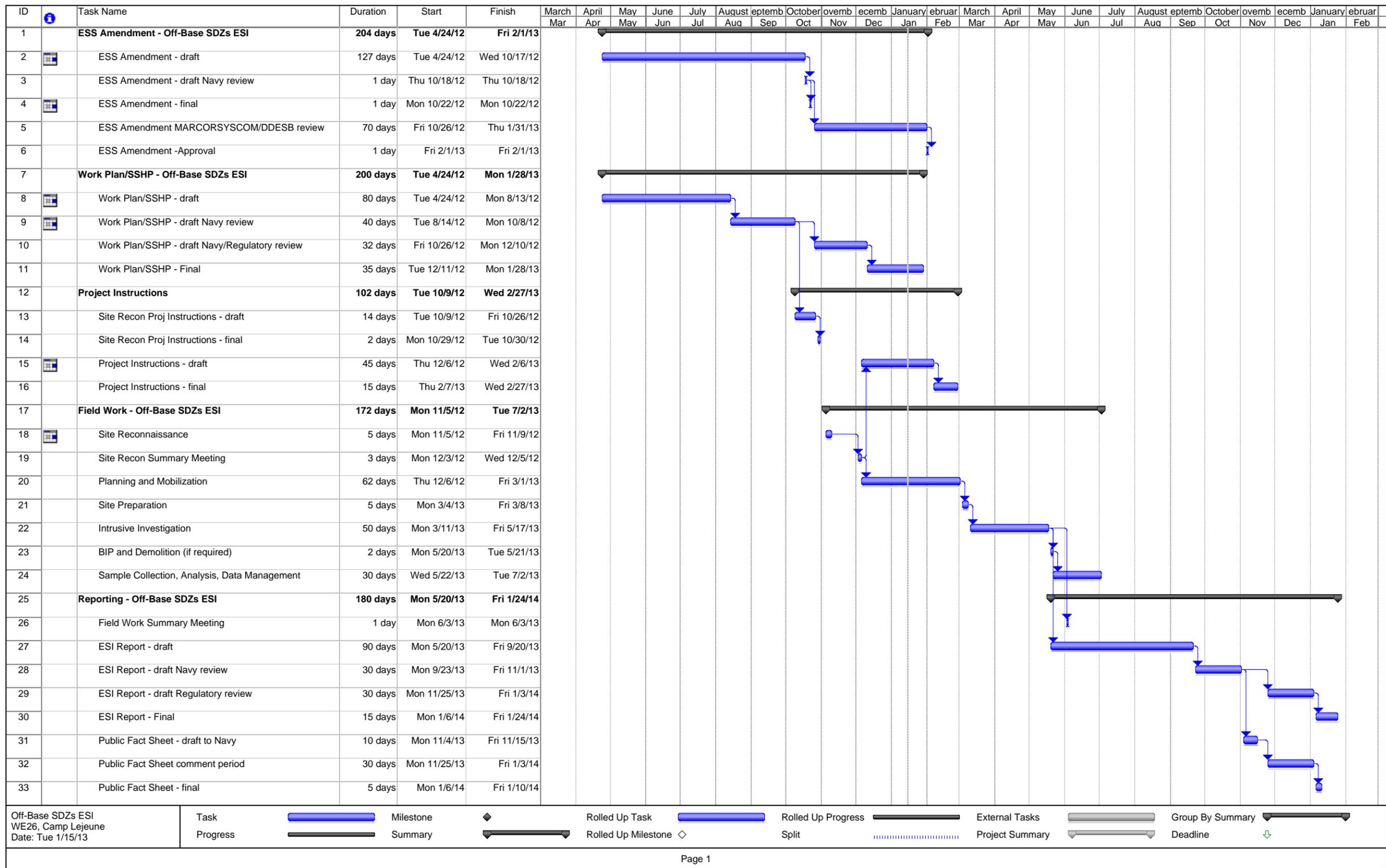


Figure 2-1  
Project Schedule  
Expanded Site Inspection Work Plan  
Off-Base Surface Danger Zones  
MCIEAST-MCB CAMLEJ  
North Carolina



# Field Investigation Plan

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## 3.1 Investigation Approach

### 3.1.1 Phased Approach

Field activities for the Off-Base SDZs will be performed using a phased field effort approach to obtain additional information regarding the MRA. This information will be applied to the follow-on actions within the MRA and will be used to refine and efficiently execute the next proposed field activity. Field activities will be conducted in accordance with the SOPs provided in the MRP MPP (CH2M HILL, 2008a) and Appendix C and will include:

- **Site Reconnaissance:** Conduct a site reconnaissance (site visit) in the proposed investigation AOIs within the SDZs (see Section 3.8) to evaluate accessibility, H&S requirements, and associated logistics for the areas. Intrusive anomaly investigation work will not be conducted during the site reconnaissance action.
- **Clear vegetation:** Clear vegetation, as needed and as permissible, to facilitate access to select anomalies within the SDZs investigation area.
- **Phase I:** Conduct an investigation along selected banks of accessible water bodies to assess the validity of the high-priority AGS anomaly selection process described in this Work Plan Addendum (see Section 3.1.2) and to evaluate the physical accessibility of these AOIs within the MRA. AGS anomalies identified along these water bodies during the 2010 PA/SI will be further investigated, as practical, using intrusive investigation methods. The proportion of MEC/MPPEH items found versus non-MEC/MPPEH items within the AOIs will be evaluated to provide further confidence in the site characterization approach (see Section 3.1.2). The Phase I effort will also identify and remove (as practical) any non-munitions metal, including debris or trash (such as cans or other rubbish), and will recover and dispose of any MEC and MPPEH that may be present. Any MEC or MPPEH items found during the site reconnaissance will be addressed as described in Section 4.
- **Phase II:** Conduct anomaly investigations within select AOIs of the Off-Base SDZs using a magnetometer or electromagnetic instrument to locate or reacquire select terrestrial DGM and AGS anomalies identified during the 2010 PA/SI, followed by intrusive investigation of the anomaly source through manual excavation. Anomalies that were identified or are found to be present beneath water will not be investigated. The anomaly investigations will be conducted using one or more of the following three approaches (**Figure 3-1**):
  - **Reacquisition and Intrusive Investigations:** Select terrestrial DGM anomalies identified during the 2010 PA/SI (see Section 3.8) will be evaluated using this approach. The terrestrial DGM reacquisition and investigation approach will be conducted primarily within areas of the MRA that are considered to be under relatively stable conditions (accessible ground located at an elevation above sea-level fluctuations). Reacquisition will be obtained by the unexploded ordnance (UXO) team using real-time kinematic GPS, conventional Total Station survey equipment, or fiducial positioning.
  - **Re-Location and “Mag-and-Dig” Investigations:** This anomaly re-location and intrusive investigation approach, applying the “mag-and-dig” field method (see Section 3.8), will be conducted primarily at and in the vicinity of select terrestrial DGM and high-priority AGS anomalies that are considered to be located within relatively unstable site conditions (marsh land subject to sea-level fluctuations or shifting sand conditions). Because of these dynamic site conditions, the metallic object associated with these anomalies may have shifted position over time. Therefore, the anomaly locations within the AOI will be used as a guide to the field team to establish the proposed “mag and dig” investigation area. The investigation area will then be expanded (adjacent to and surrounding each anomaly location), as needed, to assess the presence or absence of metallic objects potentially associated with the identified anomaly (see Section 3.9). “Mag and dig” will also be performed, as site conditions allow, within the field team access corridors/pathways leading to and away (“path-in and path-out”) from each investigated anomaly (refer to Figure 3-1).

- **Area-wide “Mag and Dig” Investigations:** Intrusive investigations will be conducted within select portions of the AOIs using an area-wide “mag-and-dig” approach. This approach will be applied primarily where multiple anomalies were identified in relative close proximity to each other, and the areas are considered physically accessible (dry ground, limited vegetation) to the investigation team (refer to Figure 3-1). These area-wide investigations will be expanded, as practical, to include additional adjacent sections of the MRA. Although the goal of the area-wide “mag-and-dig” approach would be 100-percent area coverage, access limitations and site conditions will govern the actual area evaluated by the field team.

### 3.1.2 Application of 2010 Terrestrial DGM Data

Terrestrial DGM data were collected during the 2010 PA/SI to identify anomalies representing potential subsurface MEC or MPPEH. The data were obtained within areas of the SDZs that consisted of higher elevation and drier ground and were accessible to the data collection team and the associated ground-based equipment. These areas included intertidal portions of Bear Inlet, the southeastern end of Sanders Island, the southern end of the NCDOA property, and the ICW Islands along the northern boundary of the MRA (refer to Figure 1-4).

The majority of the identified terrestrial DGM anomalies are proposed for further investigation as part of this Work Plan Addendum. However, due to potentially changing site conditions, some of the terrestrial DGM anomalies identified within Bear Inlet may now be underwater or may have been relocated by shifting sands. In addition, the sources of some terrestrial DGM anomalies are likely associated with cultural features. Due to the effects of changing site conditions and the potential presence of cultural features, the terrestrial DGM anomalies will be addressed during the Phase II field effort by one or more of the approaches described in Section 3.1.

### 3.1.3 Application of 2010 AGS Data

The objective of the helicopter magnetometer (HeliMag) AGS at the Off-Base SDZs was to identify areas containing high densities of ferrous metallic objects on the surface and/or in the subsurface that may be indicative of MEC and MPPEH. Although it is not possible to establish which specific anomalies are associated with MEC or MPPEH, the list was refined by selecting high-priority anomalies for investigation based on their physical characteristics (Sky Research, Inc., 2010).

AGS anomalies that were assigned a high priority for the Off-Base SDZs intrusive investigation exhibited one or more of the following physical characteristics:

- **Depth less than 3 feet:** AGS anomalies that were estimated to be present at a depth of less than 3 feet bgs were assigned a high priority for the investigation because site access limitations prohibit the use of heavy excavation equipment (such as a backhoe, bobcat, or similar machinery) as part of the intrusive investigation, which would likely be required to fully evaluate deeper anomaly locations.
- **Not Located under water:** AGS anomalies identified as being located in areas not covered by surface water (that is, not within a channel or inundated under low tide conditions) were assigned a high priority for the investigation.
- **Low remnant magnetism:** AGS anomalies that exhibited low remnant magnetism were assigned a high priority for the investigation. The magnetic response of ferrous material has two sources – remnant and induced magnetism. The recorded responses of these two magnetic sources can be correlated with the presence of potential munitions, described as follows:
  - **Remnant Magnetism:** Metallic objects that have undergone mechanical shock, such as munitions that have been fired, become demagnetized (that is, the remnant magnetism is removed). Therefore, objects with relatively high remnant magnetism are not likely to be associated with munitions (Sky Research, Inc., 2010).
  - **Induced magnetism:** The induced magnetic dipole responses for cylindrical bodies, such as munitions items, are aligned within (less than) 60 to 75 degrees of the Earth’s magnetic field, while remnant dipole responses are not similarly constrained. Therefore, anomalies with dipole orientations greater than 60 to 75 degrees from the Earth’s magnetic field are generally related to remnant magnetism and are not likely to be associated with munitions (Sky Research, Inc., 2010).

Based on the application of these previously detailed criteria, 616 of the 1,720 identified AGS anomalies were assigned a high priority for proposed investigation actions (**Figure 3-2**) and 1,104 were assigned a lower priority.

### 3.1.4 AOI Selection Criteria

The Off-Base SDZs MRA geophysical survey results provided anomaly locations that could potentially contain MEC and/or MPPEH (refer to Figure 1-4). However, because the MRA lies primarily within an intra-coastal salt marsh region, access to portions of the MRA is limited. Therefore, select anomalies or groups of anomalies were chosen for intrusive investigation as part of this Work Plan Addendum. These anomaly locations or AOIs were selected and prioritized for intrusive investigation work based on the following site criteria:

- **Publicly Accessible Areas:** Areas within the MRA that are accessible to the public, and which therefore may pose a potential human health risk, were included for investigation. These accessible areas include higher elevation and drier ground near public waterways (such as ICW, Bear Inlet, and so forth).
- **Proximity to Targets or Range Fans:** Locations where MEC or MPPEH is more likely to be present due to a closer proximity to the former range targets and/or range fans were included for investigation.
- **Privately or State-owned Land:** Sections of the Off-Base SDZs are privately owned or owned by the State. Therefore, select anomalies identified within these areas will be included in the proposed investigation.
- **High Density of Anomalies:** Areas within the MRA where greater densities of terrestrial DGM and/or high-priority AGS anomalies were identified will be included in the investigation.
- **Variance in Magnetic Moment:** Areas with AGS anomalies that showed a wide range of magnetic moments (see Section 3.1.2) were incorporated into the investigation. An evaluation of a wider range of magnetic moment values may provide information regarding the geophysical anomaly source characteristics underlying the variance (type, origin, size, and so forth) of metallic items generally present within the study area.
- **Terrestrial DGM Areas:** Areas in the MRA where terrestrial DGM data were collected during the PA/SI. Terrestrial DGM data were primarily collected within dry, accessible upland areas of the MRA, including the intertidal areas near Bear Inlet, the ICW islands, and higher ground on privately owned land.
- **Spatial Coverage:** Investigation activities will be performed with the intent to spatially evaluate as much of the Off-Base SDZs MRA as practical.

**Table 3-1** summarizes the AOIs and the corresponding anomaly area selection criteria. **Figure 3-3** presents the proposed Phase I and Phase II AOIs. The proposed AOIs are further described in Sections 3.6 and 3.8).

### 3.1.5 Investigation Limitations

The intent of the Off-Base SDZs investigation is to evaluate the accessible and applicable (see previous sections) geophysical anomalies identified within the MRA during the 2010 PA/SI for the potential presence or absence of MEC or MPPEH. However, because the SDZs are within a coastal tidal marsh region and adjacent to the ICW and private residences, access and associated intrusive investigation actions within the MRA are limited. Also, physical site conditions are subject to change caused by ocean fluctuations and changing weather conditions. **Figure 3-4** shows the variances over time of the landforms (drainage ways, sand bars, and so forth) within Bear Inlet. Therefore, physical field conditions will dictate the UXO team's access and investigation success at selected AOIs or anomalies, described as follows:

- The Off-Base SDZs MRA primarily consists of surface water, tidal channels, coastal wetlands, and salt marsh (approximately 1,459 of the total 1,632 acres). Much of the upland within the MRA is part of Bear Island, which was investigated in 2010 (CH2M HILL, 2011a). Therefore, physical access within the majority of the remainder of the MRA is limited. Any proposed investigation areas that cannot be safely accessed by the field team because of restrictive site conditions (thick vegetation, unstable surface soil, deeper water in stream channels, or other such constraints) will be excluded from the proposed intrusive investigation. The attempted investigation within the proposed AOI, along with the reason for exclusion from the investigation approach, will be noted in the field logbook and in the ESI report.

TABLE 3-1

Proposed Investigation Areas, Relative Criteria, and Sequence of Actions

Sequence #	Area or AIO ID	Approximate Total Acreage	Total # of DGM Anomalies	Total # of AGS Anomalies	Total # of Anomalies Identified in Area	Total # of Retained AGS Anomalies	Total # of Anomalies Identified for Investigation	Accessible to the Public	Relatively Close to Former Target or within Range Fan	Privately Owned Land	Relatively High Density of Anomalies	Varying Range of Amplitudes	High/Dry Ground	2010 DGM Data Area	Provide Spatial Coverage	General Location
1	PH1-1	6.13	0	20	20	3	3	X			X	X				Channel Area
2	PH1-2	8.50	0	39	39	23	23	X		X	X	X				Channel Area
3	PH1-3	14.58	0	39	39	20	20	X			X	X			X	Channel Area
4	A	3.44	0	13	13	10	10		X		X					North of former range target
5	B	1.65	0	8	8	7	7		X		X	X				North of former range target
6	C	2.17	0	4	4	4	4		X		X	X				North of former range target
7	D	10.91	0	25	25	17	17		X	X	X	X			X	Sanders Island - SW portion
8	E	68.63	37	43	80	27	64	X				X	X	X		ICW Islands 1 through 7
9	F	0.43	28	10	38	4	32	X	X		X	X	X	X		ICW-7 - active dredge spoil area
10	G	3.55	0	1	1	1	1		X	X						Private area to extreme north
11	H	1.19	0	3	3	1	1		X							Bear Creek area
12	I	56.41	15	317	332	40	55	X	X		X	X	X	X		Bear Creek inlet
13	J	18.62	60	14	74	10	70	X	X	X			X	X		Southeast edge of Sanders Island
14	K	13.82	63	14	77	10	73	X	X	X		X	X	X		Southeastern end of Sanders Island
15	L	23.34	82	21	103	11	93	X	X	X	X	X	X	X		SW portion of NCDOA Property
16	M	6.46	0	5	5	2	2	X	X	X		X	X			Southeast end of Sanders
17	N	1.50	0	1	1	1	1	X		X			X			South end of NCDOA property
18	O	1.49	0	4	4	4	4	X			X	X	X			Small island SW of ICW-7
19	P	1.87	0	6	6	6	6			X	X	X			X	Northern Portion of NCDOA Property
20	Q	0.37	0	4	4	4	4				X				X	North of Sanders Island
21	R	0.93	0	9	9	4	4		X		X	X				North of former range target
22	S	0.42	0	5	5	3	3		X		X				X	North of Sanders Island
Total:		246	285	605	890	212	497									

AOI = area of interest, AGS = aerial geophysical survey, DGM = digital geophysical mapping, ID = identifier

- Depths to potential MEC/MPPEH within the Off-Base SDZs MRA are not known. However, based on expected conditions in the MRA, the anticipated excavation depths using hand tools will likely vary from near the ground surface to approximately 2 feet bgs. Anomaly intrusive investigation work will be halted once water is encountered in the excavation.
- The sources of anomalies identified during the 2010 PA/SI may have moved as a result of dynamic coastal environment conditions, such as tidal fluctuations and severe weather. Therefore, “mag and dig” investigation methods will be applied within the area surrounding the anomaly location to assess the source of the identified anomaly. However, because of these site conditions, metallic objects may not be found at some of the proposed anomaly investigation locations.
- Because of safety concerns, anomalies that place any private residence or business within the EZ (refer to the ESS Amendment and Section 4 of this Addendum) will not be evaluated during the field effort.
- Intrusive investigation actions (such as digging at anomaly locations) will be halted when a boat or other water craft enters the EZ during the field effort (refer to the ESS Amendment and Section 4 of this Addendum).
- Access permission will be required before conducting investigation activities on privately owned land.
- AGS and/or terrestrial DGM anomalies that were identified or are found to be present beneath water at the time of investigation will not be investigated during this ESI.
- Because of potential Base range operational activities occurring adjacent to the project site, such as direct firing artillery training, access to adjoining sections of the Off-Base SDZs MRA may be restricted during Base exercises.
- Bird species listed under the federal Migratory Bird Treaty Act (MBTA) may nest in the coastal marshland or the woody vegetation that are found throughout the Off-Base SDZs MRA (see Section 9.2). The presence of these bird species or related nests may restrict team access to portions of the MRA during the ESI.

## 3.2 Planning

The following actions require advance planning and will be conducted before mobilization to the site:

- Finalize procurement of supplies and services needed during the mobilization
- Hold a pre-mobilization meeting and Operations Readiness Review with the project team at least 1 week before field operations begin
- Coordinate with the NAVFAC PM and Base point of contact on notification of local stakeholders regarding upcoming project activities
- Reconfirm site personnel documentation of proper training, certifications, and medical monitoring

## 3.3 Mobilization

Mobilization will involve identifying, briefing, and mobilizing staff, as well as securing and deploying equipment.

Note: access to and from the investigation areas will require boat transportation.

### 3.3.1 General Mobilization Activities

- Identify and procure, package, ship, and inventory project equipment, including geophysical instrumentation, hand tools, boat supplies, and any other miscellaneous supplies.
- Coordinate with local agencies, including MCIEAST-MCB CAMLEJ; Base Range Control; U.S. Coast Guard; police, hospital, and fire departments; and Hammocks Beach State Park, as appropriate.
- Coordinate communications and other logistical support.

- Test and inspect equipment, including communication equipment.
- Finalize operating schedules.
- Review subcontractor and internal Activity Hazard Analysis forms.
- Verify that all forms and project documentation are in order and that project team members understand their responsibilities regarding completing project reporting requirements.
- Establish MPPEH and MDAS collection areas, in accordance with the ESS.
- Conduct site-specific training regarding this Work Plan Addendum, Project Instructions, ESS Amendment, SSHP, and MEC/MPPEH procedures and hazards.
- Establish a project command post in an area that is convenient to intrusive activities, but outside the EZs that will be established for intrusive activities, in accordance with the ESS Amendment.

### 3.3.2 Command Post

Because of the remote location of the project site, a typical command post will not be established. However, the boat used to transport members to the Off-Base SDZs MRA will be the focal point for team meetings and congregation. Team members will congregate at a designated boat slip at the beginning of the day before departure. The designated congregation area in the MRA during field operations will be the location where the boat makes landfall. The boat itself will be used as a makeshift command post for important documents that will be maintained by the site manager.

### 3.3.3 Kickoff and Safety Meeting

During mobilization, a kickoff and site safety meeting will be conducted and will include a review of this Work Plan Addendum, the ESS Amendment, and the SSHP by all site personnel. Additional meetings will occur as needed, as new personnel, visitors, and/or subcontractors arrive at the site.

## 3.4 Buried Utility Clearance

The North Carolina One-Call Center will be contacted regarding the proposed Off-Base SDZs MRA investigation area. Because of the remote coastal location of the SDZs, third-party underground utility locating is not proposed. All intrusive investigation work will be performed manually using hand-held tools.

## 3.5 Site Reconnaissance

Site reconnaissance of the Off-Base SDZs will be conducted as a separate mobilization and will take place before starting the proposed intrusive investigation work. The reconnaissance action will be implemented to achieve the following:

- Evaluate the physical accessibility of the proposed AOIs (see Section 3.8)
- Refine the project logistics, identify H&S issues and required field equipment, and establish emergency contacts with Base and local authorities

The site reconnaissance will include an evaluation of the physical terrain of the SDZs and will be performed from a boat and/or land. The action will not include intrusive anomaly investigation work. However, test excavations may be conducted at select locations within the SDZs, using anomaly avoidance procedures, to evaluate the strength of the soil materials and assess the depth to water during both low and/or high tide conditions. MEC avoidance activities will be conducted by the team members during the field effort in accordance with the SSHP.

## 3.6 Phase I Anomaly Evaluation and Intrusive Investigation

The majority of the AGS anomalies identified during the 2010 PA/SI are located in or very close to the water channels, and are therefore consistent with the presence of non-munitions-related material (such as other debris

or trash) or ferrous clutter (Sky Research, Inc., 2010). Therefore, a Phase I anomaly evaluation and intrusive investigation will be conducted within select and accessible water channels in the Off-Base SDZs MRA.

This Phase I action will be conducted to achieve the following:

- Evaluate the types of metallic materials present at the AGS anomalies identified along the shoreline of the selected channels.
- Assess the validity of the high-priority AGS anomaly selection process described in Section 3.1.2. Select AGS anomalies identified along the shorelines that were not assigned a high priority for investigation work based on the criteria presented in Section 3.1.2 will be investigated during Phase I to establish the source of the metallic anomaly (that is, MEC/MPPEH or other debris, such as trash). Findings associated with these AGS anomalies will be used to assess the need to investigate additional lower-priority AGS anomalies within the MRA.
- Identify (visually) and remove as much small, other debris or trash (such as cans, nails, and any rubbish) present on the ground surface, as practical. Larger debris and trash (crab pots, boat anchors, and the like) that would be difficult to physically remove from the site will be photographed, documented in the logbook, and left in place.

**Note: Any suspected MEC and MPPEH found during the site reconnaissance effort will be handled as specified in Section 4.**

The selected AGS anomalies will be located in the field using GPS and will be visually evaluated for the presence of MEC/MPPEH or other debris on the ground surface. Anomaly items that cannot be visually identified on the surface will be further investigated using “mag-and-dig” techniques. The types and percentages of the other debris found at these anomaly locations (compared to MEC/MPPEH found) will be used to assess the need for additional anomaly shoreline intrusive investigation efforts within the MRA.

The Phase I action will be implemented from a flat-bottom boat, canoe, or similar water craft, and will be conducted by UXO-qualified personnel. Metallic items found during Phase I will be geographically located using GPS and documented in the site logbook.

Phase I will be conducted within three proposed channel areas (PH1-1, PH1-2, and PH1-3 as shown on **Figure 3-5**) adjacent to accessible waterways within the Off-Base SDZs MRA, as follows:

1. **Areas PH1-1 and PH1-2:** Approximately 3,000 feet of shoreline along the north (PH1-1) and south (PH1-2) shorelines of the east-west trending water channel along the north side of Sanders Island (refer to Figure 3-5). This water channel appears accessible to the public, adjoins private property, and partially lies within the former artillery range fans associated with ranges G-6 and G-7. The channel bank area will be evaluated as follows:
  - Area PH1-1: Northern Channel Shoreline: Three AGS anomalies that were assigned a high priority for potential investigation work based on the criteria presented in Section 3.1.2 were identified within this approximately 6-acre shoreline area near the confluence with Bear Creek (western end). This northern shoreline also includes 17 AGS anomalies that were assigned a lower priority based upon the selection criteria. These 17 anomalies will also be evaluated as part of Phase I to assess the validity of the AGS anomaly priority assignment process described in Section 3.1.2.
  - Area PH1-2: Southern Channel Shoreline: 23 AGS anomalies of varying magnetic moment that were assigned a high priority for potential investigation work based on the criteria presented in Section 3.1.2 were identified within this approximately 8.5-acre shoreline area. Nearly half of these anomalies are present near the confluence with Bear Creek (western end). This southern shoreline area also includes 16 AGS anomalies that were assigned a lower priority based upon the selection criteria. These 16 anomalies will also be evaluated as part of Phase I to assess the validity of the AGS anomaly priority assignment process described in Section 3.1.2.

2. **Area PH1-3:** An approximate 14.5-acre area located within Sanders Creek and north of Bear Inlet (refer to Figure 3-5). This investigation area is primarily located within an elevated sand-bar portion of the creek that is likely susceptible to shifting sands and deep water conditions, depending on the volume of water flow within the creek and the distribution of sand bars at the time of investigation. The proposed Phase I investigation area includes approximately 800 feet of a potentially accessible water channel where 20 high priority AGS anomalies of varying magnetic moment were identified (refer to Figure 3-5). Approximately 19 lower-priority AGS anomalies were identified within the combined areas of the creek and the eastern water channel. These 19 anomalies will also be evaluated during Phase I to assess the validity of the AGS anomaly priority assignment process outlined in Section 3.1.2.

## 3.7 Vegetation Clearing

If necessary and not damaging to the environment (refer to Section 8), vegetation smaller than 3 inches in diameter will be removed to within 6 inches of the ground surface to provide access to identified anomalies. Some vegetation clearing may be required to re-establish the terrestrial DGM transects within the ICW islands along the northern boundary of the MRA. Additional vegetation clearing will be implemented, as necessary, to provide access to selected terrestrial DGM and/or high-priority AGS anomaly areas.

Vegetation clearing will be accomplished using a combination of mechanical and manual methods, depending on site conditions. Mechanical removal may involve the use of chain saws or other mechanized cutters, and manual removal would involve the use of loppers, hand saws, or similar tools. Felled vegetation would be left on the site. Overhanging vines and protruding branches that could interfere with safe and effective site access would be removed. During vegetation removal, UXO technicians will conduct MEC avoidance activities in accordance with the SSHP.

## 3.8 Phase II Anomaly Evaluation and Intrusive Investigation

The objective of the Phase II investigation is to evaluate (intrusively investigate) the high-priority AGS anomalies and select terrestrial DGM anomalies identified within each selected AOI. The Phase II investigation will be conducted within 19 distinct AOIs within the Off-Base SDZs MRA (**Figure 3-6**). These proposed AOIs were selected, and have been prioritized for investigation, based on the site criteria outlined in Section 3.1 (refer to **Table 3-1**). The specific anomaly evaluation approach for each proposed AOI is presented below, but will be refined, as needed, based on the findings of the site reconnaissance. Following these initial field actions, the 19 proposed AOIs will be investigated in the proposed order as follows.

### 3.8.1 Area A: North of Rocket Range Target

An approximate 3.4-acre area along the western edge of Bear Inlet and roughly 1,100 feet north of the center point of the former Brown Island RR-1 will be investigated (**Figure 3-7**). This combined tidal marsh and potential upland area is partially accessible to the public and includes 10 high-priority AGS anomalies that were selected for potential investigation based on the criteria presented in Section 3.1.2. It is anticipated that the re-location and “mag and dig” investigation approach will be applied to Area A, as described in Section 3.1. However, an area-wide “mag and dig” investigation approach may be applied to portions of the AOI, as site conditions warrant.

### 3.8.2 Area B: Northwest of Rocket Range Target

An approximate 1.6-acre area roughly 700 feet west of Bear Inlet and 1,500 feet north-northwest of the center point of the former Brown RR-1 (refer to **Figure 3-7**) will be evaluated. This tidal salt marsh area includes seven high-priority AGS anomalies of varying magnetic moments that are grouped relatively close together. The re-location and “mag and dig” investigation approach will be applied to Area B (see Section 3.1). However, an area-wide “mag and dig” investigation approach may be applied to portions of this AOI, as site conditions warrant.

### 3.8.3 Area C: West of Rocket Range Target

An approximate 2-acre portion of the MRA that is roughly 1,200 feet west of the center point of the former Brown Island RR-1 (refer to **Figure 3-7**) will be assessed. This relatively small AOI appears to be covered by both salt

marsh and sand drainage ways associated with the adjacent upland island. The area includes four high-priority AGS anomalies of varying magnetic moments. The re-location and “mag and dig” investigation approach will be applied to Area C (see Section 3.1). However, an area-wide “mag and dig” investigation approach may be applied to portions of this AOI and adjacent areas, as site conditions warrant.

### 3.8.4 Area D: Southwest Portion of Sanders Island

A tidal marsh area covering approximately 11 acres and lying within the southwest portion of Sanders Island (refer to **Figure 3-7**) will be investigated. This AOI encompasses 17 high-priority AGS anomalies (refer to Section 3.1.2) with varying magnetic moments that may be associated with the former G-6 Artillery Range (to the north-northwest) or the former RR-1 (approximately 0.5 mile to the south-southeast). The re-location and “mag and dig” investigation approach will be applied to Area D (see Section 3.1). However, an area-wide “mag and dig” investigation approach may be applied to portions of this AOI and adjacent areas, as site conditions warrant.

### 3.8.5 Area E: ICW Islands

Area E consists of seven ICW islands that encompass approximately 68 acres, are adjacent to the south side of the ICW, are accessible to the public, and form the northern boundary of the Off-Base SDZs. The identified anomalies within this AOI may be associated with activities at the former G-6 Artillery Range (to the north-northwest). This AOI investigation will include approximately 37 terrestrial DGM and 27 high-priority AGS anomalies of varying magnetic moments identified within ICW islands 1 through 7 (**Figure 3-8**), excluding the active dredge spoil pile area within the western portion of ICW-7 (refer to Section 3.8.6). (Note: terrestrial DGM anomalies were not identified on islands 4 and 5).

An anomaly reacquisition and intrusive investigation approach (see Section 3.1) will be conducted for all of the terrestrial DGM anomalies identified within Area E. The field team will use the previously established geophysical investigation transects as access to the terrestrial DGM anomalies identified on the islands.

High-priority AGS anomalies identified within the AOI will be evaluated using the re-location and “mag and dig” investigation approach (see Section 3.1). However, an area-wide “mag and dig” investigation approach may be applied to portions of this AOI and adjacent areas, as site conditions warrant.

### 3.8.6 Area F: Active Dredge Spoil Area on ICW-7

Select terrestrial DGM and high-priority AGS anomalies identified within the interior of the active dredge spoil area of ICW-7 will be investigated at this AOI (**Figure 3-9** and refer to Figure 3-8). This ICW island is near the confluence of Bear Creek and the ICW, within the northwest portion of the Off-Base SDZs. The identified anomalies on the island are accessible to the public and may be associated with Base activities at the former G-6 Artillery Range. MEC/MPPEH items associated with the former range that might have affected the ICW may have been removed through ICW dredging activities and placed onto the island spoil and drainage pile. Cultural/other debris associated with the ICW dredging activities are also likely present within the spoil pile.

The intrusive investigation will be focused within the interior of the island, where varying magnetic moment anomaly readings were identified during the PA/SI (refer to Figure 3-9). This area of the dredge spoil island contains an estimated 32 anomalies (combined terrestrial DGM and AGS) and encompasses approximately 0.4 acre in total. The investigation work will exclude anomalies associated with the dredge spoil netting (erosion control mechanism) that primarily lie around the perimeter of the active dredge spoil area and settling/drainage basin (refer to Figure 3-9). Because the dredge spoil pile area is considered accessible and elevated dry ground, an area-wide “mag and dig” investigation approach will be applied to this AOI. Other areas on the dredge spoil island and adjacent to this AOI may also be evaluated during the field effort using this approach.

### 3.8.7 Area G: Private Property within Bear Creek

Approximately 2.3 acres of private property in the Bear Creek drainage channel will be evaluated (**Figure 3-10**). The AOI is approximately 1.5 miles northwest of the confluence of Bear Creek and the ICW. Potential MEC/MPPEH items within this area of the site would likely be associated with the former G-6 Artillery Range (located northwest of the property).

One AGS anomaly was identified within the southern portion of the AOI. However, as part of the re-location and “mag and dig” investigation approach, two proposed investigation transects will also be conducted (where accessible) across the property. One of the investigation transects should intersect the identified AGS anomaly (refer to Figure 3-10).

### 3.8.8 Area H: Anomaly in Bear Creek

An approximate 1-acre area within the Bear Creek drainage channel, approximately 0.4 mile northwest of the confluence of Bear Creek and the ICW (refer to **Figure 3-10**), will be evaluated. The investigation will be focused on one AGS anomaly identified at the western edge of Bear Creek. The anomaly and surrounding area will be evaluated, as accessible, using the re-location and “mag and dig” approach (see Section 3.1). This location is likely accessible from the MCIEAST-MCB CAMLEJ property adjacent to the west of the anomaly. Potential MEC/MPPEH within this investigation area would likely be associated with the former G-6 Artillery Range (located northwest of the AOI).

### 3.8.9 Area I: Bear Inlet

This Bear Inlet AOI is adjacent to and extends northeast of the center point of the former Bear Island RR-1 (**Figure 3-11**). This approximate 56-acre area is accessible to the public and is composed of sand deposits within the inlet, with little to no vegetation present. The area is historically affected by changing tidal and weather conditions (see Figure 3-4), and portions of the area that were once considered dry ground may now be submerged.

This AOI contains both terrestrial DGM (approximately 14) and high-priority AGS (approximately 40) anomalies of varying amplitudes and magnetic moments. Approximately 332 total anomalies were identified within this portion of the MRA during the 2010 PA/SI. The area-wide “mag and dig” investigation approach will be applied to portions of this AOI and potentially other adjacent areas (see Section 3.1). However, the re-location and “mag and dig” investigation approach may be applied to select anomalies identified within portions of Area I, as site conditions warrant.

### 3.8.10 Area J: Southeast Portion of Sanders Island

This AOI consists of approximately 18.6 acres of relatively high, dry ground adjacent to tidal salt marsh, and is within the southeast portion of Sanders Island (refer to **Figure 3-11**). The area is adjacent to Bear Inlet and approximately 0.5 mile northeast of the approximate center point of the former Bear Island RR-1. Both terrestrial DGM (60 anomalies identified) and AGS (10 anomalies assigned a high priority) studies were performed within this accessible portion of the MRA. Both the re-location and area-wide “mag and dig” investigation approaches will likely be applied to select portions of Area J (see Section 3.1), as site conditions warrant.

### 3.8.11 Area K: Eastern End of Sanders Island

A section of relatively high, dry ground along the eastern end of Sanders Island will be evaluated (refer to **Figure 3-11**). This AOI is located approximately 3,600 feet northeast of the center point of the former Bear Island RR-1 and is accessible to the public via the adjacent Bear Inlet. Both terrestrial DGM (roughly 63 anomalies identified) and AGS (10 anomalies assigned a high priority) studies were performed within this 14-acre portion of the MRA during the 2010 PA/SI. Both the re-location and area-wide “mag and dig” investigation approaches will be applied to select portions of Area K (see Section 3.1), as site conditions warrant.

### 3.8.12 Area L: Southwest Portion of NCDOA Property

The southwest portion of the NCDOA property (adjacent to the northeastern portion of Bear Inlet) will be investigated (**Figure 3-12** and refer to Figure 3-11). This AOI covers approximately 23 acres, with an estimated 82 terrestrial DMG and 11 high-priority AGS anomalies of varying magnetic moments identified within the proposed area. The NCDOA property is roughly 0.8 mile northeast of the approximate center point of the former Bear Island RR-1. Because this portion of the MRA is considered to be dry upland area, the area is accessible to public. The re-location and area-wide “mag and dig” investigation approaches will likely both be implemented within select portions of Area L (see Section 3.1), as site conditions warrant.

### 3.8.13 Area M: South-Central Portion of Sanders Island

An 80- to 140-foot-wide, east-to-west trending strip of dry, upland area (approximately 6 total acres) along the south-central portion of Sanders Island will be evaluated (refer to Figure 3-11). This AOI is roughly 0.5 mile north-northwest of the approximate center point of the former Bear Island RR-1. Two AGS anomalies that were assigned a high priority for potential investigation based on the criteria presented in Section 3.1.2 will be evaluated using the re-location and “mag and dig” approach (see Section 3.1). In addition to the two identified AGS anomalies, other physically accessible portions of this AOI will be evaluated for potential MEC/MPPEH using the area-wide “mag-and-dig” approach, as site conditions warrant.

### 3.8.14 Area N: Southern Portion of NCDOA Property

Approximately 1.5 acres of higher elevation (dry) ground along the southern end of the NCDOA property (refer to Figure 3-12) will be evaluated. One high-priority AGS anomaly (refer to Section 3.1.2) was identified within this AOI. The southern portion of the NCDOA property is accessible to the public via the adjacent Bear Inlet drainage way. It is anticipated that the area-wide “mag and dig” investigation approach will be applied to this smaller AOI (see Section 3.1). However, if site conditions limit access, the anomaly relocation and “mag and dig” approach will be implemented for the one high-priority AGS anomaly.

### 3.8.15 Area O: Channel Island SW of ICW-7

An intrusive investigation will be performed within the central portion of the channel island located approximately 550 feet southwest of ICW-7 and at the confluence of the ICW and Bear Creek (refer to Figure 3-9). This approximately 1.5-acre island is accessible to the public and lies within the southern portion of the former G-6 and/or G-7 artillery range fans. Four high-priority AGS anomalies of varying magnetic moments, potentially associated with these ranges, were identified on the island during the PA/SI. The re-location and “mag and dig” investigation approach will be applied to Area O (see Section 3.1). However, an area-wide “mag and dig” investigation approach may be applied to portions of this AOI and adjacent areas, as site conditions warrant.

### 3.8.16 Area P: Northern Portion of NCDOA Property

AGS anomalies identified within an approximate 1.8-acre area, within the northern portion of the NCDOA property, will be assessed (refer to Figure 3-12). This AOI lies within the eastern section of the MRA, approximately 1.2 miles northeast of the former Bear Island RR-1. Six AGS anomalies of varying magnetic moments, each assigned a high-priority for investigation based on the criteria presented in Section 3.1.2, were identified within this relatively small tidal marsh area. The re-location and “mag and dig” investigation approach (see Section 3.1) will be applied to Area P. However, an area-wide “mag and dig” investigation approach may be applied to select portions of this AOI and adjacent areas, as site conditions warrant.

### 3.8.17 Area Q: Anomalies North of Sanders Island

Four high-priority AGS anomalies identified within an approximate 0.4-acre area will be evaluated. This AOI is along the north side of the east-west trending drainage channel present along the north side of Sanders Island (refer to Figure 3-8). The area is approximately 700 feet west of Bear Creek and roughly 1 mile north of the former Bear Island RR-1. The re-location and “mag and dig” investigation approach (see Section 3.1) will be applied to Area Q. However, an area-wide “mag and dig” investigation approach may be applied to select portions of this AOI and adjacent areas, as site conditions warrant.

### 3.8.18 Area R: Anomalies South of Sanders Island

Four high-priority AGS anomalies of varying magnetic moments will be evaluated within an approximate 1-acre area adjacent to the drainage way along the south side of Sanders Island (refer to Figures 3-7 and 3-11). This tidal marsh area is approximately 0.5 mile north-northwest of the former Bear Island RR-1. The re-location and “mag and dig” investigation approach (see Section 3.1) will be applied to Area R. However, an area-wide “mag and dig” investigation approach may be applied to select portions of this AOI and adjacent areas, as site conditions warrant.

### 3.8.19 Area S: Anomalies North of Sanders Island

Three high-priority AGS anomalies identified within an approximate 0.4-acre area along the north side of the east-west-trending drainage channel present along the north side of Sanders Island will be investigated (refer to Figure 3-8). This AOI is approximately 1,400 feet southwest of Bear Creek and roughly 0.8 mile north of the former Bear Island RR-1. The re-location and “mag and dig” investigation approach (see Section 3.1) will be applied to Area S. However, an area-wide “mag and dig” investigation approach may be applied to select portions of this AOI and adjacent areas, as site conditions warrant.

## 3.9 MEC Intrusive Investigation and Removal Operations

MEC/MPPEH intrusive investigation and removal operations will follow the anomaly reacquisition, anomaly re-location and “mag and dig”, and/or the area-wide anomaly “mag and dig” investigation approaches, as outlined in Section 3.1 and described below.

### 3.9.1 Anomaly Reacquisition

The anomaly reacquisition approach will be used to locate and intrusively investigate the terrestrial DGM anomalies identified within proposed investigation Area E. These geophysical anomalies will be reacquired by the UXO intrusive investigation team using a real-time kinematic or other GPS units, conventional Total Station survey equipment, or fiducial positioning. After locating the approximate anomaly position, an EM61-MK2 will be used to confirm the position of the anomaly, and the anomaly will be investigated via intrusive excavation using hand excavation tools (see below).

If the anomaly is not immediately intrusively investigated, the location will be flagged for later investigation purposes. A polyvinyl chloride flag will be marked with a unique identifier number (recorded in indelible ink) and will be placed approximately 1 foot north of the actual anomaly location.

### 3.9.2 Anomaly Re-location and Area-wide “Mag and Dig” Approaches

**Re-location/“Mag and Dig” Approach:** The UXO field team will “mag and dig” within the anomaly access corridors/walkways established by the field team, beginning at the most accessible location of the AOI (refer to Figure 3-1). From this initial AOI access point, the team will traverse along an access corridor towards an identified AGS or terrestrial DGM anomaly location using GPS latitude and longitude values. Each access corridor will be surveyed for metallic objects by the UXO team using a handheld analog detector instrument (Schonstedt GA-52CX magnetometer and/or a White’s XLT metal detector) while moving toward the next identified anomaly location. During this survey action, the UXO technician will move the instrument back and forth, from one side of the corridor to the other (3 to 5 feet wide or as applicable), at a pace to ensure that the entire access corridor has been evaluated and that the instrument is able to appropriately respond to subsurface anomalies.

Once the anomaly proposed for investigation is located in the field using latitude and longitude values previously derived from the GIS and a GPS field unit, an area surrounding the anomaly location [roughly 10 to 15 feet away (radius) in each direction from the anomaly location, depending on site conditions] will be investigated using the “mag and dig” approach. GPS readings will be collected and recorded at the location of each metallic item found within the expanded investigation area. Vegetation will not be cleared as part of this expanded investigation; therefore, the additional investigation area will be limited to only accessible portions of the surrounding site. As field conditions allow, additional portions of the AOI may be investigated using the area-wide “mag and dig” approach (see below).

**Area-wide Approach:** “Mag and dig” investigations will be conducted in large, continuous, and contiguous areas, where feasible. This approach will be followed where there is a high density of AGS and/or terrestrial DGM anomalies in accessible areas of the AOI, such as intertidal beaches or elevated (dry) ground. In this case, the corners and/or boundaries of the “mag and dig” area will be documented using GPS equipment, and individual search lanes or transects will be established within the area. The UXO technician will move forward from one end of the lane to the opposite baseline. Depending on field conditions, the team may use either handheld instruments or the digital EM61-MK2 to perform the area-wide “mag and dig” activity.

### 3.9.3 Anomaly Excavation

Excavation of individual geophysical anomalies will be performed by qualified UXO technicians using hand-excavation tools. The anomalies will be investigated to a depth of 2 feet bgs or until water is encountered. If the anomaly source remains deeper than 2 feet and the investigation excavation is dry, the CH2M HILL site manager and PM will be contacted to decide if further (deeper) investigation is warranted.

The UXO teams performing this work will be composed of at least one UXO Technician II and up to four UXO Technicians II or I, supervised by a UXO Technician III. The following basic techniques will be used for anomaly excavation:

- Until identified otherwise, the source of the anomaly is assumed to be MEC. The excavation will be initiated adjacent to the anomaly and will continue until the excavated area has reached a depth below the top of the source of the anomaly, as indicated by frequent inspection with an appropriate geophysical instrument, or until water is encountered in the excavation.
- Using progressively smaller and more-delicate tools to carefully remove the soil, the excavation team will expand the sidewall to expose the source of the anomaly for inspection and identification without moving or disturbing the item.
- Once the item is exposed for inspection, the excavation team will determine whether the item is MEC, MPPEH, or other debris.
  - If the item is MEC, a positive identification will be documented and confirmed by another UXO technician. If confirmed, the MEC item will be disposed of by blow-in-place (BIP) methods, or, if the item is safe to move (as confirmed by the Senior UXO Supervisor [SUXOS] and UXO Safety Officer [UXOSO]), the item may be moved for controlled detonation and/or consolidation. However, all items found must stay within the designated boundary of the Off-Base SDZs MRA. For MEC, including suspect munitions items, the SUXOS and UXOSO must conclude that the risk associated with movement is acceptable and that the movement is necessary for the efficiency of the activities being conducted or the protection of people, property, or critical assets. In such cases, the responsible SUXOS and UXOSO must agree with the risk determination and document this decision in writing before the MEC or suspect munitions item is moved. UXO-qualified personnel may conclude that MPPEH is safe for onsite movement. Written documentation and concurrence of the UXOSO is not required.
  - Following demolition or removal of the MEC, MPPEH, or other debris, the area will be rechecked with an appropriate geophysical instrument to ensure that another item was not hidden beneath the removed item or otherwise remaining within the excavation depth. The excavation team will then record the results of the excavation and backfill the hole to be even with the surrounding ground surface. The UXO team will then move to the next anomaly location or continue with the investigation of the selected area within the AOI using the “mag-and-dig” approach.
  - If the item is considered “other debris,” it will be collected (as practical) and segregated from MEC or MPPEH. If the “debris” item is considered too large to collect (large items, heavy items, or items that will create an H&S issue for the field investigation team), the item will be photographed, logged, and left in place.
  - If the item is MEC or MPPEH, the procedures presented in Sections 4, 5, and 6 of this Work Plan Addendum will be followed.

The following information will be recorded during the anomaly identification and intrusive investigation field:

- Team personnel
- Weather conditions
- Geophysical instrument type and serial number
- Proposed AOI identifier (refer to Sections 3.6 and 3.8)

- Proposed anomaly identifier
- Field action start and stop times
- A record of the number of anomalies identified and investigated
- Amount (estimated weight) and type of cultural (other) debris found
- Amount (estimated weight) and type of munitions found and documented as MDAS
- Amount of MEC or MPPEH found, along with type, location, depth, description, and size of item recovered
- A digital photograph of each MEC and/or MPPEH item recovered

This information will be recorded into the site logbook, along with dig sheets and/or the Munitions Response Site Information Management System (CH2M HILL, 2008b).

### **3.10 Geospatial Information and Electronic Submittals**

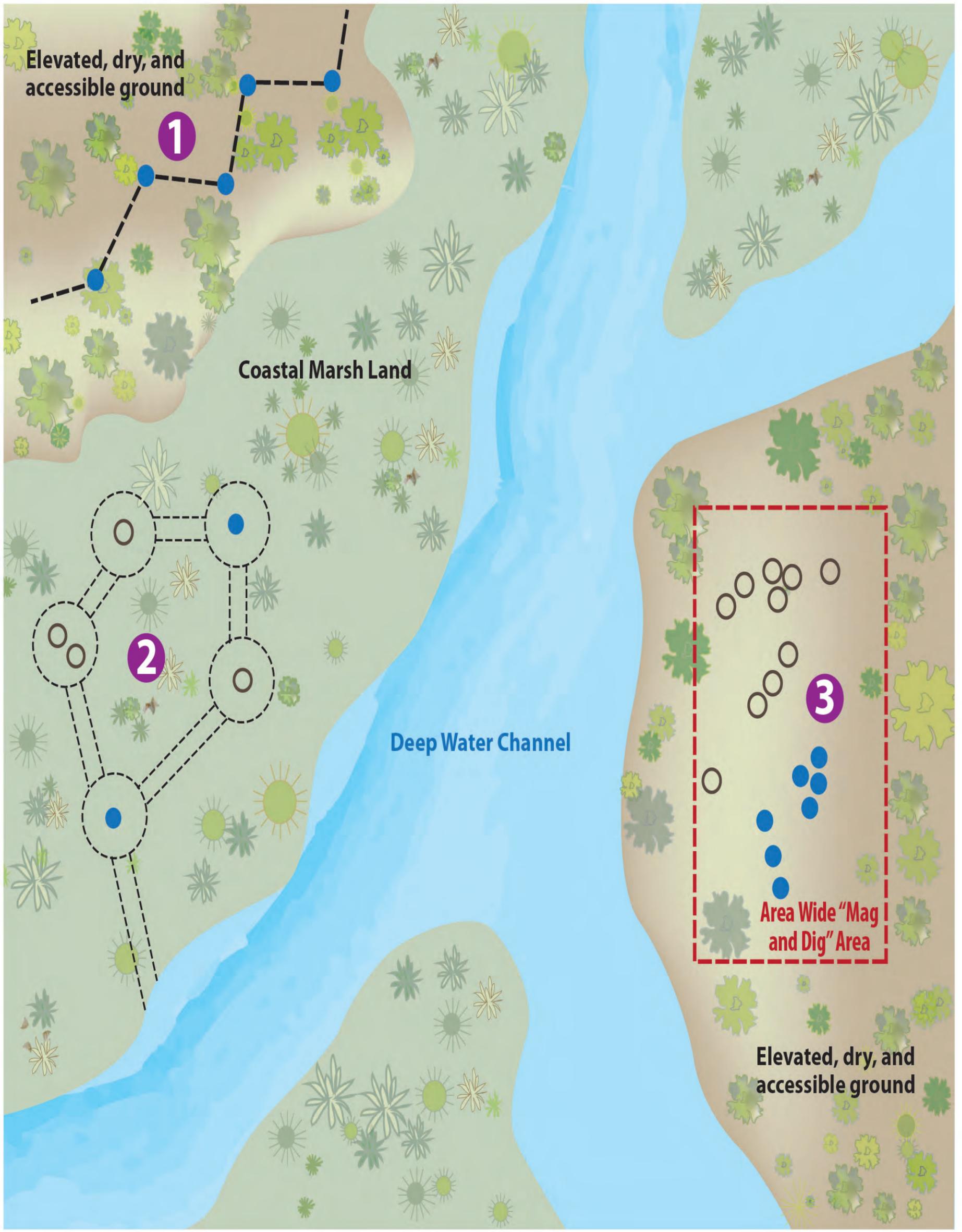
Methods, equipment, accuracy, and submittal requirements for location surveys and mapping are described in Section 7.4 of the MRP MPP (CH2M HILL, 2008a).

### **3.11 Site Restoration and Demobilization**

Damage caused by site activities will be repaired to the extent possible and as necessary to prevent erosion. Full demobilization will occur when the project is completed and appropriate quality assurance (QA)/QC checks have been performed.

The following activities will occur before demobilization begins:

- Confirm that the proposed site reconnaissance action has been completed and documented
- Confirm that intrusive investigation actions have been completed at all of the proposed AOIs and anomaly locations
- Confirm that any proposed investigation area or AOI that could not be accessed by the UXO team during the field effort is properly documented in the site logbook
- Confirm that the approximate total size of all “mag and dig” investigation areas have been recorded (in square feet or acres) and corresponding GPS coordinates of each area have been logged
- Confirm the number of QC seeds found and identified, along with their corresponding GPS coordinates
- If required, confirm that BIP measures, and the associated environmental sampling, has been properly completed
- If required, confirm that the handling of IDW is complete
- Confirm that adequate site restoration is complete
- Confirm that all field equipment has been inspected, packaged, and shipped to the appropriate location



- Legend**
- 1** Reacquisition and Intrusive Investigation Approach
  - 2** Re-location and "Mag and Dig" Investigation Approach
  - 3** Area-wide "Mag and Dig" Investigation Approach
  - Terrestrial DGM Anomaly Location
  - AGS Anomaly Location
  - Access Pathway
  - "Mag and Dig" Access Pathway and Investigation Area



Figure 3-1  
 Anomaly Investigation Approaches  
 Expanded Site Inspection Work Plan  
 Off-Base Surface Danger Zones  
 MCIEAST-MCB CAMLEJ  
 North Carolina





**Legend**

High Priority AGS Anomaly Moments (Amps - Square Meters)	Installation Boundary
0-3	Off-Base SDZs
4-8	
9-19	
20-56	
57-115	

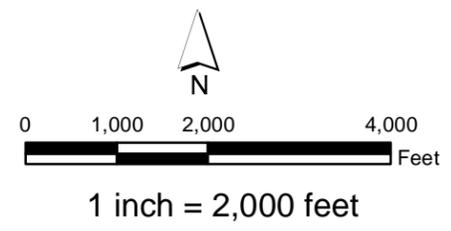


Figure 3-2  
 Retained High Priority AGS Anomaly Locations  
 Expanded Site Inspection Work Plan  
 Off-Base Surface Danger Zones  
 MCI EAST-MCB CAMLEJ  
 North Carolina

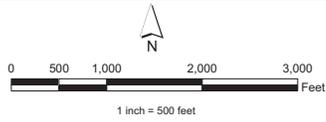
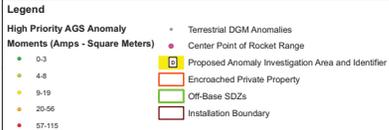
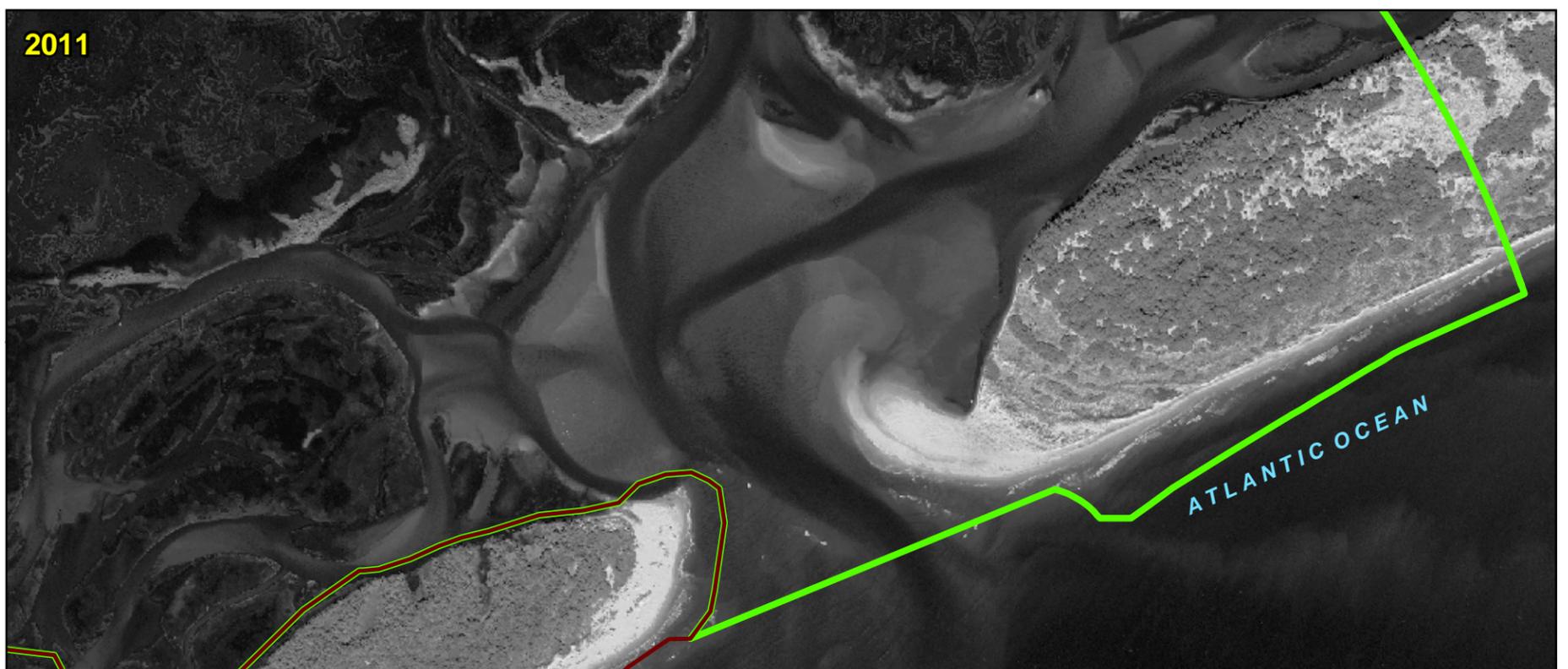
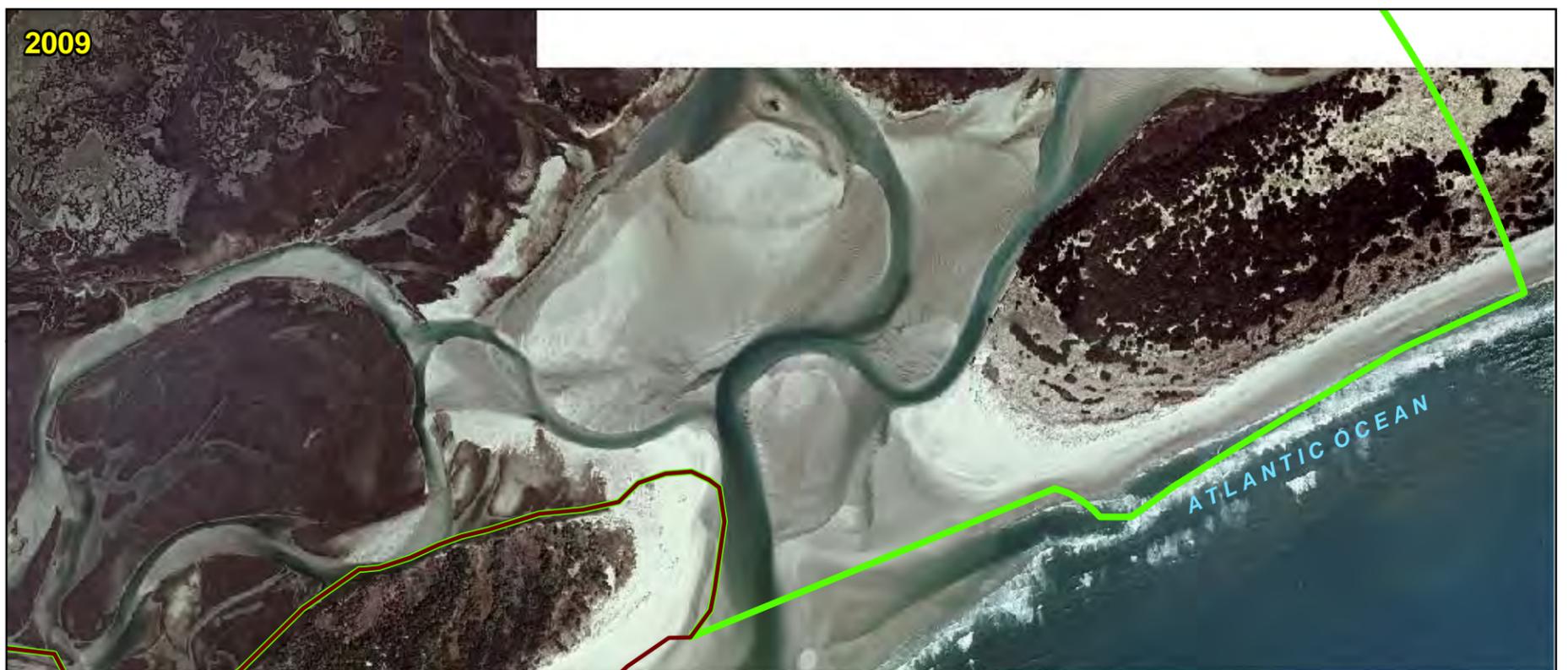
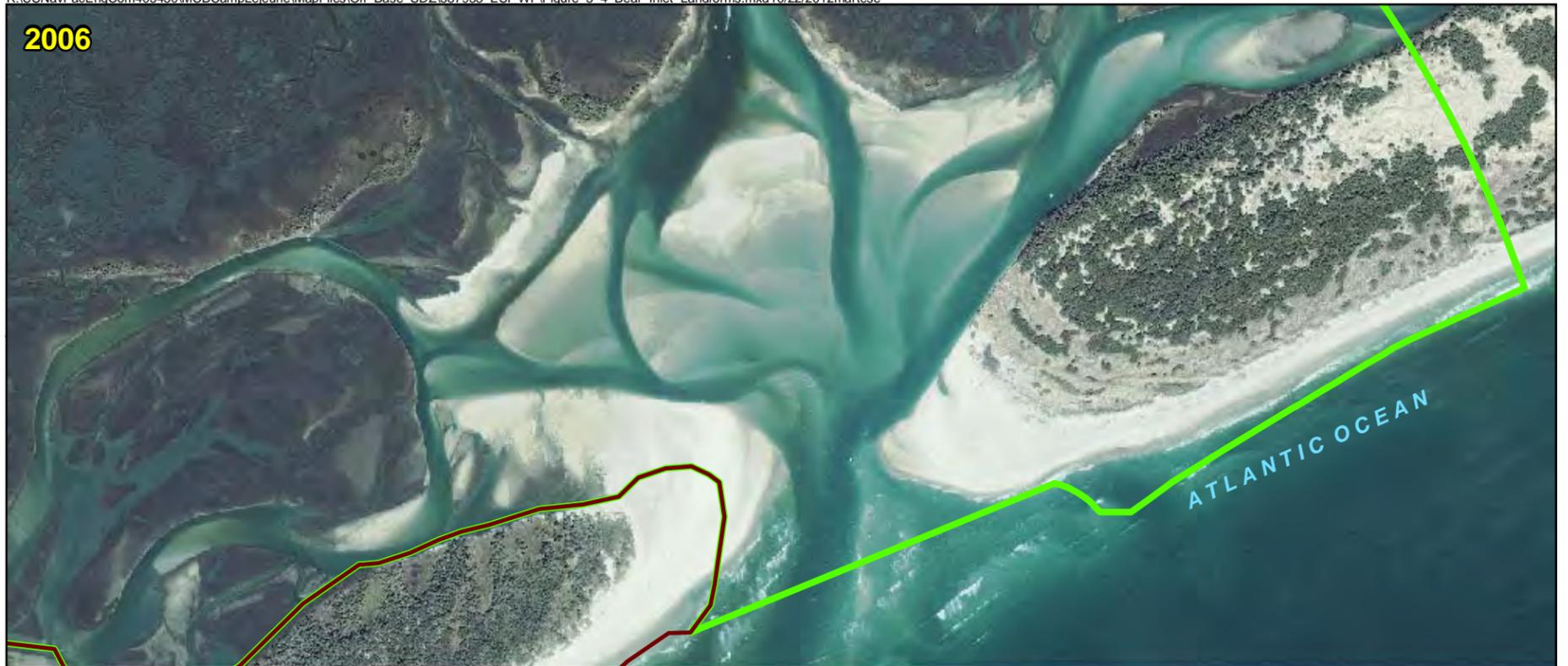


Figure 3-3  
 Phase I and II Proposed AOIs  
 Expanded Site Inspection Work Plan  
 Off-Base Surface Danger Zones  
 MCI EAST-MCB CAMLEJ  
 North Carolina



**Legend**  
Off-Base SDZs  
Installation Boundary

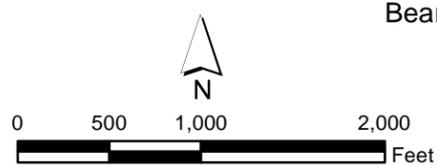
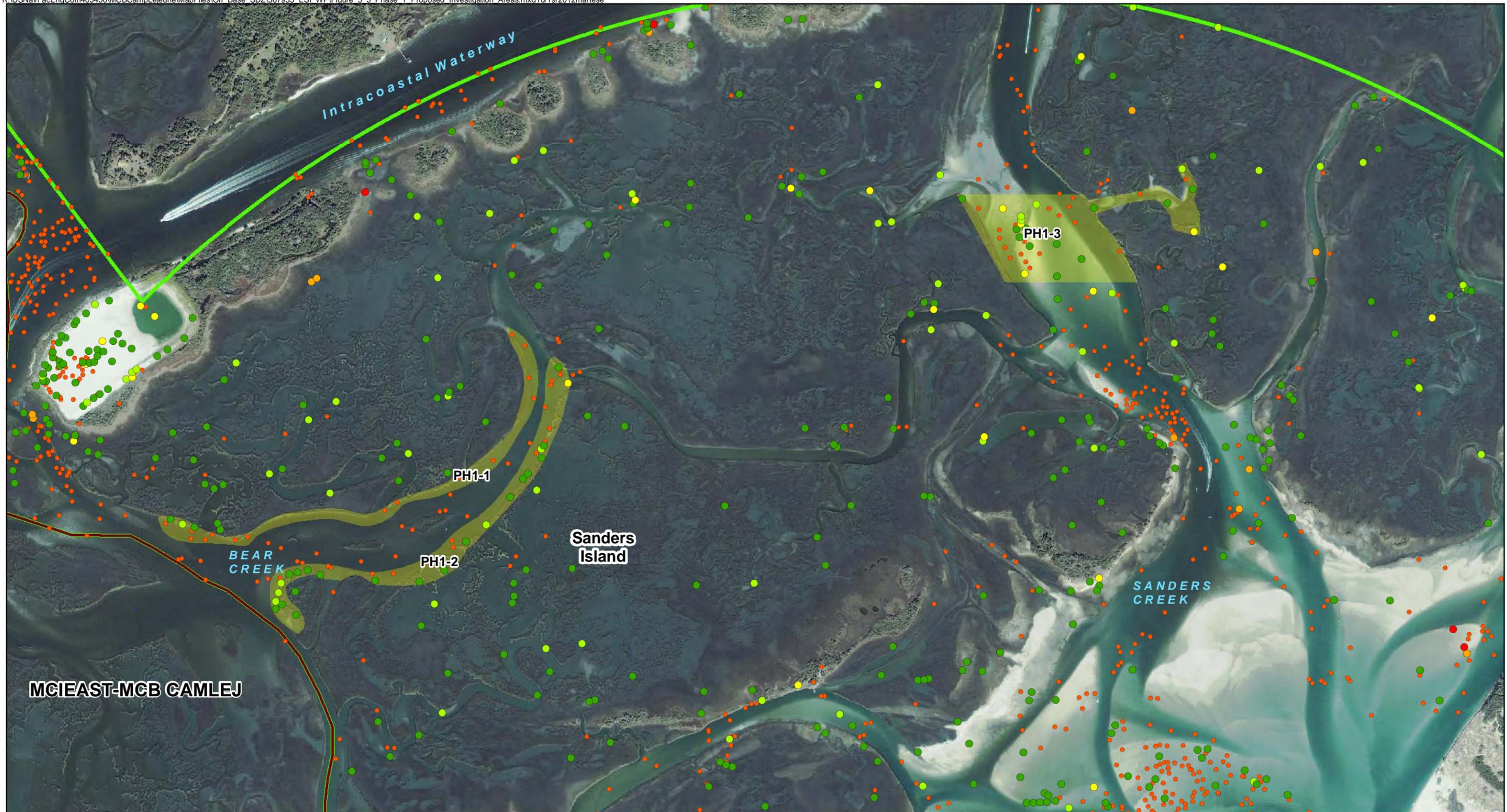


Figure 3-4  
Bear Creek Inlet Landforms - 2006, 2009, and 2011  
Expanded Site Inspection Work Plan  
Off-Base Surface Danger Zones  
MCIEAST-MCB CAMLEJ  
North Carolina



- Legend**
- High Priority AGS Anomaly Moments (Amps - Square Meters)
    - 0-3
    - 4-8
    - 9-19
    - 20-56
    - 57-115
  - AGS Anomalies (Sky Research)
  - Investigation Area
  - Installation Boundary
  - Off-Base SDZs

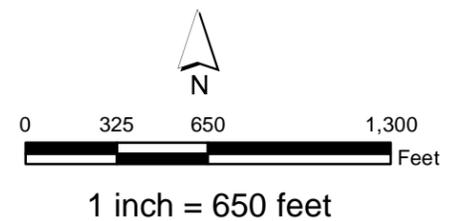


Figure 3-5  
 Phase I Proposed Investigation Areas  
 Expanded Site Inspection Work Plan  
 Off-Base Surface Danger Zones  
 MCI EAST-MCB CAMLEJ  
 North Carolina

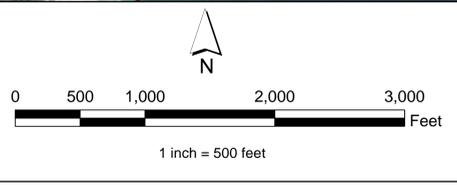
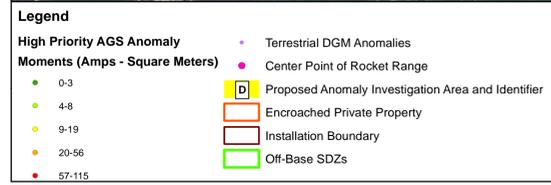


Figure 3-6  
 Phase II Proposed AOIs  
 Expanded Site Inspection Work Plan  
 Off-Base Surface Danger Zones  
 MCIEAST-MCB CAMLEJ  
 North Carolina  
 CH2MHILL



- Legend**
- High Priority AGS Anomaly Moments (Amps - Square Meters)
    - 0-3
    - 4-8
    - 9-19
    - 20-56
    - 57-115
  - Encroached Private Property
  - Proposed Anomaly Investigation Area and Area Identifier
  - Installation Boundary
  - Off-Base SDZs

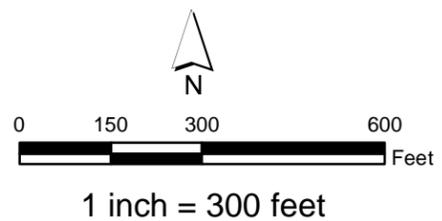


Figure 3-7  
 Phase II Proposed AOIs - SW Portion of MRA  
 Expanded Site Inspection Work Plan  
 Off-Base Surface Danger Zones  
 MCEAST-MCB CAMLEJ  
 North Carolina



- Legend**  
 High Priority AGS Anomaly Moments (Amps - Square Meters)
- 0-3
  - 4-8
  - 9-19
  - 20-56
  - 57-115

- Terrestrial DGM Anomalies
- Encroached Private Property
- Proposed Anomaly Investigation Area and Area Identifier
- Installation Boundary
- Off-Base SDZs

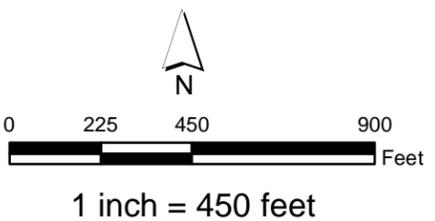


Figure 3-8  
 Phase II Proposed AOIs - ICW Islands  
 Expanded Site Inspection Work Plan  
 Off-Base Surface Danger Zones  
 MCIEAST-MCB CAMLEJ  
 North Carolina

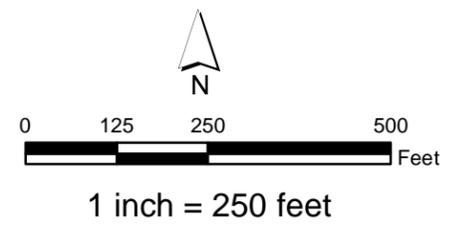
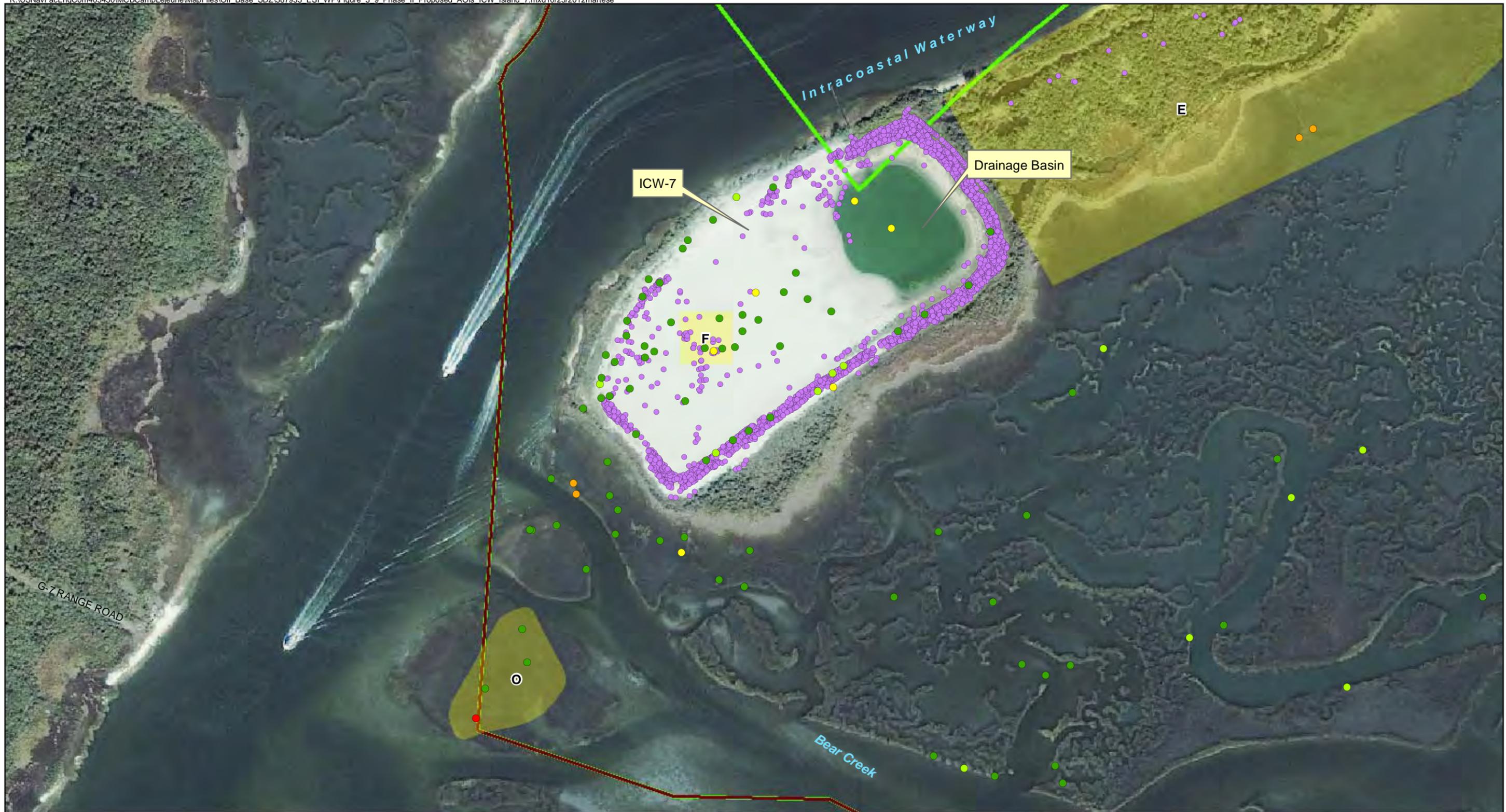


Figure 3-9  
 Phase II Proposed AOIs - ICW Island 7 Area  
 Expanded Site Inspection Work Plan  
 Off-Base Surface Danger Zones  
 MCIEAST-MCB CAMLEJ  
 North Carolina



- Legend**
- |  |   |
|--|---|
| High Priority AGS Anomaly Moments (Amps - Square Meters) | Encroached Private Property                                 |
| ● 0-3  | ● G Proposed Anomaly Investigation Area and Area Identifier |
| ● 4-8  | ■ Installation Boundary                                     |
| ● 9-19   | ■ Off-Base SDZs   |
| ● 20-56  |   |
| ● 57-115   |   |

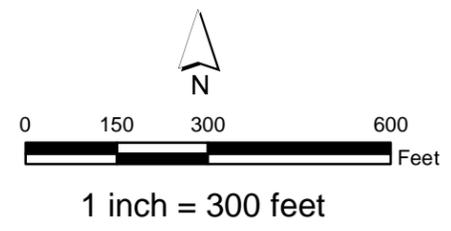
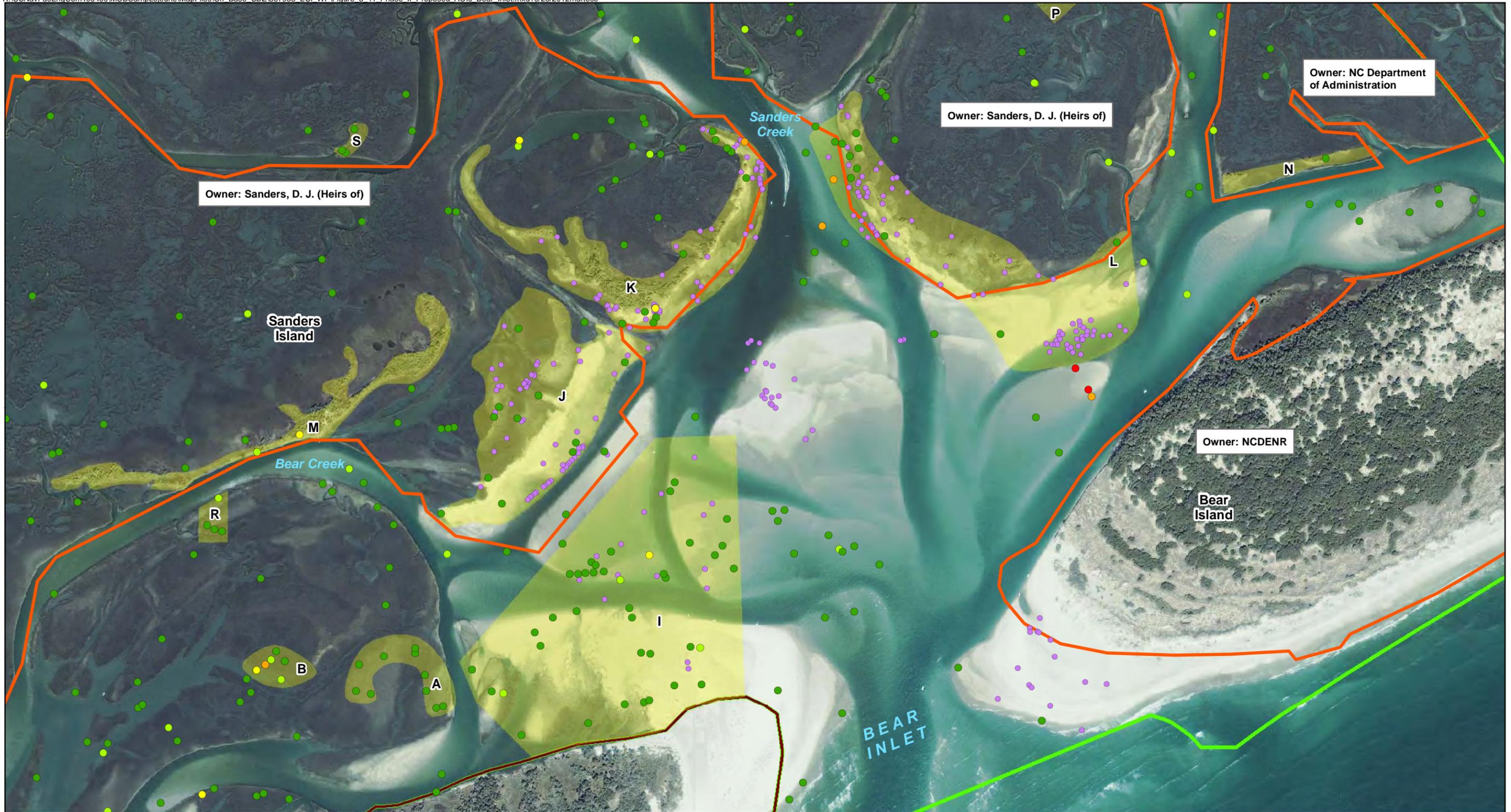


Figure 3-10  
 Phase II Proposed AOIs - Northern Portion of Bear Creek  
 Expanded Site Inspection Work Plan  
 Off-Base Surface Danger Zones  
 MCIEAST-MCB CAMLEJ  
 North Carolina



**Legend**

- |  |       |       |        |         |          |                             |                               |   |                         |                 |
|--|-------|-------|--------|---------|----------|-----------------------------|-------------------------------|---|-------------------------|-----------------|
| High Priority AGS Anomaly Moments (Amps - Square Meters) | ● 0-3 | ● 4-8 | ● 9-19 | ● 20-56 | ● 57-115 | ● Terrestrial DGM Anomalies | ○ Encroached Private Property | ■ Proposed Anomaly Investigation Area and Area Identifier | ■ Installation Boundary | ■ Off-Base SDZs |
|--|-------|-------|--------|---------|----------|-----------------------------|-------------------------------|---|-------------------------|-----------------|

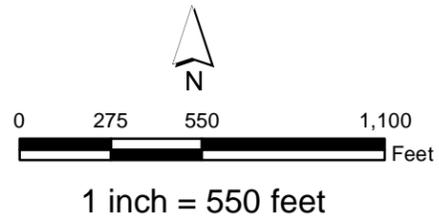


Figure 3-11  
Phase II Proposed AOIs - Bear Inlet  
Expanded Site Inspection Work Plan  
Off-Base Surface Danger Zones  
MCIEAST-MCB CAMLEJ  
North Carolina



**Legend**

High Priority AGS Anomaly Moments (Amps - Square Meters)	Terrestrial DGM Anomalies
● 0-3	● Encroached Private Property
● 4-8	■ Proposed Anomaly Investigation Area and Area Identifier
● 9-19	■ Off-Base SDZs
● 20-56	
● 57-115	

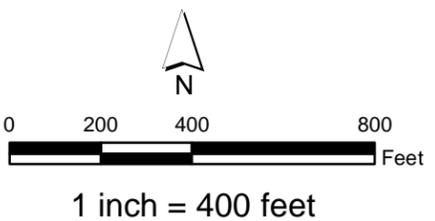


Figure 3-12  
 Phase II Proposed AOIs - NCDOA Properties  
 Expanded Site Inspection Work Plan  
 Off-Base Surface Danger Zones  
 MCIEAST-MCBCAMLEJ  
 North Carolina

# MEC and MPPEH Disposal

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This section discusses the procedures for reporting and disposing of MEC and MPPEH items encountered during the project, including the responsibilities of personnel, overall safety precautions, transportation, safe holding areas, operations in populated or sensitive areas, demolition operations, and required engineering controls and EZs for any intentional detonations.

## 4.1 MEC and MPPEH Disposition

The MEC and MPPEH disposition process is described in the Off-Base SDZs ESS Amendment (CH2M HILL, 2013).

## 4.2 Controlled Detonation

MEC and MPPEH will be disposed by controlled detonation as outlined in the ESS Amendment (CH2M HILL, 2013). The controlled detonation will be postponed if personnel or marine mammals are within the specified exclusion zone.

### 4.2.1 Overall Demolition Safety Precautions

The overall safety precautions described in Section 2.5.1 of the MRP MPP (CH2M HILL, 2008a) will be adhered to during demolition operations. The general responsibilities of project personnel are described in Section 2.4 of the MRP MPP (CH2M HILL, 2008a).

If an item is deemed unsafe to move, it will be BIP. Each required BIP action will be assigned a unique identification number (such as, SDZBIP-1), and the location of the action (latitude and longitude) will be recorded using GPS. The amount and type of charge used during the BIP will be recorded, along with the number and type of items destroyed during each BIP.

Demolition operations will be performed by a demolition team consisting of one UXO Technician III as the Demolition Supervisor and two UXO Technician II personnel, with the SUXOS responsible for the operation. UXO personnel involved in the storage and handling of demolitions will be certified in accordance with Marine Corps Order 8023. Before all planned detonations, the SUXOS will notify the stakeholders identified in the Demolition Plan. The Demolition Plan will be approved by the CH2M HILL MR H&S Manager before field demolition operations begin.

If an item is deemed safe to move, as confirmed by the SUXOS and UXOSO, it may be relocated for consolidation. Qualified UXO personnel will dispose of all MEC items using explosives demolition procedures by countercharging these items with an explosive donor charge and detonating the donor charge.

### 4.2.2 Operations in Populated and Sensitive Areas

There is one populated area located in the northern portion of the demolition operations EZ. No roads run through the MRA; however, Hammocks Beach State Park is in the southern portion of the MRA, and the ICW is located along the northern boundary of the MRA. Therefore, there is a potential for leisure and commercial watercraft to be present within the MRA and the EZ. An EZ enforcement plan will be prepared before demolition operations begin to document the steps that will be taken to ascertain that the public is not within the designated EZs.

The Off-Base SDZs MRA was divided into munitions response site (MRS) 1 and MRS 2, as determined by historical usage and maximum fragmentation distances (**Figure 4-1**).

MRS 1 comprises the full extent of the historical RR-1 SDZ and includes the historical Impact Area N-1 SDZ. The primary munition with the greatest fragmentation distance (MGFD) for MRS 1 is the 155-mm M107 (composition B filled) projectile, and the contingency MGFD for MRS 1 is the 11.75-inch Mk3 Mod 0 (Tiny Tim) 500-lb semi-AP bomb.

MRS 2 is composed of the northern portion of the historical G-6 Artillery Range SDZ. The primary MGFDF for MRS 2 is the 155-mm M107 (composition B filled) projectile, and the contingency MGFDF for MRS 2 is the 155-mm M101 projectile.

Explosive safety quantity distance (ESQD) arcs were developed based on the MGFDF calculations for intentional detonation, as shown on **Figures 4-2, 4-3, and 4-4**, and as identified in **Table 4-1**. **Figure 4-2** and **Figure 4-3** show the primary and contingency ESQD arcs for MRS 1, and **Figures 4-4 and 4-5** show the primary and contingency ESQD arcs for MRS 2. The maximum fragmentation distances-horizontal (MFDs-H) and hazardous fragmentation distances (HFDs) are summarized in **Table 4-1**.

TABLE 4-1  
Exclusion Zone Parameters

MRS within the MRA	MGFDF Type	Munitions Item	MFD-H (feet) <sup>a</sup>	HFD (feet) <sup>a</sup>
MRS 1	Primary	155-mm M107 (Composition B Filled)	2,630	450
MRS 1	Contingency	11.75-inch Mk 3 Mod 0 (Tiny Tim) 500-lb semi-AP Bomb	4,068	613
MRS 2	Primary	155-mm M107 (Composition B Filled)	2,630	450
MRS 2	Contingency	155-mm M101	2,894	450 <sup>b</sup>

<sup>a</sup> From the Data Fragmentation Review Form (CH2M HILL, 2013)

<sup>b</sup> The HFD for the primary MGFDF is utilized because it is greater than the contingency MGFDF.

For controlled detonation operations, engineering controls, including the Buried Explosion Module (BEM) and sandbag mitigation, where authorized, will be utilized. Figures 4-2, 4-3, 4-4, and 4-5 show the ESQD arcs for engineering controls and controlling items.

If a MEC item with a fragmentation distance greater than that of the primary MGFDF is encountered during this project at MRS 1, the contingency MGFDF for MRS 1 will be used. If a MEC item is found at MRS 1 with a fragmentation distance greater than the contingency MGFDF, or if a MEC item is found at MRS 2 with a fragmentation distance greater than the primary MGFDF, an amendment to the ESS will be prepared.

### 4.3 MPPEH Disposal

MPPEH will be visually inspected and independently re-inspected for explosives hazards in accordance with the requirements of Department of Defense Instruction (DoDI) 4140.62 (DoD, 2008), DoD 4160.21-M, Chapter 4, Paragraph B (DoD, 1997), and Ordnance Pamphlet-5 Volume 1, Chapters 13–15 (Naval Sea Systems Command, 2011). Only UXO-qualified personnel will perform these inspections. A UXO Technician III will perform the 100-percent inspection and document that the MPPEH is free of explosive hazards. In accordance with Ordnance Pamphlet -5, Section 13-15.7.2 (Naval Sea Systems Command, 2011) and/or DoDI 4140.62 (DoD, 2008), the UXO Quality Control Specialist (UXOQCS) will conduct the re-inspection and document that the MPPEH is free of explosive hazards. Upon documentation of these two visual inspections, the MPPEH becomes MDAS.

Demolition operations will be conducted on MPPEH that cannot be documented as MDAS. The SUXOS may choose to store such MPPEH for consolidated demolition operations in accordance with the requirements in the ESS Amendment.

If necessary, demilitarization of the MDAS will be conducted. DD Form 1348-1 (series) will be used as 100 percent inspection and 100 percent re-inspection documentation. All DD 1348-1 (series) forms will clearly show the following information in typed or printed letters:

- Name of SUXOS and the Government representative
- Organization

- Two signatures not in the same chain of command (for example, a UXO Technician III and the UXOQCS)
- The two signatures will be authorized by letter from the contractor to the Commanding Officer Engineering Command, Mid-Atlantic, and via the NAVFAC Mid-Atlantic PM
- Contractor's office
- Field office phone number(s) of the persons certifying and verifying the MDAS
- Basic material content (type of metal - for example, steel or mixed)
- Estimated weight
- Unique identification of each sealed container
- Location where MDAS was obtained
- Seal identification, if different from the unique identification of the sealed container

As part of the transfer of MDAS to an off-Base facility for final disposition, the following statement will be entered on each DD Form 1348-1 (series) and will be signed by the SUXOS and the UXOQCS:

*The material listed on this form has been inspected or processed by DDESB-approved means, as required by DOD policy, and to the best of my knowledge and belief does not pose an explosive hazard.*



- Legend**
- MRS 1
  - MRS 2
  - Installation Boundary

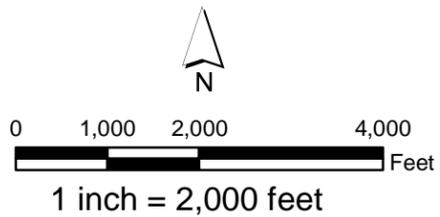


Figure 4-1  
Off-Base SDZ MRS Divisions  
Expanded Site Inspection Work Plan  
Off-Base Surface Danger Zones  
MCIEAST-MCB CAMLEJ  
North Carolina



- Legend**
- Entry Control Point
  - MPPEH Collection Point
  - MDAS Collection Point
  - MPPEH Collection Point PTR (317 ft)
  - MPPEH Collection Point HFD EZ, 20 lb (529 ft)
  - Intentional Detonation EZ, using Sandbag Mitigation, All Personnel (220 ft)
  - Unintentional Detonation EZ, Public and Non-Essential Personnel (450 ft)
  - Intentional Detonation EZ, All Personnel (2,630 ft)
  - MRS 1
  - MCIEAST-MCB CAMLEJ Installation Boundary

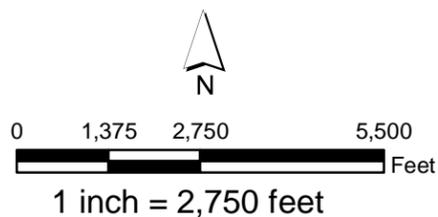
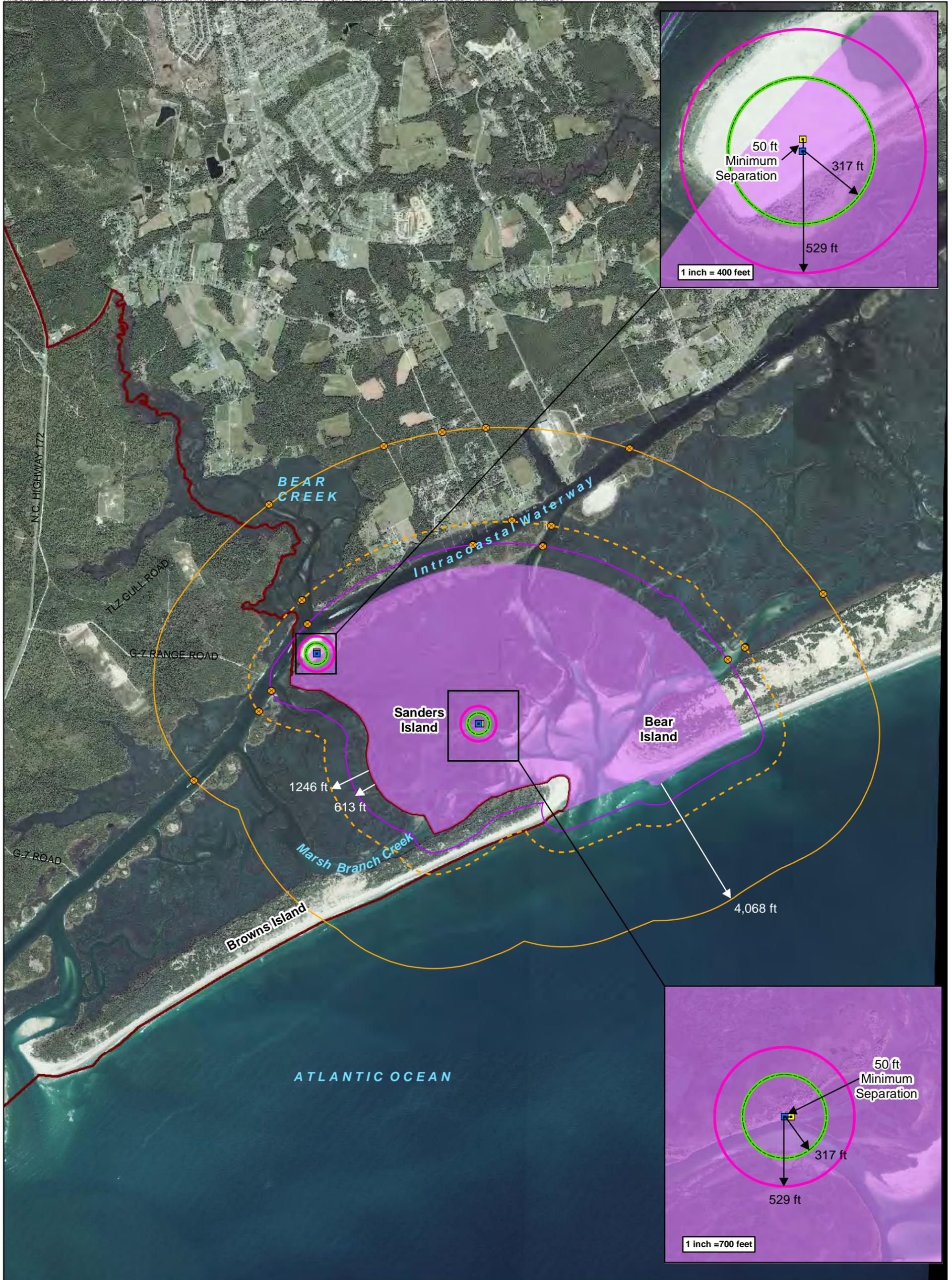


Figure 4-2  
 MRS 1 - Primary ESQD Arcs  
 (155 mm M107 [Composition B filled])  
 Expanded Site Inspection Work Plan  
 Off-Base Surface Danger Zones  
 MCIEAST-MCB CAMLEJ  
 North Carolina





- Legend**
- Entry Control Point
  - MPPEH Collection Point
  - MDAS Collection Point
  - MPPEH Collection Point PTR (317ft)
  - MPPEH Collection Point HFD EZ, 20 lb (529 ft)
  - Intentional Detonation EZ, using BEM (6 ft Depth), All Personnel (1246 ft)
  - Intentional Detonation EZ, All Personnel (4,068 ft)
  - Unintentional Detonation EZ, Public and Non-Essential Personnel (613 ft)
  - MRS 1
  - MCB CamLej Installation Boundary

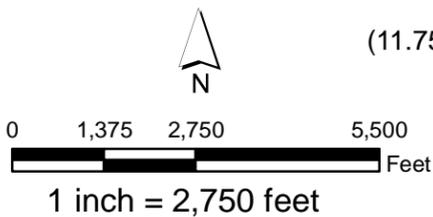


Figure 4-3  
 MRS 1 - Contingency ESQD Arcs  
 (11.75 in Mk 3 Mod 0 (Tiny Tim) 500 lb SAP Bomb)  
 Expanded Site Inspection Work Plan  
 MCIEAST-MCBCAMLEJ  
 North Carolina



**Legend**

- Entry Control Point
- MPPEH Collection Point
- MDAS Collection Point
- MPPEH Collection Point PTR (317 ft)
- MPPEH Collection Point HFD EZ, 20 lb (529 ft)
- Intentional Detonation EZ, Controlling Item using Sandbag Mitigation, All Personnel (220 ft)
- Intentional Detonation EZ, All Personnel (2,630 ft)
- Unintentional Detonation EZ, Public and Non-Essential Personnel (450 ft)
- MRS 2
- MCIEAST-MCB CAMLEJ Installation Boundary

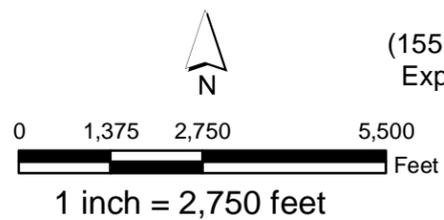


Figure 4-4  
 MRS 2 - Primary ESQD Arcs  
 (155 mm M107 [Composition B filled])  
 Expanded Site Inspection Work Plan  
 Off-Base Surface Danger Zones  
 MCIEAST-MCB CAMLEJ  
 North Carolina





**Legend**

- ⊗ Entry Control Point
- MPPEH Collection Point
- MDAS Collection Point
- MPPEH Collection Point PTR (317 ft)
- MPPEH Collection Point HFD EZ, 20 lb (529 ft)
- Intentional Detonation EZ, All Personnel (2,894 ft)
- - - Intentional Detonation EZ, using BEM 95 ft Depth, All Personnel (358 ft)
- - - Unintentional Detonation EZ, Public and Non-Essential Personnel (450 ft)
- MRS 2
- ▭ MCIEAST-MCB CAMLEJ Installation Boundary

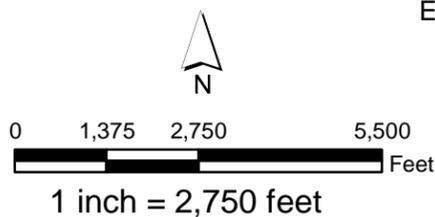


Figure 4-5  
 MRS 2 - Contingency ESQD Arcs  
 (155 mm M101)  
 Expanded Site Inspection Work Plan  
 Off-Base Surface Danger Zones  
 MCIEAST-MCB CAMLEJ  
 North Carolina



# Post-detonation Sampling

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The use of explosives during a controlled detonation or BIP operation could potentially affect the surrounding soils. Therefore, soil samples will be collected at locations where controlled detonations and BIP operations are conducted. Composite surface soil samples will be collected from both inside and outside of the detonation crater, using the TR-02-1 sampling method inside the resulting crater, and the incremental sampling method outside of the crater, described as follows. QA/QC samples will be collected in accordance with the UFP-QAPP (**Appendix B**). The site manager will coordinate with the task manager, PM, and project chemist to obtain the necessary sampling equipment and laboratory bottles.

## 5.1 TR-02-1 Surface Soil Sampling – Inside Crater

Surface soil samples from inside the controlled detonation and BIP crater will be collected using the TR-02-1 approach described in the U.S. Army Corps of Engineers (USACE) *Technical Report Engineer Research and Development Center (ERDC)/ Cold Regions Research and Engineering Laboratory (CRREL) TR-02-1, Guide for Characterization of Sites Contaminated with Energetic Materials* (Thiboutot, et al., 2002). This surface soil sampling will follow the SOPs provided in **Appendix C**.

## 5.2 Incremental Surface Soil Sampling – Outside Crater

The use of explosives during the MEC intrusive investigation could also affect the soils ejected from the controlled detonation and BIP crater. Therefore, surface soil samples will be collected outside the crater using the incremental sampling method. These surface soil samples will be obtained following the SOPs provided in **Appendix C**.

## 5.3 Sample Analysis

Samples from both inside and outside the detonation crater will be analyzed by a fixed-base laboratory for the following parameters (see Appendix C):

- Explosives residues, including pentaerythritol tetranitrate and nitroglycerin (SW-846 USEPA Method 8330)
- Perchlorate (SW-846 USEPA Method 6850)
- Target analyte list metals including mercury (SW-846 USEPA Methods 6010C and 7471B)

One duplicate sample will be taken from the composited sample collected outside the detonation crater. Analytical data obtained from both inside and outside the crater will be validated.

## 5.4 Analytical Requirements and Sample Handling

### 5.4.1 Sample Preservation and Handling

As required, sample preservation must occur in the field immediately after collection and will be consistent with the UFP-QAPP (**Appendix B**). The laboratory-supplied bottles will be pre-preserved with the appropriate analyte-specific preservative. QA/QC samples will be collected in the same types of preserved containers as the field samples. The preservatives and holding time requirements for analysis are shown in **Appendix B**.

### 5.4.2 Quality Assurance and Quality Control

QA/QC requirements for environmental sampling, handling, and management are detailed in the UFP-QAPP (**Appendix B**). Field QC samples (including equipment blanks, duplicate samples, and matrix spike/matrix spike duplicate [MS/MSD] samples) will be collected during the investigation and submitted for laboratory analysis. Required QA/QC samples and the required frequency of collection are summarized in **Appendix B**.

### 5.4.3 Sample Identification System

The following is a general guide for sample identification; an electronic sample-tracking program will be used to manage the flow of information from the field sampling team to the laboratory and to internal and external data

users. The tracking program is used to manage the entry of sampling-related data, such as station locations and field measurements.

While in the custody of the sampling team, the sample analysis data will be recorded in field logbooks, along with the Post-Detonation Soil Sampling Data Sheet. Sample labels will be either electronically pre-printed from the laboratory and/or completed in the field in indelible ink by the field sampling team. The following information typically is included on the sample label:

- Site or project name or identifier
- BIP location identifier (refer to Section 4.2.1)
- Unique sample identification number
- Date and time of sample collection
- Sampler’s initials
- Sample matrix or matrix identifier
- Type of analyses to be conducted

Each analytical sample will be assigned a unique number using the following format:

*Site#-Media/Station# or QA/QC-Year/Quarter or Depth Interval*

An explanation of each of these identifiers is given as follows.

- Site#:** This investigation includes MRP Off-Base SDZs MRA under the MRP. Therefore, the prefix “OSDZ-” will be used
- Media:** SS = Surface soil
- Station#:** Each sampling location will be identified with a unique identification number.
- Inside/Outside Crater:** IC = Inside Crater  
OC = Outside Crater
- Date:** The year and quarter will be indicated using the final two digits of the current year and the letters A, B, C, D will be used to indicate the quarter.

**January 2013 = “13A”**

Under this sample designation format, “OSDZ-SS01-OC-12A” would mean the following:

- OSDZ-SS01-OC-13A      MRP Off-Base SDZs MRA
- OSDZ-SS01-OC-13A      Surface soil sample from location #1, outside crater
- OSDZ-SS01-OC-13A      Sample was collected in the first quarter of 2013

This sample designation format will be followed throughout the project. Required deviations to this format in response to field conditions will be documented in the log book.

- QA/QC:** D = Duplicate sample (following sample type/number)  
FB = Field blank  
ER = Equipment rinsate

All MS/MSD samples will be entered in the same line as the field sample on the chain-of-custody form. The total number of sample containers submitted will be entered on the chain-of-custody form and “MS/MSD” will be indicated in the comments section.

### 5.4.4 Sample Packaging and Shipping

Samples will be packaged and shipped following Section 14.8 of the SOPs in Appendix C.

SECTION 6

# Explosives Management Plan

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Explosives to support the removal and disposal of MEC and MPPEH items that may be discovered during the investigation at the Off-Base SDZs MRA will be managed in accordance with Section 3 of the MRP MPP (CH2M HILL, 2008a). Authorization for demolition operations will be obtained from MCIEAST-MCB CAMLEJ Range Control, and notifications will be made to other agencies and stakeholders, such as the U.S. Coast Guard and the Onslow County Sheriff's Office.

SECTION 7

# Explosives Siting Plan

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Explosives safety criteria for planning and siting explosives operations for the MEC intentional detonation operations at the Off-Base SDZs MRA are provided in Section 4 of the MRP MPP (CH2M HILL, 2008a). There are no planned or established MEC detonation areas. MEC will be BIP where it is found, or, if the item is safe to move, it may be relocated for demolition (refer to Section 4).

## SECTION 8

# Quality Control Plan

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All applicable work conducted by CH2M HILL and its subcontractors at the Off-Base SDZs MRA will be performed in accordance with the QCP in Section 8 of the MRP MPP (CH2M HILL, 2008a). The QCP describes the QC approach and procedures to be employed during the investigation of the Off-Base SDZs MRA. The QCP is divided into two parts:

- **Section 8.1** addresses environmental investigation activities
- **Section 8.2** addresses MEC avoidance, surveying, and DGM activities

Included in the anomalies for excavation are the QC seeds placed in the investigation areas before the 2010 terrestrial DGM investigation. QC seeds placed within the area of Bear Inlet may have moved over time as a result of the dynamic coastal environment and therefore may not be reacquired or physically identified during this investigation. Also, some QC seeds placed in 2010 may not be present within the boundaries of the selected AOIs (refer to Section 3) and therefore may not be reacquired or physically identified during the ESI field action.

# Environmental Protection Plan

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A summary of the regional ecology is provided in Section 9.1 of the MRP MPP (CH2M HILL, 2008a).

## 9.1 Endangered and Threatened Species within the Project Site

Many protected species have been sighted in the vicinity of and on MCIEAST-MCB CAMLEJ, such as the American bald eagle, piping plover, red-cockaded woodpecker, American alligator, green sea turtle, loggerhead sea turtle, seabeach amaranth, and rough-leaf loosestrife (USMC, 2006). **Table 9-1**, presented at the end of this section, lists species that could occur in Onslow County and are listed as threatened, endangered, or of special concern by the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act of 1973, as amended.

The red-cockaded woodpecker would not occur in the Off-Base SDZs MRA because the habitat is unsuitable for this species. Recent aerial photography indicates that habitat in the Off-Base SDZs MRA consists of scrubland, relatively small coastal live oak, and open dunes. There is no pine forest habitat in the Off-Base SDZs MRA. No impacts to this species would result.

The bald eagle was removed from the USFWS endangered and threatened species list in August 2007 and is currently protected under the MBTA (16USC703712, as amended 1918), which protects all migratory birds, the Bald and Golden Eagle Protection Act (16USC668, amended 1962), and the *National Bald Eagle Management Guidelines* (USFWS, 2007). Vegetation in the Off-Base SDZs MRA is unsuitable for nesting or roosting by the bald eagle. However, non-nesting eagles may use the Off-Base SDZs MRA as transients or for foraging. The Off-Base SDZs MRA is approximately 90 percent coastal wetlands or waterways and may be used by eagles for foraging when humans are not present. No negative impacts to bald eagles are expected.

Suitable habitat for the piping plover exists at the point of Hammocks Beach State Park. The Atlantic coast populations of piping plovers tend to prefer sandy beaches close to the primary dunes of barrier islands and coastlines. The species prefers sparsely vegetated open sand, gravel, or cobble for nesting sites and forage along the rack line where the tide washes onto the beach. Piping plovers may occur on or adjacent to the barrier island, Bear Island, within the Off-Base SDZs MRA, where suitable habitat along the Atlantic Ocean coastline occurs. Piping plovers may be present at the site for feeding, breeding, or nesting. In 2001, USFWS designated several areas along the North Carolina coast as critical wintering habitat for the piping plover, with the closest habitat occurring at New Topsail Inlet, 35 miles down the coast from the Off-Base SDZ MRA (USMC, 2006).

The American alligator is listed on the federal threatened and endangered species list due to its similarity of appearance to the American crocodile. Potentially suitable habitat for the American alligator exists at the Off-Base SDZs MRA, and the species may occur in the project area. The American alligator would not nest in the Off-Base SDZs MRA because the vegetation is unsuitable. The species would be expected to leave the area during the high level of human activity associated with the project. No impact to this species is expected.

The federally protected marine species (such as the green sea turtle, leatherback sea turtle, loggerhead sea turtle, and West Indian manatee) listed in **Table 9-1** potentially inhabit the Off-Base SDZs MRA. Beaches and foraging habitat for the marine species, such as sea grass for manatees, are found in the area. The green sea turtle and the loggerhead sea turtle are listed as threatened and are known to nest at MCIEAST-MCB CAMLEJ on Onslow Beach, approximately 6 miles down the coast from the Off-Base SDZs MRA. The loggerhead sea turtle is known to nest on Bear Island in Hammocks Beach State Park and may nest within the Off-Base SDZs MRA. Either of the sea turtles may forage or nest in the Off-Base SDZs MRA. Sea turtle nesting occurs from mid-May to mid-August, with hatchlings emerging through November. Nesting sites for the leatherback sea turtle, federally listed as endangered, have been confirmed on the North Carolina coast within 60 miles from the Off-Base SDZs MRA (Rabon et al., 2003). Protective measures outlined in the Integrated Natural Resource Management Plan for MCIEAST-MCB CAMLEJ will apply to any species of turtle that nests on Onslow Beach (USMC, 2006) and may be

applied to off-Base sightings as well. For example, wildlife technicians monitor turtle activity along the beaches during the nesting season from May to November. When observed, the turtles nesting in areas likely to be disturbed will be relocated to a more suitable spot. No impacts to these species are expected.

The federally listed rough-leaved loosestrife does not occur in marshes or on islands. It would not occur in the Off-Base SDZs MRA. No impacts to rough-leaved loosestrife would occur.

Seabeach amaranth is an annual that has been described as a dune-builder because it frequently occupies areas seaward of primary dunes, often growing closer to the high tide line than any other coastal plant. As such, this plant is generally found along Onslow Beach (approximately 6 miles from the Off-Base SDZs MRA), and it is known to occur in scattered locations on Bear Island within the Off-Base SDZs MRA. However, there are no concentrations of the plant on Bear Island. Seabeach amaranth is an annual plant, and its location cannot be reliably predicted from year to year.

The remaining species listed in **Table 9-1** are not expected to exist at the Off-Base SDZs MRA. No adverse impacts to listed species are expected to result from the proposed work within the Off-Base SDZs MRA. However, should MEC be found near a sensitive species occurrence, USFWS would be contacted before demolition procedures were initiated. Project design features have been developed to prevent impacts to listed species.

## 9.2 Migratory Birds within the Project Site

The federal MBTA is an applicable or relevant and appropriate requirement in accordance with CERCLA requirements. The MBTA protects listed birds, as well as their eggs and active nests (nests containing eggs or non-fledged young). Numerous bird species listed under the MBTA may occur or nest in the coastal marshland or the woody vegetation that are found throughout the Off-Base SDZs MRA. Destruction of an active nest or causing adults to abandon an active nest would be violations of the MBTA.

Vegetation clearing could destroy active nests or cause nest abandonment if conducted in spring or summer. Should the intrusive activities occur in spring or summer, the following measures would be implemented:

- Proposed work areas and an additional 150 feet around the proposed work areas would be surveyed for bird nests before intrusive investigation work begins.
- Inactive nests would be destroyed.
- Active nest locations would be mapped using a GPS receiver capable of 1-meter accuracy.
- A buffer of 120 feet would be established around active nests using GIS software.
- The nest buffers would be provided to the field investigation crews as a GIS data layer for the GPS units used during the intrusive investigations.
- No work would occur within the designated nest buffers and the field crews would not enter these areas.
- Active nests would be examined every 7 to 10 days by an avian biologist to monitor ongoing nest status.
- Active nests cannot be removed without a Navy decision regarding obtaining a depredation permit from USFWS. Work in these areas would be delayed until a permit is obtained, a CERCLA permit waiver is determined to be appropriate, or the fledglings leave the nest. Once young have fledged from a nest, the intrusive investigation would be allowed to proceed in the area of that nest.

Should work occur outside of the nesting period (fall or winter), the above measures would not be required.

## 9.3 Wetlands within the Project Site

Jurisdictional wetland areas occur within the Off-Base SDZs MRA. Approximately 75 percent of the Off-Base SDZs MRA is coastal marshland. Work in wetland areas will be avoided to the extent practical. To provide access to the geophysical anomalies, vegetation removal may be necessary. Vegetation would be cut at or just above ground level and the roots would be left in place. No significant soil disturbance is anticipated from planned site work as

described in this Work Plan Addendum. Excavation of 3-foot by 3-foot holes to a depth of 2 feet would be a minor disturbance to marshland, but these holes would be backfilled and the topsoil, with the intact root mat, returned to the surface, limiting any impacts to short-term and minor in significance. If an excavation occurred in a high-velocity area that would be subject to scour, additional stabilization measures would be implemented by placing inert, biodegradable erosion netting over the backfilled area.

Because there will be no significant ground disturbance, a stormwater pollution prevention plan will not be required. However, if the potential for runoff to jurisdictional wetlands exists, appropriate protection measures will be put in place.

## **9.4 Dune Grasses within the Project Site**

The presence of vegetation, especially dune grasses, is important for the stability of beach dunes. Some of the land-based investigation area may contain dune grasses. Appropriate measures will be put in place to prevent disturbance of dune grass root systems and maintain dune stability. When traversing dune areas, field team personnel would avoid walking in the same path to minimize the potential for creating trenches in a dune.

## **9.5 Cultural and Archaeological Resources within the Project Site**

The probability that any significant cultural or archeological resources will be affected by the field investigation is low. If any cultural or archaeological materials or resources are discovered within the project investigation area, the Base archaeologist and the North Carolina Office of the State Archaeologist will be notified to provide guidance on performing further work in the area.

## **9.6 Water Resources within the Project Site**

Approximately 1,460 acres of the 1,619-acre Off-Base SDZs MRA is within the ICW or the Bear Creek and coastal wetlands. No water resources are expected to be affected by the project. Should clearing of vegetation be required in areas adjacent to a water body, appropriate silt barriers or other best management practices will be put in place to prevent sediment from migrating to the water body.

## **9.7 Coastal Zones within the Project Site**

Onslow County is subject to the rules and policies of the North Carolina Coastal Resources Commission, which administers the Coastal Area Management Act (CAMA). Federal projects within a state's coastal zone are reviewed under the Coastal Zone Management Act, which requires that a proposed federal action be consistent, to the maximum extent practicable, with the relevant enforceable policies of the state's coastal management program. North Carolina's coastal zone management program consists of, but is not limited to, CAMA, the State's dredge and fill law, Chapter 7 of Title 15A of North Carolina Administrative Code, and the land use plan of the county and/or local municipality in which the proposed project is located.

The investigation at Off-Base SDZs MRA will involve intrusive investigations, using hand tools, in a very limited area. There will be no potential to affect any coastal use or resources from the investigation. As outlined in Subpart "C" of 15 Code of Federal Regulations 930, the U.S. Marine Corps (USMC) has concluded that the proposed project would have no effects on any coastal use or resource. In addition, a negative determination analysis was submitted for similar work adjacent to the MRA (USMC, 2007). Regardless, the USMC will submit a Consistency Determination to the North Carolina Division of Coastal Management in advance of the proposed work.

Should it be discovered through collection of new or additional information that development, as defined under CAMA, would occur under the proposed, project further coordination with Division of Coastal Management would be initiated.

## 9.8 Vegetation to be Removed within the Project Site

Vegetation may be removed to access geophysical anomaly locations in heavily wooded or saw grass areas. Vegetation smaller than 3 inches in diameter will be removed to 6 inches above ground surface to allow access in these areas. Felled vegetation would be removed from the immediate investigation area, but left onsite and away from the ICW. Large trees, if present, will be avoided to the extent practicable during path clearing.

## 9.9 Existing Waste Disposal Sites within the Project Site

No known waste disposal sites are present within the area of investigation.

## 9.10 Compliance with Applicable or Relevant and Appropriate Requirements

CH2M HILL will follow all applicable regulations concerning environmental protection, pollution control, and abatement for the proposed project work, as described in Section 9.3 of the MRP MPP (CH2M HILL, 2008a). No permits have been identified to be required for the proposed work.

## 9.11 Detailed Procedures and Methods to Protect and/or Mitigate the Resources and Sites Identified

During the proposed work, a general survey of the project area will be conducted by the field personnel to identify obvious environmental concerns. The PM, in conjunction with a qualified ecologist, will provide instructions to field personnel regarding the protection of onsite environmental resources. Such protective measures will include, but are not limited to, the following:

- Should federally protected plants be identified within the project area, the specimens will be flagged for easy relocation and verification.
- Should federally protected animals be identified within the project area, the specimens will be flagged.
- Should active nests of migratory birds be identified in the project area, the measures identified in Section 9.2 would be implemented.
- Should cultural or archaeological material or resources be discovered within the project area, a qualified archaeologist will be notified to provide guidance on performing further work in the area.
- The PM will seek the guidance of the qualified ecologist to identify appropriate mitigation measures in the event that the work activities affect an environmental resource.

TABLE 9-1

Species Potentially Occurring on or Adjacent to MCIEAST-MCB CAMLEJ, in Onslow County, Listed as Threatened, Endangered, or of Special Concern by USFWS

*Site-Specific Work Plan Addendum*

*Off-Base SDZs*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scientific Name	Common Name	Federal Status	Habitat
<i>Anguilla rostrata</i>	American eel	FSC	The American eel is catadromous; it spawns in oceanic waters but uses freshwater and brackish and estuarine systems for most of its developmental life. Migrates in autumn to the Sargasso Sea to spawn. Occurs usually in permanent streams with continuous flow. Hides during the day in undercut banks and in deep pools near logs and boulders.
<i>Chelonia mydas</i>	Green sea turtle	T	Green turtles are generally found in fairly shallow waters (except when migrating) inside reefs, bays, and inlets. The turtles are attracted to lagoons and shoals with an abundance of marine grass and algae. Open beaches with a sloping platform and minimal disturbance are required for nesting.

TABLE 9-1

Species Potentially Occurring on or Adjacent to MCIEAST-MCB CAMLEJ, in Onslow County, Listed as Threatened, Endangered, or of Special Concern by USFWS

*Site-Specific Work Plan Addendum*

*Off-Base SDZs*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scientific Name	Common Name	Federal Status	Habitat
<i>Caretta caretta</i>	Loggerhead sea turtle	T	The loggerhead is widely distributed within its range. It may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers.
<i>Dermochelys coriacea</i>	Leatherback sea turtle	E	An open-ocean species, it sometimes moves into shallow bays, estuaries, and even river mouths.
<i>Trichechus manatus</i>	West Indian manatee	E	Manatees inhabit both salt and fresh water of sufficient depth (1.5 meters to usually less than 6 meters) throughout their range.
<i>Alligator mississippiensis</i>	American alligator	T(S/A)	Rivers, swamps, estuaries, lakes, and marshes
<i>Charadrius melodus</i>	Piping plover	T	Open, sandy beaches close to the primary dune of the barrier islands and coastlines of the Atlantic for breeding. They prefer sparsely vegetated open sand, gravel, or cobble for a nest site. They forage along the rack line where the tide washes up onto the beach.
<i>Aimophila aestivalis</i>	Bachman's sparrow	FSC	Occurs only in pine forests of the southeastern United States
<i>Haliaeetus leucocephalus</i>	American bald eagle	T	A single bald eagle's nest is found on MCIEAST-MCB CAMLEJ - at the junction of Sneads Creek and the New River near the back gate. Three protective buffers have been established at approximately 750 feet, 1,000 feet, and 1,500 feet from the nest site.
<i>Laterallus jamaicensis</i>	Black rail	FSC	Marsh and wetlands; The "Eastern" black rail can be found in appropriate saltmarsh habitat along the eastern seaboard from Connecticut to Florida and along the Gulf Coast.
<i>Acipenser brevirostrum</i>	Shortnose sturgeon	E	Sturgeon inhabit the lower sections of larger rivers and coastal waters along the Atlantic coast. They may spend most of the year in brackish or salt water and move into fresh water only to spawn. The fish feeds on invertebrates (shrimp, worms, and so forth) and stems and leaves of macrophytes.
<i>Rana capito capito</i>	Carolina crawfish frog	FSC	Carolina crawfish frogs live primarily in the sandhills and pine barrens of the North Carolina Coastal Plain. Crawfish frogs are more terrestrial than most frogs, generally only coming to the water to breed. They are also nocturnal, spending daylight hours underground in burrows.
<i>Puma concolor cougar</i>	Eastern cougar	E	No preference for specific habitat types has been noted. The primary need is apparently for a large wilderness area with an adequate food supply. Male cougars of other subspecies have been observed to occupy a range of 25 or more square miles, and females from 5 to 20 square miles.
<i>Passerina ciris ciris</i>	Eastern painted bunting	FSC*	Found mainly in southern states and Mexico, where the brushy, weedy shrub-scrub habitat that this bird prefers abounds.
<i>Ammodramus henslowii</i>	Eastern Henslow's sparrow	FSC	A species of tallgrass prairies, agricultural grasslands, and pine savannas of the eastern United States; the species migrates south to spend the non-breeding season in the native pine savanna habitats of the southeastern United States.
<i>Ophisaurus mimicus</i>	Mimic glass lizard	FSC	This species is found in the southeastern Coastal Plain. They are most common in pine flatwoods and open woodlands.
<i>Picoides borealis</i>	Red-cockaded woodpecker	E	For nesting and roosting habitat, open stands of pine containing trees 60 years old and older. Red-cockaded woodpeckers need live, older pines in which to excavate their cavities. Longleaf pines ( <i>Pinus palustris</i> ) are most commonly used, but other species of southern pine are also acceptable. Dense stands (stands that are primarily hardwoods, or that have a dense hardwood understory) are avoided. Foraging habitat is provided in pine and pine hardwood stands 30 years old or older with foraging preference for pine trees 10 inches or larger in diameter. In good, moderately stocked pine habitat, sufficient foraging substrate can be provided on 80 to 125 acres.

TABLE 9-1

Species Potentially Occurring on or Adjacent to MCIEAST-MCB CAMLEJ, in Onslow County, Listed as Threatened, Endangered, or of Special Concern by USFWS

Site-Specific Work Plan Addendum

Off-Base SDZs

MCIEAST-MCB CAMLEJ, North Carolina

Scientific Name	Common Name	Federal Status	Habitat
<i>Heterodon simus</i>	Southern hognose snake	FSC	These snakes are found in sandy fields and woods of the Coastal Plain, particularly in the Sandhills region.
<i>Agrotis buchholzi</i>	Buchholz's dart moth	FSC	Found in forested wetlands, scrub-shrub wetlands, shrubland and chaparral, and coniferous woodlands. This moth is mostly found in recently burned habitats. Populations can persist up to about a decade or rarely two without fire, until litter accumulates sufficiently to cover food plants. In most cases, habitat is probably suboptimal beginning about 5 years after a fire.
<i>Atrytonopsis sp.</i>	Skipper	FSC	One species, the dusteds, are fairly rare at the coast but found throughout North Carolina ( <i>A. hianna</i> ). An assumption is made that the genus is generally defined.
<i>Isoetes microvela</i>	Quillwort	FSC	Quillworts are usually restricted to areas of clean water where other plants are absent. Occasionally, quillwort may grow partly or entirely out of the water.
<i>Rhexia aristosa</i>	Awned meadowbeauty	FSC	Found in a variety of wet habitats in the Coastal Plain from New Jersey to Alabama.
<i>Lobelia boykinii</i>	Boykin's lobelia	FSC	Grows in swamps and cypress ponds from the coastal plain of Delaware to Florida. The lower portion is often immersed in water, at least seasonally.
<i>Solidago pulchra</i>	Coastal goldenrod	FSC	Bogs, freshwater habitats, grasslands
<i>Parnassia caroliniana</i>	Carolina grass-of-parnassus	FSC	Bogs, freshwater habitats, grasslands
<i>Trillium pusillum var. pusillum</i>	Carolina trillium	FSC	Grows in alluvial woods, pocosin borders, and savannas.
<i>Asplenium heteroresiliens</i>	Carolina (wagner) spleenwort	FSC	Rock outcrops
<i>Rhynchospora pleiantha</i>	Coastal beaksedge	FSC	Extremely rare; found at fewer than 25 sites throughout its North Carolina-to-Alabama range.
<i>Solidago villosicarpa</i>	Coastal goldenrod	FSC	Known to occur in only five populations in three counties in eastern North Carolina. Three of these populations occur on MCIEAST-MCB CAMLEJ. The other sites are in Pender and Brunswick counties. Currently, the North Carolina Natural Heritage Program is conducting a survey of likely habitat to look for coastal goldenrod.
<i>Thalictrum cooleyi</i>	Cooley's meadowrue	E	Cooley's meadowrue occurs in moist to wet bogs and savannas. It grows along fireplow lines, roadside ditches, woodland clearings, and powerline rights-of-way and needs some type of disturbance to maintain its open habitat.
<i>Carex lutea</i>	Golden sedge	E	Biologists have located golden sedge in only eight locations, all in coastal savannas in Onslow and Pender counties that are underlain by calcareous, or chalk, deposits.
<i>Sagittaria weatherbiana</i>	Grassleaf arrowhead	FSC	Found in shallow water of brackish swamps
<i>Dichantherium sp.</i>	Hirst's panic grass	FSC	Worldwide, Hirst's panic grass occurs in four extant populations. Historically, it was found in coastal plain habitats in New Jersey, Delaware, North Carolina, and Georgia. Currently, Hirst's panic grass is known to exist in one site in Delaware and two known sites in North Carolina, both of which are on MCIEAST-MCB CAMLEJ.
<i>Myriophyllum laxum</i>	Loose watermilfoil	FSC	Riparian habitats
<i>Calopogon multiflorus</i>	Many-flower grass-pink	FSC	Grasslands, pinelands; typically in wet areas

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Species Potentially Occurring on or Adjacent to MCIEAST-MCB CAMLEJ, in Onslow County, Listed as Threatened, Endangered, or of Special Concern by USFWS

*Site-Specific Work Plan Addendum*

*Off-Base SDZs*

*MCIEAST-MCB CAMLEJ, North Carolina*

Scientific Name	Common Name	Federal Status	Habitat
<i>Plantago sparsiflora</i>	Pineland plantain	FSC	Savannas, roadsides, and ditches
<i>Lindera melissifolia</i>	Pondberry	E	Associated with wetland habitats such as bottomland and hardwoods in the interior areas, and the margins of sinks, ponds and other depressions in the more coastal sites. The plants generally grow in shaded areas but may also be found in full sun.
<i>Litsea aestivalis</i>	Pondspice	FSC	Freshwater habitats
<i>Lysimachia asperulaefolia</i>	Rough-leaved loosestrife	E	Species generally occurs in the ecotones or edges between longleaf pine uplands and pond pine pocosins (areas of dense shrub and vine growth usually on a wet, peaty, poorly drained soil), on moist to seasonally saturated sands and on shallow organic soils overlaying sand. Rough-leaved loosestrife has also been found on deep peat in the low shrub community of large Carolina bays.
<i>Amaranthus pumilus</i>	Seabeach amaranth	T	Occurs on barrier island beaches
<i>Allium sp.</i>	Savanna onion	FSC	Wet savannas
<i>Scleria sp.</i>	Smooth-seeded hairy nutrush	FSC	Dry woods, pineland, and savannas ( <i>S. triglomerata</i> )
<i>Rhynchospora decurrens</i>	Swamp forest beakrush	FSC	Swamp forests, very rare
<i>Solidago verna</i>	Spring-flowering goldenrod	FSC	The only spring-flowering goldenrod that occurs in the Sandhills and Coastal Plain of the Carolinas. It can be found in a wide array of habitats, including pine savannas, pocosins, and pine barrens
<i>Rhynchospora thornei</i>	Thorne's beaksedge	FSC	Bogs, freshwater habitats, pinelands
<i>Dionea muscipula</i>	Venus flytrap	FSC	Bogs, pinelands

E = Endangered—A taxon in danger of extinction throughout all or a significant portion of its range.

T = Threatened—A taxon likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

FSC = Federal species of special concern—species may or may not be listed in the future.

T(S/A)—Threatened due to similarity of appearance (such as the American alligator)—a species that is threatened due to similarity of appearance with other rare species and is listed for its protection. These species are not biologically endangered or threatened and are not subject to Section 7 consultation.

\*Historical record—the species was last observed in the county more than 50 years ago.

# References

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- CH2M HILL. 2008a. *MCB Camp Lejeune Munitions Response Program Master Project Plans, Marine Corps Base Camp Lejeune, North Carolina*. May.
- CH2M HILL. 2008b. *Master Project Plan, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina*. June.
- CH2M HILL. 2009a. *Site Specific Work Plan Addendum for Preliminary Assessment/Site Inspection Off-Base Surface Danger Zones*. October.
- CH2M HILL. 2009b. *Explosives Safety Submission Munitions Response Activities Off-Base Surface Danger Zones (ESS-110), Marine Corps Base Camp Lejeune, Jacksonville, North Carolina*. September.
- CH2M HILL. 2011a. *Focused Preliminary Assessment/Site Inspection Off-Base Surface Danger Zones Report*. October.
- CH2M HILL. 2011b. *Community Outreach Strategy for the Investigation of Off-Base Surface Danger Zones (SDZs) at Marine Corps Installations East-Marine Corps Base Camp Lejeune*. November.
- CH2M HILL. 2013. *Explosives Safety Submission Munitions Response Activities Off-Base Surface Danger Zones (ESS-128), Amendment No. 1, Marine Corps Installations East-Marine Corps Base Camp Lejeune, Jacksonville, North Carolina*. date pending.
- Department of Defense (DoD). 1997. *DoD 4145.26-M, Contractors Safety Manual for Ammunition and Explosives*. August.
- DoD. 2008. *DoDI 4140.62, Material Potentially Presenting an Explosive Hazard*. November 25.
- Marine Corps Base Camp Lejeune (MCB CamLej). 2009. *Investigation of Off-Base Surface Danger Zones (SDZs)*. June
- Naval Sea Systems Command. 2011. *Ordnance Publication 5 Volume 1, Ammunition and Explosives Ashore: Safety Regulations for Handling, Storing, Production, Renovation, and Shipping of Ammunition and Explosives Ashore, Seventh Revision, Change 10*. July.
- Naval Ordnance Safety and Security Activity (NOSSA). 2011. *Instruction 8020.15C. Explosives Safety Review, Oversight, and Verification of Munitions Responses*. February 10.
- Rabon Jr., D., S. Johnson, R. Boettcher, M. Dodd, M. Lyons, S. Murphy, S. Ramsey, S. Roff, and K. Stewart. 2003. *Confirmed Leatherback Turtle (Dermochelys coriacea) Nests from North Carolina, with a Summary of Leatherback Nesting Activities North of Florida*. Marine Turtle Newsletter No. 101.
- Sky Research, Inc. 2010. *HeliMag Survey Report, Camp Lejeune Off-Base Surface Danger Zones Onslow County, North Carolina*. March.
- Thiboutot, S., G. Ampleman, and A.D. Hewitt. 2002. *Technical Report Engineer Research and Development Center/ Cold Regions Research and Engineering Laboratory TR-02-1, Guide for Characterization of Sites Contaminated with Energetic Materials*. United States Army Corps of Engineers, Engineer Research and Development Center.
- United States Army Corps of Engineers (USACE). 2001a. *Final Range Identification and Preliminary Range Assessment, MCB Camp Lejeune, Onslow, North Carolina*. St. Louis District. December.
- USACE. 2001b. *Archives Search Report, MCAS Cherry Point, New Bern, North Carolina*. St. Louis District. December.
- USACE. 2001c. *Final Range Identification and Preliminary Range Assessment, MCAS Cherry Point, New Bern, North Carolina*. St. Louis District. December.
- United States Fish and Wildlife Service (USFWS). 2007. *National Bald Eagle Management Guidelines*. May.
- United States Marine Corps (USMC). 2006. *Integrated Natural Resource Management Plan 2007-2011, Marine Corps Base Camp Lejeune, Onslow County, North Carolina*. November.
- USMC. 2007. *Negative Determination Analysis for the Removal of Unexploded Ordnance (UXO) from Marches and Tidal Creeks in the N-1/BT-3 Impact Area, Marine Corps Base Camp Lejeune, North Carolina*. October.

**Appendix A**  
**Site Safety and Health Plan**

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# **Site Safety and Health Plan**

## **Expanded Site Inspection Off-Base Surface Danger Zones**

**Maine Corps Installations East-Marine Corps Base Camp Lejeune, North  
Carolina**

**Contract Task Order WE26**

**October 2012**

Prepared for

**Department of the Navy  
Naval Facilities Engineering Command  
Mid-Atlantic**

Under the

**NAVFAC CLEAN 8012 Program  
Contract No. N62470-11-D-8012**

Prepared by



**Knoxville, Tennessee**

# Contents

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Acronyms and Abbreviations .....	vii
Approval .....	ix
<b>1. Introduction .....</b>	<b>1-1</b>
1.1 CH2M HILL Policy and Commitment .....	1-2
1.1.1 Safe Work Policy .....	1-2
1.1.2 Health and Safety Commitment .....	1-2
1.1.3 Project-Specific Health, Safety, and the Environment Goals .....	1-2
<b>2. Applicability .....</b>	<b>2-1</b>
<b>3. General Project Information .....</b>	<b>3-1</b>
3.1 Project Information and Background .....	3-1
3.2 Site Background and Setting .....	3-1
3.3 Description of Tasks .....	3-2
3.3.1 HAZWOPER-regulated Tasks .....	3-2
3.3.2 Non-HAZWOPER-regulated Tasks .....	3-3
<b>4. Project Organization and Responsibilities .....</b>	<b>4-1</b>
4.1 Client .....	4-1
4.1.1 Project Manager .....	4-1
4.1.2 Responsible Health and Safety Manager .....	4-2
4.1.3 Project Environmental Manager .....	4-2
4.1.4 Safety Coordinator .....	4-2
4.1.5 UXO Safety Officer /UXO Quality Control Specialist .....	4-3
4.2 CH2M HILL Subcontractors .....	4-4
4.3 Employee Responsibilities .....	4-5
4.3.1 Employee Authority .....	4-5
4.4 Client Contractors .....	4-5
<b>5. Standards of Conduct .....</b>	<b>5-1</b>
5.1 Standards of Conduct Violations .....	5-1
5.2 Disciplinary Actions .....	5-1
5.3 Subcontractor Safety Performance .....	5-1
5.3.1 Observed Hazard Form .....	5-2
5.3.2 Stop Work Order .....	5-2
5.4 Incentive Program .....	5-2
5.5 Reporting Unsafe Conditions/Practices .....	5-2
<b>6. Safety Planning and Change Management .....</b>	<b>6-1</b>
6.1 Daily Safety Meetings and Pre-Task Safety Plans .....	6-1
6.2 Change Management .....	6-1
6.3 Agency Inspection Guidance .....	6-1
<b>7. Project Hazard Analysis .....</b>	<b>7-1</b>
7.1 Activity Hazard Analysis .....	7-1
7.2 Subcontractor Activity Hazard Analysis .....	7-1
<b>8. General Hazards and Controls .....</b>	<b>8-1</b>
8.1 Bloodborne Pathogens .....	8-1
8.2 Chemical Storage .....	8-1

8.2.1	General Storage of Flammable/Combustible Liquids .....	8-1
8.2.2	Indoor Storage of Flammable/Combustible Liquids .....	8-2
8.2.3	Outside Storage of Flammable/Combustible Liquids .....	8-2
8.2.4	Storage of Hazardous Waste .....	8-2
8.2.5	Storage of Injection Chemicals/Materials.....	8-2
8.3	Driving Safety .....	8-3
8.4	Field Vehicles .....	8-3
8.5	Electrical Safety.....	8-4
8.6	Fire Prevention.....	8-5
8.6.1	Fire Extinguishers and General Fire Prevention Practices .....	8-5
8.6.2	Dispensing of Flammable/Combustible Liquids.....	8-5
8.7	General Practices and Housekeeping .....	8-5
8.8	Hazard Communication .....	8-6
8.9	Knife Use .....	8-7
8.10	Lighting.....	8-8
8.11	Manual Lifting .....	8-9
8.12	Personal Hygiene .....	8-9
8.13	Shipping and Transportation of Hazardous Materials .....	8-9
8.14	Substance Abuse .....	8-10
<b>9.</b>	<b>Project-specific Hazard Controls .....</b>	<b>9-1</b>
9.1	Chainsaws .....	9-1
9.1.1	Equipment.....	9-1
9.1.2	PPE Requirements.....	9-1
9.1.3	Safe Operation .....	9-1
9.1.4	Refueling the Engine .....	9-2
9.2	Drum and Portable Tank Handling.....	9-2
9.3	Drum Sampling Safety.....	9-3
9.4	Excavation Activities .....	9-4
9.5	Forklift Operations .....	9-5
9.6	Hand and Power Tools .....	9-5
9.7	Munitions and Explosives of Concern and Material Potentially Presenting an Explosive Hazard... 9-6	
9.7.1	Hazard Identification.....	9-6
9.7.2	Hazard Mitigation/Prevention .....	9-7
9.7.3	MEC Avoidance Procedures .....	9-8
9.8	Underground Utilities .....	9-9
9.8.1	Background and Records Assessment of Known Utilities.....	9-9
9.8.2	Designated Local Utility Locating Service .....	9-9
9.8.3	Visual Assessment before and during Intrusive Activities .....	9-9
9.8.4	Intrusive Activities within 2 feet of an Underground Utility.....	9-10
9.9	Overhead Utilities .....	9-10
9.9.1	Proximity to Power Lines .....	9-10
9.10	Working Around Material-handling Equipment .....	9-10
<b>10.</b>	<b>Physical Hazards and Controls .....</b>	<b>10-1</b>
10.1	Noise .....	10-1
10.2	Ultraviolet Radiation (Sun Exposure).....	10-1
10.2.1	Limit Exposure Time.....	10-1
10.2.2	Provide Shade .....	10-2
10.2.3	Clothing .....	10-2
10.2.4	Sunscreen.....	10-2
10.3	Temperature Extremes .....	10-2
10.3.1	Heat.....	10-2

	10.3.2 Cold .....	10-4
10.4	Radiological Hazards .....	10-6
<b>11.</b>	<b>Biological Hazards and Controls.....</b>	<b>11-1</b>
11.1	Bees and Other Stinging Insects .....	11-1
11.2	Bird Droppings .....	11-1
11.3	Feral Dogs.....	11-1
11.4	Mosquito Bites .....	11-1
11.5	Poison Ivy, Poison Oak, and Poison Sumac.....	11-2
11.6	Snakes .....	11-3
11.7	Spiders - Brown Recluse and Widow .....	11-4
11.8	Ticks.....	11-5
	11.8.1 Clothing Options .....	11-5
	11.8.2 Skin Treatment.....	11-6
	11.8.3 Required Protective Actions .....	11-7
	11.8.4 Tick Checks .....	11-7
	11.8.5 Tick Bite and Removal.....	11-7
<b>12.</b>	<b>Contaminants of Concern .....</b>	<b>12-1</b>
<b>13.</b>	<b>Site Monitoring .....</b>	<b>13-1</b>
<b>14.</b>	<b>Personal Protective Equipment .....</b>	<b>14-1</b>
14.1	Required PPE.....	14-1
14.2	Respiratory Protection .....	14-2
	14.2.1 Respirator Change-Out Schedule.....	14-3
<b>15.</b>	<b>Worker Training and Qualification.....</b>	<b>15-1</b>
15.1	CH2M HILL Worker Training.....	15-1
	15.1.1 Hazardous Waste Operations Training .....	15-1
	15.1.2 Initial Training .....	15-1
	15.1.3 Three-Day Actual Field Experience .....	15-1
	15.1.4 Refresher Training.....	15-1
	15.1.5 Eight-Hour Supervisory Training.....	15-1
	15.1.6 First Aid/CPR .....	15-1
	15.1.7 SC Training .....	15-2
	15.1.8 Site-Specific Training.....	15-2
	15.1.9 Project-Specific Training Requirements.....	15-2
<b>16.</b>	<b>Medical Surveillance and Qualification.....</b>	<b>16-1</b>
16.1	HAZWOPER Activities.....	16-1
16.2	Job or Site-specific Medical Surveillance .....	16-1
16.3	Respirator User Qualification.....	16-1
16.4	Hearing Conservation .....	16-1
<b>17.</b>	<b>Site Control Plan .....</b>	<b>17-1</b>
17.1	Site Control Procedures .....	17-1
17.2	Controlled Areas .....	17-1
<b>18.</b>	<b>Decontamination .....</b>	<b>18-1</b>
18.1	Contamination Prevention.....	18-1
18.2	Personnel and Equipment Decontamination.....	18-1
18.3	Decontamination during Medical Emergencies.....	18-2
18.4	Waste Collection and Disposal.....	18-2
18.5	Diagram of Personnel-Decontamination Line.....	18-2

<b>19.</b>	<b>Emergency Response Plan .....</b>	<b>19-1</b>
19.1	Pre-Emergency Planning .....	19-1
19.2	Emergency Equipment and Supplies .....	19-1
19.3	Incident Response .....	19-2
19.4	Emergency Medical Treatment.....	19-2
19.5	Directions to Hospital .....	19-3
19.6	Evacuation.....	19-4
19.7	Evacuation Signals.....	19-4
19.8	Inclement Weather .....	19-4
<b>20.</b>	<b>Spill Containment Procedures .....</b>	<b>20-1</b>
<b>21.</b>	<b>Inspections.....</b>	<b>21-1</b>
21.1	Project Activity Self-Assessment Checklists .....	21-1
21.2	Safe Behavior Observations .....	21-1
<b>22.</b>	<b>Incident Notification, Reporting, and Investigation.....</b>	<b>22-1</b>
22.1	General Information .....	22-1
22.2	Section Definitions .....	22-1
	22.2.1 Incident .....	22-1
	22.2.2 Near-miss .....	22-1
	22.2.3 Serious Incident .....	22-1
22.3	Reporting Requirements.....	22-2
22.4	HITS and Incident Report Form.....	22-2
22.5	Injury Management/Return-to-Work (for US/Puerto Rico-based CH2M HILL Staff Only) .....	22-2
	22.5.1 Background .....	22-2
	22.5.2 Injury Management/Return-to-Work Notification Process.....	22-2
22.6	Serious Incident Reporting Requirements .....	22-3
	22.6.1 Serious Incident Determination.....	22-3
	22.6.2 Serious Incident Reporting.....	22-3
22.7	Incident Root Cause Analysis .....	22-5
	22.7.1 Corrective Actions.....	22-5
<b>23.</b>	<b>Records and Reports .....</b>	<b>23-1</b>

## **Attachments**

- 1 SSHP Employee Signoff Form
- 2 Chemical Inventory/Register Form
- 3 Chemical-Specific Training Form
- 4 Project Activity Self-Assessment Checklists/Permits/Forms
- 5 Key Target Zero Program Elements
- 6 Fact Sheets
- 7 Observed Hazard Form
- 8 Stop Work Order Form
- 9 Agency Inspection Target Zero Bulletin
- 10 Completed CH2M HILL AHAs:
  - Mobilization/Site Preparation
  - Soil Sampling
  - IDW Handling and Management
  - Demobilization/Cleanup
  - Boating Operations
  - Field Reconnaissance
  - Vegetation Removal
  - Loading Material for Off-site Disposal
  - MEC Demolition
- 11 Boating Operations – Self Assessment Check List
- 12 AED Program
- 13 Material Safety Data Sheets

# Acronyms and Abbreviations

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$\mu\text{g}/\text{m}^3$	micrograms per cubic meter
AHA	Activity Hazard Analysis
ASR	Archival Search Report
Base	Marine Corps Base Camp Lejeune
BDU	bomb dummy unit
CFR	Code of Federal Regulations
CO	carbon monoxide
COC(s)	contaminant(s) of concern
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
CWM	chemical warfare material
dBA	decibels, A-weighted
DDESB	Department of Defense Explosives Safety Board
DEET	N,N-diethyl-meta-toluamide
DOT	U.S. Department of Transportation
EM	environmental manager
EPA	U.S. Environmental Protection Agency
ERC	emergency response coordinator
ESBG	Environmental Services Business Group
ESI	Expanded Site Investigation
ESQD	explosives safety quantity-distance
ESS(s)	Explosives Safety Submission(s)
EZ	Exclusion Zone
FID	flame ionization detector
GFCI(s)	ground fault circuit interrupter(s)
HAZWOPER	hazardous waste operations and emergency response
HEPA	high-efficiency particulate air (filter)
HITS	Hours and Incident Tracking System
HSE	health, safety, and the environment
HSSE	Health, Safety, Security, & Environment
IDW	investigation-derived waste
IRF	Incident Report Form
JATO	jet-assisted take off
kV	kilovolt(s)
LO/TO	lockout/tagout
lpm	liters per minute
lx	lux
MC	munitions constituents
MCB CamLej	Marine Corps Base Camp Lejeune
MEC	munitions and explosives of concern
MGFD(s)	munition(s) with the greatest fragmentation distance
mm	millimeter(s)
MPPEH	material potentially presenting an explosive hazard

MR	munitions response
MSDS(s)	Material Safety Data Sheet(s)
OSHA	Occupational Safety and Health Administration
PA/SI	Preliminary Assessment/Site Inspection
PEL	permissible exposure limit
PID	photoionization detector
PIM	potentially infectious material
PM	project manager
PPE	personal protective equipment
ppm	parts per million
PTSP(s)	Pre-Task Safety Plan(s)
RCA(s)	Root Cause Analysis (Analyses)
RHSM	Responsible Health and Safety Manager
RMSF	Rocky Mountain spotted fever
SBO(s)	Safe Behavior Observation(s)
SC	safety coordinator
SCBA	self-contained breathing apparatus
SOP(s)	standard operating procedure(s)
SSHHP	Site Safety and Health Plan
SZ	Support Zone
USACE	U.S. Army Corps of Engineers
UV	ultraviolet
UXO	unexploded ordnance
UXOSO/UXOQCS	UXO safety officer/UXO quality control specialist
VO	Virtual Office (CH2M HILL intranet system)
WP	Work Plan

# Approval

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This Site Safety and Health Plan (SSHP) 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 and identified scope(s) of work and must be amended if those conditions or scope(s) of work change.

By approving this SSHP, the Responsible Health and Safety Manager (RHSM) certifies that the personal protective equipment (PPE) has been selected based on the project-specific hazard assessment.

**Original Plan**



**RHSM Approval:** John Culley/SPK, CIH

**Date:** March 16, 2012

---

**MR/UXO Safety Officer Approval:**

**Date:**

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**Field Operations Manager Approval:**

**Date:**

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**Revisions**

**Revisions Made By:**

**Date:**

**Description of Revisions to Plan:**

**Revisions Approved By:**

**Date:**

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# Introduction

CH2MHILL

**HSSE**  
**TargetZero**  
World-Class Performance



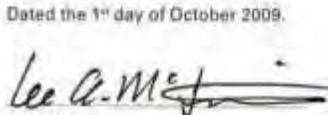
## Health, Safety, Security, and Environment Policy

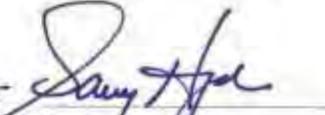
Protection of people and the environment is a CH2M HILL core value. It is our vision to create a culture within CH2M HILL that empowers employees to drive this value into all global operations and achieve excellence in health, safety, security, and environment (HSSE) performance. CH2M HILL deploys an integrated, enterprise-wide behavior-based HSSE management system to fulfill our mission and the expectations of our clients, staff, and communities based on the following principles:

- We require all management and supervisory personnel to provide the leadership and resources to inspire and empower our employees to take responsibility for their actions and for the actions of their fellow employees to create a safe, healthy, secure, and environmentally-responsible workplace.
- We provide value to clients by tailoring HSSE processes to customer needs and requiring all CH2M HILL employees and subcontractors to deliver projects with agility, personal service, and responsiveness and in compliance with HSSE requirements and company standards to achieve health, safety, security, and pollution prevention excellence. Our performance will aspire to influence others and continually redefine world-class HSSE excellence.
- We systematically evaluate our design engineering and physical work environment to verify safe and secure work conditions and practices are established, consistently followed, and timely corrected.
- We continually assess and improve our HSSE program to achieve and maintain world-class performance by setting and reviewing objectives and targets, reporting performance metrics, and routinely reviewing our progress.
- We care about the safety and security of every CH2M HILL employee and expect all employees to embrace our culture, share our core value for the protection of people and the environment, understand their obligations, actively participate, take responsibility, and "walk the talk" on and off the job.

The undersigned pledge our leadership, commitment, and accountability for making this policy a reality at CH2M HILL.

Dated the 1<sup>st</sup> day of October 2009.

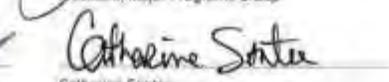
  
 Lee A. McIntire  
 Chief Executive Officer

  
 Garry Higdon  
 President, Energy Division

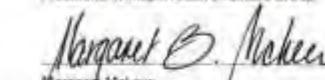
  
 Jacqueline Ross  
 President, Major Programs Group

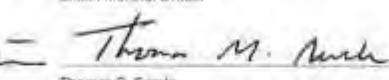
  
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 Chief Human Resources Officer

  
 Mark Lasswell  
 President, Transportation Business Group

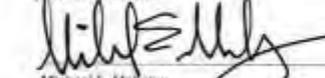
  
 Catharine Sinter  
 Chief Financial Officer

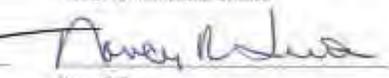
  
 Bob Ward  
 President, Facilities & Infrastructure Division

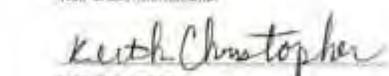
  
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 Thomas G. Searle  
 President, International Division

  
 Bill Dehn  
 Senior Vice President, Special Projects

  
 Michael E. McKelvy  
 President, Government, Environment, and Nuclear Division

  
 Nancy R. Tuor  
 Vice-Chair, International

  
 Keith Christopher  
 Senior Vice President, Health, Safety, Security, and Environment

# **1.1 CH2M HILL Policy and Commitment**

## **1.1.1 Safe Work Policy**

It is the policy of CH2M HILL to perform work in the safest manner possible. Safety must never be compromised. To fulfill the requirements of this policy, an organized and effective safety program must be carried out at each location where work is performed.

CH2M HILL believes that all injuries are preventable, and we are dedicated to the goal of a safe work environment. To achieve this goal, every employee on the project must assume responsibility for safety.

Every employee is empowered to:

- Conduct his or her work in a safe manner
- Stop work immediately to correct any unsafe condition that is encountered
- Take corrective actions so that work may proceed in a safe manner

Safety, occupational health, and environmental protection will not be sacrificed for production. These elements are integrated into quality control, cost reduction, and job performance, and are crucial to our success.

## **1.1.2 Health and Safety Commitment**

CH2M HILL has embraced a philosophy for health and safety excellence. The primary driving force behind this commitment to health and safety is simple: employees are CH2M HILL's most significant asset, and CH2M HILL management values their safety, health, and welfare. Also, top management believes that all injuries are preventable. CH2M HILL's safety culture empowers employees at all levels to accept ownership for safety and take whatever actions are necessary to eliminate injury. Our company is committed to world-class performance in health and safety and also understands that world-class performance in health and safety is a critical element in overall business success.

CH2M HILL is committed to the prevention of personal injuries, occupational illnesses, and damage to equipment and property in all of its operations; to the protection of the general public whenever it comes in contact with the company's work; and to the prevention of pollution and environmental degradation.

Company management, field supervisors, and employees plan safety into each work task in order to prevent occupational injuries and illnesses. The ultimate success of CH2M HILL's safety program depends on the full cooperation and participation of each employee.

CH2M HILL management extends its full commitment to health and safety excellence.

## **1.1.3 Project-Specific Health, Safety, and the Environment Goals**

All managers and employees are expected to strive to meet the project-specific health, safety, and the environment (HSE) goals outlined below. The project team will be successful only if everyone makes a concerted effort to accomplish these goals. The goals allow the project to stay focused on optimizing the health and safety of all project personnel and, therefore, making the project a great success.

The project has established 11 specific HSE goals and objectives:

- Create an injury-free environment
- Have zero injuries or incidents
- Provide management leadership for HSE by communicating performance expectations, reviewing and tracking performance, and leading by example
- Ensure effective implementation of this SSHP through education, delegation, and teamwork
- Ensure 100 percent participation in HSE compliance
- Continuously improve our safety performance
- Maintain free and open lines of communication

- Make a personal commitment to safety as a value
- Focus safety improvements on high-risk groups
- Continue strong employee involvement initiatives
- Achieve health and safety excellence

## SECTION 2

# Applicability

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This SSHP applies to:

- All CH2M HILL project personnel, including subcontractors and tiered subcontractors of CH2M HILL working on the site; and
- All visitors to the construction site in the custody of CH2M HILL (including visitors from the Client, the Government, the public, and other personnel of any CH2M HILL company).

This SSHP does not apply to the third-party contractors, their workers, their subcontractors, their visitors, or any other persons not under the direct control or custody of CH2M HILL.

This SSHP defines the procedures and requirements for the health and safety of CH2M HILL staff members and visitors when they are physically on the work site. The work site consists of the project area (as defined by the contract documents) and the project offices, trailers, and facilities thereon.

This SSHP will be kept onsite during field activities and will be reviewed as necessary. It will be amended or revised as project activities or conditions change or when supplemental information becomes available. This SSHP adopts, by reference, the enterprise-wide core standards and standard operating procedures (SOPs), as appropriate. In addition, this SSHP may adopt procedures from the project Work Plan (WP) and any governing regulations. If there is a contradiction between this SSHP and any governing regulation, the more-stringent and protective requirement shall apply.

All CH2M HILL project team members and subcontractors must sign the employee sign-off form presented in this document as Attachment 1 to acknowledge review of this document. Copies of the signature page will be maintained onsite by the safety coordinator (SC).

# General Project Information

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## 3.1 Project Information and Background

**Project Number:** 387933

**Client:** NAVFAC Atlantic

**Project/Site Name:** NAVFAC CLEAN 8012, CTO-WE26 Expanded Site Inspection (ESI)/ Marine Corps Installations East-Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ) Off-Base Surface Danger Zones (SDZs) Munitions Response Area (MRA)

**Site Address:** Southeastern boundary of MCIEAST-MCB CAMLEJ, Onslow County, North Carolina

**CH2M HILL Project Manager:** Keith LaTorre/KNV

**CH2M HILL Office:** Knoxville, Tennessee

**DATE SSHP Prepared:** 2/24/12; updated 8/3/12

**Date(s) of Site Work:** TBD

## 3.2 Site Background and Setting

The Off-Base SDZs is located adjacent to the southeastern boundary of MCIEAST-MCB CAMLEJ and encompasses approximately 1,632 acres (**Figure 1-1**). The majority of the MRA is located between the Atlantic Ocean at Bear Inlet and the Intracoastal Waterway (ICW), and encompasses tidal channels, coastal wetlands, uplands, and privately owned land. The Off-Base SDZs is comprised of roughly 173 acres of upland terrain (above mean high tide), and approximately 1,459 acres of surface water and salt marsh. There are no residences or commercial buildings within the Off-Base SDZs MRA. Approximately 45 acres of the uplands within the area are comprised of small islands along the Atlantic ICW, located along the northern boundary of the SDZs MRA. Based on a review of available aerial photography and site reconnaissance, approximately 20 percent of the investigation area appears to be heavily vegetated with trees and dense undergrowth. All access to and from the area of investigation will require boat transportation.

The Off-Base SDZs was comprised of the following former ranges:

- Rocket Range Number 1 (ASR #2.33)
- Direct Fire Artillery Range (G-7) (ASR #2.61)
- G-6 Artillery Range (ASR #2.62)
- Impact Area N-1 (ASR 2.207), which includes Bomb Target (BT)-3 and BT-5

The area within the current Off-Base SDZs MRA was used jointly by MCIEAST-MCB CAMLEJ and Marine Corps Air Station (MCAS) Cherry Point. Portions of the SDZs were utilized between 1944 and 2001. The danger zones related to activities within MCIEAST-MCB CAMLEJ are from land-based artillery ranges, and the danger zones related to MCAS Cherry Point were used for airborne strafing, rocket firing, and bombing. Munitions use at these former ranges ranged from small caliber arms, various sized aircraft rockets and millimeter Howitzer use, and up to 500 lb Practice Bombs (*refer to the ESI Work Plan Addendum, Section 1.4, for additional information regarding munitions use at the Off Base SDZs*).

Because the SDZs extended off-base, there is the possibility that munitions and explosives of concern (MEC) or munitions constituents (MC) may be present within the off-base acreage. It is anticipated that potential MEC would have originally been deposited at or near the ground surface or under water, but over the years, dynamic site conditions (e.g. strong storms and tidal influences) may have caused the MEC to move, become uncovered, or buried to unknown depths.

During the 2010 Preliminary Assessment/Site Inspection (PA/SI), a total of 2,059 anomalies were identified through a combined Aerial Geophysical Survey (AGS) and a terrestrial Digital Geophysical Mapping (DGM) effort (*refer to the ESI Work Plan Addendum*). The areas of greatest anomaly densities were observed at the mouth of Bear Inlet, at the convergence of Bear Creek and the ICW, and along a main channel through the east-central portion of the site. The majority of the identified anomalies are located within or very close to water channels running through the site.

An intrusive investigation was conducted at 182 identified anomalies on Bear Island during the PA/SI. One MEC and three MPPEH items were identified during the anomaly investigation, as follows.

MEC:

- One MK 45 Mod 0 Aircraft Flare

MPPEH:

- One jet-assisted take off (JATO) bottle
- Three expended bomb dummy units (BDU-33s)
- One 25-mm cartridge case

The candle portion of the MK 45 Mod 0 Aircraft Flare (MEC) was still intact and unexpended, but the parachute had been deployed and was not present. The flare was deemed safe to move and was destroyed by a controlled, intentional detonation on the island.

### **3.3 Description of Tasks**

All CH2M HILL and subcontractor employees engaging in hazardous waste operations or emergency response (HAZWOPER) tasks shall receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120 and 29 CFR 1926.65 (or if required by subcontract). Personnel who have not met these training requirements shall not be allowed to engage in hazardous waste operations or emergency response activities. Tasks that fall under HAZWOPER requirements are listed in section 3.3.1.

The Off Base SDZs MRA has the potential to contain MEC, material potentially presenting an explosive hazard (MPPEH) and/or environmental contamination with MC. Because of the historical range activities that occurred within this MRA, additional investigation work is being conducted to accomplish the following:

- Conduct a site reconnaissance action/site visit to evaluate the accessibility of the proposed anomaly investigation areas, assess health and safety requirements, and refine the logistics associated with the proposed field effort.
- Clear vegetation, where necessary and permissible, to facilitate access within the investigation area.
- Conduct a Phase I anomaly evaluation and intrusive investigation along the banks of accessible waterways to assess the validity of the AGS anomaly exclusion process (*refer to the Work Plan Addendum*) and evaluate the type of metallic material generally present along the waterways within the MRA.
- Conduct a Phase II anomaly evaluation and intrusive investigation within areas of interest (AOIs) located within the Off-Base SDZs and in the vicinity of select terrestrial DGM and high-priority AGS anomalies identified within the MRA.
- Manage the MEC/MPPEH disposal process through controlled detonations and associated media sampling, and manage material documented as safe (MDAS), and any investigation-derived waste (IDW), as required.

#### **3.3.1 HAZWOPER-regulated Tasks**

- MEC intrusive investigation
- MEC demolition and disposal (blasting operations)
- Soil sampling related to BIP
- Investigation-derived waste (IDW) management

### 3.3.2 Non-HAZWOPER-regulated Tasks

Under specific circumstances, the training and medical monitoring requirements of federal or state HAZWOPER regulations are not applicable. Because the tasks listed below do not involve exposure to safety or health hazards associated with the hazardous waste operations, HAZWOPER training or medical requirements do not apply.

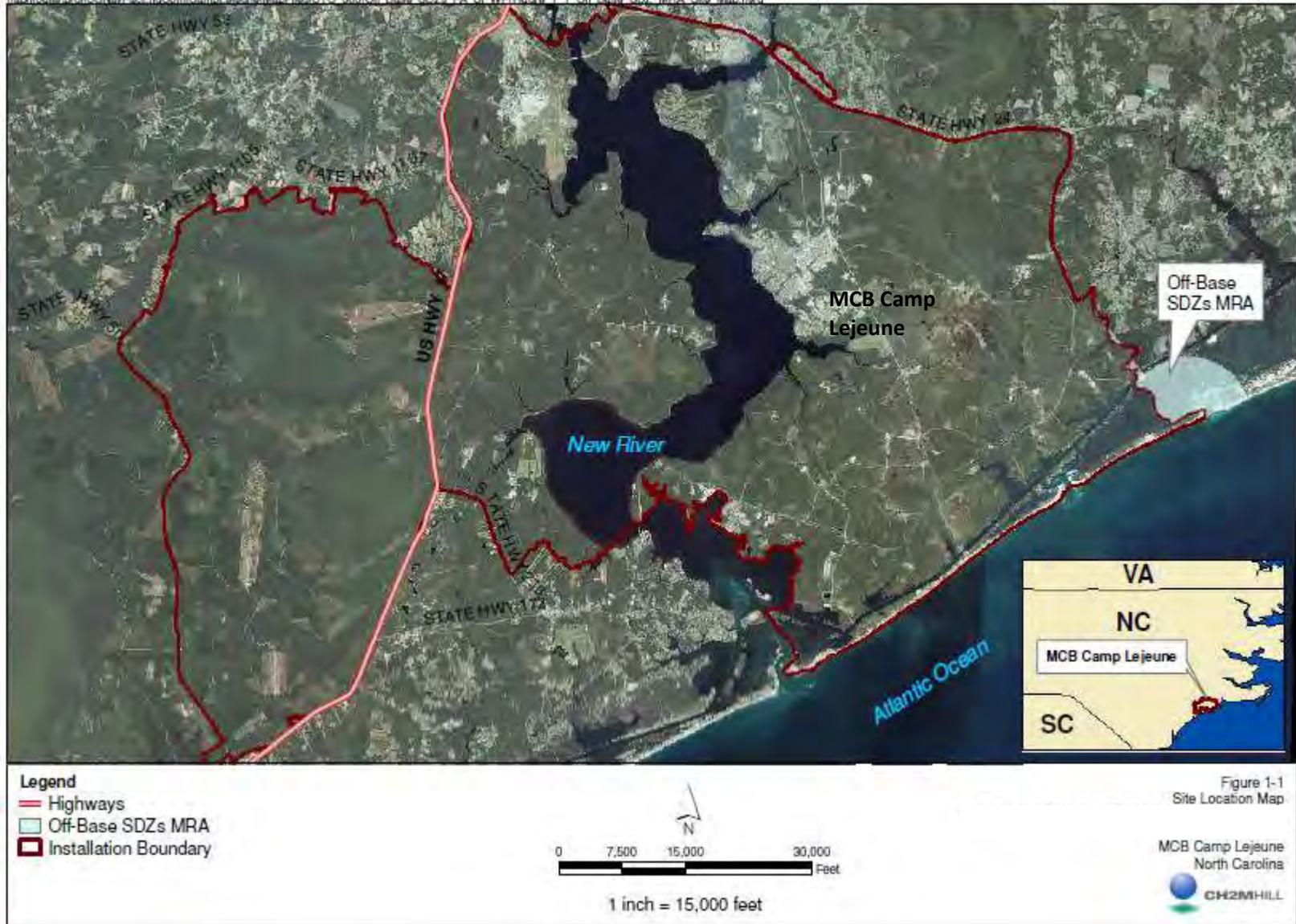
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Tasks	Controls
<ul style="list-style-type: none"><li>• Site Reconnaissance</li><li>• Mobilization/ Demobilization</li><li>• Vegetation removal, if necessary</li></ul>	<ul style="list-style-type: none"><li>• Brief on hazards, limits of access, and emergency procedures.</li><li>• Non-intrusive work</li><li>• MEC avoidance</li><li>• Wear PPE according to Section 14</li></ul>

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Site Map

\\archprod\proj\USNavFacEngCom\CampLejeune\MapFiles\CTO\_0807\Off-Base\_SDZs\_PA\_SI\_WP\Figure\_1-1\_Off-Base\_SDZs\_MRA\_Site\_Map.mxd



# Project Organization and Responsibilities

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## 4.1 Client

### Client Contact

Bryan Beck  
CIV NAVFAC Mid-Atlantic  
NC IPT, EV Business Line  
6506 Hampton Blvd  
Norfolk, Virginia 23508-1278

### Base Contact

Charity Rychak  
Camp Lejeune - EMD  
Building 12  
Marine Corps Base Camp Lejeune, NC 28542-0004  
Direct (910) 451-9385  
Fax: (910) 451-5997  
[charity.rychak@usmc.mil](mailto:charity.rychak@usmc.mil)

### CH2M HILL

#### 4.1.1 Project Manager

Name: Keith LaTorre  
CH2M HILL Office: KNV  
Telephone Number: (865) 769-3204  
Cellular Number: (865)323-3300

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

- Incorporate standard terms and conditions, and contract-specific HSE roles and responsibilities in contract and subcontract agreements (including flow-down requirements to lower-tier subcontractors)
- Select safe and competent subcontractors by:
  - Choosing potential subcontractors based on technical ability and HSE performance
  - Implementing the subcontractor prequalification process
  - Ensuring that acceptable certificates of insurance, including CH2M HILL as named additional insured, are secured as a condition of subcontract award
  - Ensuring HSE submittals, subcontract agreements, and appropriate site-specific safety procedures are in place and accepted before field mobilization
- Ensure copies of training and medical monitoring records, and site-specific safety procedures are being maintained in the project file and are accessible to site personnel
- Provide oversight of subcontractor HSE practices in accordance with the site-specific safety plans and procedures
- Manage the site and interfacing with third parties in a manner consistent with the contract and subcontract agreements and the applicable standard of reasonable care
- Ensure that the overall, job-specific, HSE goals are fully and continuously implemented
- Support and implement use of stop-work orders when subcontractor safety performance is not adequate

### **4.1.2 Responsible Health and Safety Manager**

Name: Carl Woods

CH2M HILL Office: CIN

Telephone Number: (513) 889-5771

Cellular Number: (513) 319-5771

The Responsible Health and Safety Manager (RHSM) is responsible for the following:

- Review and evaluate subcontractor HSE performance using the pre-qualification process
- Approve SSHP and its revisions as well as Activity Hazard Analyses (AHAs)
- Review and evaluate subcontractor site-specific safety procedures for adequacy before the subcontractor's field operations begin
- Support the oversight (or SC's direct oversight) of subcontractor and tiered subcontractor HSE practices
- Permit upgrades and downgrades in respiratory protection after reviewing analytical data
- Conduct audits as determined by project schedule and coordination with PM
- Participate in incident investigations, lessons learned, and loss and near-loss reporting

### **4.1.3 Project Environmental Manager**

Name: Nancy Ballantyne

CH2M HILL Office: DEN

Telephone Number: (720) 286-5561

Cellular Number: (303) 885-9954

The project environmental manager (EM) is responsible for the following:

- Provide environmental program support in areas such as training, auditing, planning, permit tracking, and subcontractor oversight as needed or as specified in the project environmental plan
- Review and evaluate qualifications for subcontractors with a history of environmental non-compliance and for waste transportation and disposal subcontractors
- Evaluate any spills, releases, or environmental permit incidents for appropriate follow-up actions, notifications, and recordkeeping requirements
- Provide environmental compliance and environmental management expertise and advice to the project team as needed during the course of the project

### **4.1.4 Safety Coordinator**

Name: TBD

CH2M HILL Office:

Telephone Number:

Cellular Number:

The Safety Coordinator (SC) is responsible for verifying that the project is conducted safely, including the following specific obligations:

- Verify that this SSHP is current and amended when project activities or conditions change
- Verify that CH2M HILL site personnel and subcontractor personnel read the SSHP and sign the Employee Sign-Off Form, before beginning field activities
- Verify that CH2M HILL site personnel have completed any required specialty training (for example, fall protection or confined space entry, among others) and medical surveillance as identified in this SSHP

- 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, contractor's license, training and medical monitoring records, and accepted site-specific safety procedures before the subcontractor's field operations begin
- Act as the project Hazard Communication Coordinator and perform the related responsibilities outlined in this SSHP
- Act as the project emergency response coordinator (ERC) and perform the related responsibilities outlined in this SSHP
- Post the Occupational Safety and Health Administration (OSHA) job-site poster at sites where project field offices, trailers, or equipment-storage boxes are established
- Hold and/or verify that safety meetings are conducted and documented in the project file initially and as needed throughout the course of the project (as tasks or hazards change)
- Verify that project health and safety forms and permits are being used as outlined this SSHP
- Perform oversight and assessments of subcontractor HSE practices in accordance with the site-specific safety plan and verify that project activity self-assessment checklists are being used as outlined this SSHP
- Coordinate with the RHSM regarding CH2M HILL and subcontractor operational performance, and third-party interfaces
- Verify appropriate PPE use, availability, and training
- Ensure that the overall, job-specific HSE goals are fully and continuously implemented
- Conduct accident investigations, including root cause analysis
- Calibrate and conduct air monitoring in accordance with this SSHP and maintain all air monitoring records in project file
- Maintain HSE records and documentation
- Facilitate OSHA or other government agency inspections, including accompanying inspectors and providing all necessary documentation and follow-up
- Deliver field HSE training as needed based on project-specific hazards and activities
- Contact the RHSM and PM in the event of an incident
- When an apparent imminent danger exists, immediately remove all affected CH2M HILL employees and subcontractors; notify subcontractor safety representative; stop affected work until adequate corrective measures are implemented; and notify the PM and RHSM as appropriate
- Document all oral health and safety-related communications in project field logbook, daily reports, or other records.

#### **4.1.5 UXO Safety Officer /UXO Quality Control Specialist**

Name: TBD

CH2M HILL Office:

Telephone Number:

Cellular Number:

The UXO safety officer/UXO quality control specialist (UXOSO/UXOQCS) for this project will report directly to the PM on issues pertaining to the MEC operations at the sites. The UXOSO/UXOQCS will have the following safety and health-related responsibilities:

- Report directly to the CH2M HILL PM

- Manage the funding, manpower, and equipment necessary to safely conduct site operations
- Review and become familiar with the project WP and this SSHP
- Provide copies of the WP and SSHP to site personnel
- Review the scope of work and ensure that the required safety and health elements are addressed in this SSHP and/or WP
- Coordinate the assignment of personnel and ensure that the personnel and equipment provided meet the requirements of the WP and this SSHP
- Ensure that project quality, safety and health procedures area implemented
- Conduct early detection and identification of potential problem areas, including safety and health matters, and institute corrective measures
- Interface directly with the PM and advise him of safety and health matters related to conduct of the site operations
- Act as the On-Scene Incident Commander in a MEC emergency, notifying and coordinating with offsite emergency and medical response agencies.

## 4.2 CH2M HILL Subcontractors

(Reference CH2M HILL SOP HSE-215, *Contracts and Subcontracts*)

UXO Subcontractor: USAE

Subcontractor Contact:

Telephone:

IDW Disposal Contractor: TBD (if required)

Subcontractor Contact:

Telephone:

Laboratory Subcontractor: TBD (if required)

Subcontractor Contact Name: TBD

Telephone: TBD

Boar Charter Subcontractor: TBD

Subcontractor Contact Name: TBD

Telephone: TBD

Subcontractors must comply with the following activities, and are responsible to:

- Comply with all local, state, and federal safety standards
- Comply with project and owner safety requirements
- Actively participate in the project safety program and either hold or attend and participate in all required safety meetings
- Provide a qualified safety representative to interface with CH2M HILL
- Maintain safety equipment and PPE for their employees
- Maintain and replace safety protection systems damaged or removed by their operations
- Notify the SC of any accident, injury, or incident (including spills or releases) immediately and submit reports to CH2M HILL within 24 hours
- Install contractually required general conditions for safety (for example, handrail, fencing, fall protection systems, floor opening covers)
- Conduct and document weekly safety inspections of project-specific tasks and associated work areas
- Conduct site-specific and job-specific training for all subcontractor employees, including review of this CH2M HILL SSHP, subcontractor SSHPs, and subcontractor AHAs, and sign appropriate sign-off forms
- Develop and implement necessary controls and corrective actions to correct unsafe conditions

The subcontractors listed above may be required to submit their own site-specific health and safety plan (SSHP) and other plans. 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 and acceptance before the start of field work.

Subcontractors are also required to prepare AHAs before beginning each activity posing hazards to their personnel. Each AHA shall identify the principal steps of the activity, potential health and safety hazards for each step, and recommended control measures for each identified hazard. In addition, a list 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 provided.

## 4.3 Employee Responsibilities

All personnel are responsible for safe and healthy operations. This concept is the foundation for involving all CH2M HILL and subcontractor employees in identifying hazards and providing solutions. For any operation, individuals have full authority to stop work and initiate immediate corrective action or control. In addition, each worker has a right and responsibility to report unsafe conditions or practices. This right represents a significant facet of worker empowerment and program ownership. Through shared values and a belief that all accidents are preventable, our employees accept personal responsibility for working safely.

Each employee is responsible for achieving the following performance objectives:

- Perform work in a safe manner and produce quality results
- Perform work in accordance with company policies, and report injuries, illnesses, and unsafe conditions
- Complete work without injury, illness, or property damage
- Report all incidents immediately to supervisor, and file proper forms with a human resources representative
- Report all hazardous conditions and/or hazardous activities immediately to supervisor for corrective action
- Complete an HSE orientation before being authorized to enter the project work areas.

### 4.3.1 Employee Authority

Each employee on the project has the obligation and authority to shut down any perceived unsafe work. During employee orientation, each employee will be informed of his/her authority to do so.

## 4.4 Client Contractors

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

Contractor: Not Applicable

Contact Name:

Telephone:

Contractor Task(s):

This SSHP does not cover contractors that are contracted directly to the client or the owner. CH2M HILL is not responsible for the health and safety or means and methods of such a contractor's work, and we must never assume such responsibility through our actions (such as advising on health and safety issues). In addition to these instructions, CH2M HILL team members should review contractor safety plans so that we remain aware of appropriate precautions that apply to us. Self-assessment checklists are to be used by the SC and CH2M HILL team members to review the contractor's performance only as it pertains to evaluating CH2M HILL exposure and safety. The RHSM is the only person authorized to comment on or approve contractor safety procedures.

Health and safety-related communications with contractors should be conducted as follows:

- Request the contractor to brief CH2M HILL team members on the precautions related to the contractor's work
- When an apparent contractor non-compliance or unsafe condition or practice poses a risk to CH2M HILL team members

- Notify the contractor safety representative
- Request that the contractor develop and implement corrective actions
- If necessary, stop affected CH2M HILL work until contractor corrects the condition or practice
- Notify the client, PM, and RHSM as appropriate

If apparent contractor non-compliance or unsafe conditions or practices are observed, inform the contractor safety representative (CH2M HILL's obligation is limited strictly to informing the contractor of the observation; the contractor is solely responsible for developing and implementing necessary controls and corrective actions).

If an apparent imminent danger is observed, immediately warn the contractor employee(s) in danger and notify the contractor safety representative (CH2M HILL's obligation is limited strictly to immediately warning the affected individual(s) and informing the contractor of the observation; the contractor is solely responsible for developing and implementing necessary controls and corrective actions).

All verbal health and safety-related communications will be documented in project field logbook, daily reports, or other records.

## SECTION 5

# Standards of Conduct

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All individuals associated with this project must work injury-free and drug-free and must comply with the following standards of conduct, this SSHP, and CH2M HILL's safety requirements. Commonly accepted standards of conduct help maintain good relationships between people. They promote responsibility and self-development. Misunderstandings, frictions, and disciplinary action can be avoided by refraining from thoughtless or wrongful acts.

## 5.1 Standards of Conduct Violations

All individuals associated with this project are expected to behave in a professional manner. Violations of the standards of conduct include, but are not limited to:

- Failure to perform work
- Inefficient performance, incompetence, or neglect of work
- Willful refusal to perform work as directed (insubordination)
- Negligence in observing safety regulations, poor housekeeping, or failure to report on-the-job injuries or unsafe conditions
- Unexcused or excessive absence or tardiness
- Unwillingness or inability to work in harmony with others
- Discourtesy, irritation, friction, or other conduct that creates disharmony
- Harassment or discrimination against another individual
- Failure to be prepared for work by wearing the appropriate construction clothing or bringing the necessary tools or
- Violation of any other commonly accepted reasonable rule of responsible personal conduct

## 5.2 Disciplinary Actions

The CH2M HILL Environmental Services Business Group (ESBG) employees, employees working on ESBG projects, and subcontractor employees are subject to disciplinary action for not following HSE rules and requirements. Potential disciplinary action is equally applicable to all employees, including managers and supervisors. Disciplinary action may include denial of access to the worksite, warnings, reprimands, and other actions up to and including termination depending on the specific circumstances.

## 5.3 Subcontractor Safety Performance

CH2M HILL should continuously endeavor to observe subcontractors' safety performance and adherence to their plans 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. CH2M HILL oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

### **5.3.1 Observed Hazard Form**

When apparent non-compliance or unsafe conditions or practices are observed, notify the subcontractor's supervisor or safety representative verbally, and document the condition(s) or practice(s) using the Observed Hazard Form, provided as an attachment to this SSHP, and require corrective action.

If necessary, stop subcontractor's work using the Stop Work Order Form, provided as an attachment to this SSHP, until corrective actions are implemented for observed serious hazards or conditions. Update the Observed Hazard Form to document that corrective actions have been taken. The subcontractor is responsible for developing and implementing necessary controls and corrective actions.

### **5.3.2 Stop Work Order**

CH2M HILL has the authority, as specified in the contract, and the responsibility to stop work when any CH2M HILL employee observes unsafe conditions or failure of the subcontractor to adhere to its safe-work practices, or observes a condition or practice that may result in a release or violation of an environmental requirement. This authority and action does not in any way relieve the subcontractor of its responsibilities for the means and methods of the work or, therefore, of any corrective actions. Failure to comply with safe work practices can be the basis for restriction or removal of the subcontractor staff from the job site, termination of the subcontract, restriction from future work, or all three.

When an apparent imminent danger is observed, immediately stop work and alert all affected individuals. Remove all affected CH2M HILL employees and subcontractor personnel from the danger; notify the subcontractor's supervisor or safety representative; and do not allow work to resume until adequate corrective measures are implemented. Notify the PM, Contract Administrator, and RHSM.

When repeated non-compliance or unsafe conditions are observed, notify the subcontractor's supervisor or safety representative and stop affected work by completing and delivering the Stop Work Order Form until adequate corrective measures are implemented. Consult the Contract Administrator to find out what the contract dictates for actions to pursue in event of subcontractor non-compliance, such as work stoppage, back charges, progress payments, and removal of subcontractor manager, monetary penalties, or termination of subcontractor for cause.

## **5.4 Incentive Program**

Each project team is encouraged to implement a safety incentive program that rewards workers for exhibiting exemplary safety behaviors. Actions that qualify are those that go above and beyond what is expected. Actions that will be rewarded include spotting and correcting a hazard, bringing a hazard to the attention of a supervisor, telling the supervisor about an incident, coming up with a safer way to get the work done, or stopping a team member from doing something unsafe. The program will operate throughout the project, covering all workers. The incentive program will be communicated to all employees during the project employee orientation and project safety meetings.

## **5.5 Reporting Unsafe Conditions/Practices**

Responsibility for effective health and safety management extends to all levels of the project team and requires effective communication between employees, supervisors, and managers. Accident prevention requires a proactive policy on near misses, close calls, unsafe conditions, and unsafe practices. All personnel must report any situation, practice, or condition that might jeopardize the safety of the project. All unsafe conditions or unsafe practices will be corrected immediately. CH2M HILL has zero tolerance of unsafe conditions or unsafe practices.

No employee or supervisor will be disciplined for reporting unsafe conditions or practices. Individuals involved in reporting the unsafe conditions or practices will remain anonymous.

The following reporting procedures will be followed by all project employees:

- Upon detection of any unsafe condition or practice, the responsible employee will attempt to safely correct the condition.
- The unsafe condition or practice will be brought to the attention of the worker's direct supervisor, unless the unsafe condition or practice involves the employee's direct supervisor. If so, the SC needs to be notified at once by the responsible employee.
- Either the responsible employee or responsible employee's direct supervisor is responsible for immediately reporting the unsafe condition or practice to the SC.
- The SC will act promptly to correct the unsafe condition or practice.
- Details of the incident or situation will be recorded by the SC in the field logbook or on the Observed Hazard Form if a subcontractor was involved.

# Safety Planning and Change Management

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## 6.1 Daily Safety Meetings and Pre-Task Safety Plans

Daily safety meetings are to be attended by all project personnel to review the hazards posed and required HSE procedures and AHAs that apply for each day's project activities. The Pre-Task Safety Plans (PTSPs) serve the same purpose as these general assembly safety meetings, but the PTSPs are held between the crew supervisors 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 as an attachment to this SSHP, with input from the work crew, during their daily safety meeting. The day's tasks and the personnel, tools, and equipment that will be used to perform these tasks are listed, along with the hazards posed and required HSE procedures, as identified in this SSHP and AHA. The use of PTSPs promotes worker participation in the hazard recognition and control process while reinforcing the task-specific hazard and required HSE procedures with the crew each day.

## 6.2 Change Management

This SSHP addresses all known activities and associated hazards. As work progresses, if significant changes are identified that could affect health and safety at the site, coordinate with the RHSM to decide whether an SSHP update is necessary.

The following are examples of changes that may require a revision to the plan:

- Change in the CH2M HILL staff
- New subcontractor to perform work
- New chemicals brought to site for use
- Change in scope of work or addition of new tasks
- Change in contaminants of concern (COCs) or change in concentrations of COCs
- New hazards or hazards not previously identified that are not addressed in this SSHP

## 6.3 Agency Inspection Guidance

(Reference CH2M HILL SOP HSE-201, *Agency Inspections and Communications*)

Agency inspections (for example, OSHA, U.S. Environmental Protection Agency [EPA], other regulatory agencies) have increased. CH2M HILL implements safety and environmental programs in order to ensure safety to workers, the public, and the environment. This SSHP addresses things such as labeling containers, completing the hazard communication training using the attachments to this SSHP, listing training requirements and PPE requirements, and addressing project-specific hazards. Field personnel should contact the RHSM to update this SSHP if they encounter hazards that are not addressed.

Following is some pertinent information regarding OSHA inspections in 2011:

- The number of OSHA inspectors increased by 130.
- A goal has been set to conduct 44,000 workplace inspections (up from 36,000 inspections).
- The definition for "Repeat Violations" will encompass the past 5 years instead of 3 years.
- OSHA directors can only reduce fines by a maximum of 30 percent.
- Some fines will be increased by between \$3,000 and \$4,000 per violation.
- Proposed legislature would raise serious fines from \$7,000 to \$12,000.
- Proposed legislature would raise willful fines from \$70,000 to \$250,000.

[SOP HSE-201](#) addresses agency inspections in detail, and the attached **Agency Inspection Target Zero Bulletin** provides a good summary of the inspection process and what to do if a representative from an agency such as OSHA or EPA shows up at the site. It is critical that the PM or the RHSM be immediately notified if an inspector arrives onsite (and the EM if the inspection is environmental-related); they can help facilitate and make additional notifications.

The Target Zero Bulletin should be posted at the field trailer or kept with this SSHP /Environmental Plan; make it a topic at a safety meeting and keep it readily available in the event of an inspection.

# Project Hazard Analysis

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A health and safety risk analysis (Table 1) has been performed for each task to be performed on this project. In the order listed below, the RHSM considers the various methods for mitigating hazards. Employees will be trained on this hierarchy of controls during their hazardous waste training and reminded of them throughout the execution of the project:

- Elimination of the hazards (for example, use remote sampling methodology to avoid going into a confined space)
- Substitution (for example, reduce exposure to vapors by using of a drill rig instead of test pitting)
- Engineering controls (for example, ventilate a confined space to improve air quality)
- Warnings (establish exclusion zones to keep untrained people away from hazardous work)
- Administrative controls (implement a work-rest schedule to reduce chance of heat stress)
- Use of PPE (use of respirators when action levels are exceeded)

The hazard controls and safe work practices are summarized in the following sections of this SSHP:

- General hazards and controls
- Project-specific hazards and controls
- Physical hazards and controls
- Biological hazards and controls
- Contaminants of concern (COCs)

## 7.1 Activity Hazard Analysis

An AHA must be developed for each CH2M HILL job activity. The AHA shall define the work tasks required to perform each activity, along with potential HSE hazards and recommended control measures for each hazard. In addition, a list of the equipment to be used to perform the activity, inspection requirements to be performed and training requirements for the safe operation of the equipment listed must be identified. Workers will be briefed on the AHA before performing the work and their input will be solicited before, during, and after the performance of work to further identify the hazards posed and control measures required.

The following hazard controls and applicable CH2M HILL core standards and SOPs should be used as a basis for preparing AHAs. AHAs prepared for CH2M HILL activities are included as an attachment to this SSHP.

## 7.2 Subcontractor Activity Hazard Analysis

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 scope of work, along with their project-specific safety plan and procedures. Additions or changes in field activities, equipment, tools, or material used to perform work or hazards not addressed in existing AHAs requires that either a new AHA be prepared or an existing AHA be revised.

TABLE 1

**General Activity Hazard Analysis**

<b>Potential Hazard</b>	<b>Mobilization/ Demobilization</b>	<b>Utility Location</b>	<b>MEC Investigation, Demolition and Disposal</b>	<b>Vegetation Clearance</b>	<b>Soil Sampling</b>	<b>IDW Management</b>
Biological Hazards	X	X	X	X	X	X
Chain Saw/Brush Cutter				X		
Chemical Hazard	X		X		X	X
Drum Handling/Sampling	X		X		X	X
Electrical Safety		X				
Excavations			X			
Explosives Usage or Munitions Response (MR)			X			
Field Vehicles	X	X	X	X	X	X
Fire Prevention	X	X	X	X	X	X
Forklifts			X			X
Hand & Power Tools	X	X	X	X	X	X
Knife Use	X					
Manual Lifting	X	X	X	X	X	X
MEC/MPPEH	X	X	X	X	X	X
Noise			X	X		
Temperature Extremes	X	X	X	X	X	X
Traffic Control	X	X	X	X	X	X
Ultraviolet Light exposure (sunburn)	X	X	X	X	X	X
Utilities (underground/overhead)		X	X	X		
Working around Material Handling Equipment	X	X	X			

## SECTION 8

# General Hazards and Controls

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This section discusses safe work practices and control measures used to reduce or eliminate potential hazards. It is a summarized list of requirements. Always consult the appropriate CH2M HILL SOP to ensure that all requirements are met.

## 8.1 Bloodborne Pathogens

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

Exposure to bloodborne pathogens may occur when rendering first aid or cardiopulmonary resuscitation (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 pathogens computer-based training module annually. When performing first-aid/CPR, the following shall apply:

- Observe universal precautions to prevent contact with blood or other PIMs. Where differentiation between body fluid types is difficult or impossible, consider all body fluids to be potentially infectious materials.
- Always wash your hands and face with soap and running water after contacting PIMs. If washing facilities are unavailable, use an antiseptic cleanser with clean paper towels or moist towelettes.
- If necessary, decontaminate all potentially contaminated equipment and surfaces with chlorine bleach as soon as possible. Use one part chlorine bleach (5.25 percent sodium hypochlorite solution) diluted with 10 parts water for decontaminating equipment or surfaces after initially removing blood or other PIMs. Remove contaminated PPE as soon as possible before leaving a work area.

CH2M HILL will provide exposed employees with a confidential medical examination if they are exposed to PIM. This examination consists of the following procedures:

- Documenting the exposure
- Testing the exposed employee's and the source individual's blood (with consent)
- Administering post-exposure prophylaxis

## 8.2 Chemical Storage

The following are general guidelines for storing chemicals and other hazardous materials:

- Keep acids away from bases
- Keep oxidizers (nitric acid, nitrates, peroxides, chlorates) and organics away from inorganic reducing agents (metals)
- Keep flammables and corrosives in appropriate storage cabinets
- Store paper or other combustibles away from flammables
- Use secondary containment and lipped shelving that is secured
- Have a fire suppression system available

### 8.2.1 General Storage of Flammable/Combustible Liquids

- Only approved containers and portable tanks shall be used for storage and handling of flammable and combustible liquids.
- Approved safety cans shall be used for the handling and use of flammable liquids in quantities of 5 gallons (22.7 liters) or less. Do not use plastic gas cans.

- For quantities of 1 gallon (4.5 liters) or less, the original container may be used for storage and use of flammable liquids.
- Flammable or combustible liquids shall not be stored in areas used for stairways or normally used for the passage of people.

### **8.2.2 Indoor Storage of Flammable/Combustible Liquids**

- No more than 25 gallons (113.7 liters) of flammable or combustible liquids shall be stored in a room outside of an approved storage cabinet.
- Quantities of flammable and combustible liquids in excess of 25 gallons (113.7 liters) shall be stored in an acceptable or approved cabinet.
- Cabinets shall be conspicuously lettered: "FLAMMABLE: KEEP FIRE AWAY."
- Not more than 60 gallons (272.8 liters) of flammable liquids or 120 gallons (545.5 liters) of combustible liquids shall be stored in any one storage cabinet. No more than three such cabinets may be located in a single storage area.

### **8.2.3 Outside Storage of Flammable/Combustible Liquids**

- Storage of containers (not more than 60 gallons [272.8 liters] each) shall not exceed 1,100 gallons (5,000 liters) in any one area. No area shall be within 20 feet (6.1 meters) of any building.
- Storage areas shall be graded to divert spills away from buildings and surrounded by an earthen dike.
- Storage areas may not be located near a storm drain. Overflow and spills must be diverted away from storm drains or surface waters.
- Storage areas shall be free from weeds, debris, and other combustible materials.
- Outdoor portable tanks shall be provided with emergency vent devices and shall be located at least 20 feet (6.1 meters) away from any building.
- Signs prohibiting smoking shall be posted around the storage area.

### **8.2.4 Storage of Hazardous Waste**

- All facilities storing ignitable and combustible liquids and hazardous wastes must be designed, constructed, maintained, and operated to minimize the possibility of a fire, explosion, or any release of hazardous constituents.
- Flammable wastes should be stored more than 50 feet from the property line.

### **8.2.5 Storage of Injection Chemicals/Materials**

- When chemical injection remediation technologies are being used at a site, the following storage guidelines must be followed:
- Some injection chemicals, such as strong oxidizers, may have stringent storage requirements according to local or national fire codes. Verify that appropriate storage provisions are in place before starting work.
- **NOTE:** Counties and cities also may have requirements specific to storing these chemicals. In addition, storage and use of certain chemicals, such as potassium permanganate and hydrogen peroxide, may be subject to the new Chemical Facility Anti-Terrorism Standards of the Department of Homeland Security. The applicability depends on the chemical, quantity/concentration, and type of facility. Please contact the EM to find out whether the project chemicals are subject to these standards.
- Injection chemicals must be stored in a designated, secured area with spill prevention capabilities. Review material safety data sheets (MSDSs) or other information to identify potential incompatible materials. Incompatible materials shall not be stored together. All containers must be labeled.

## 8.3 Driving Safety

### Distracted Driving – Mobile Phones & Wireless Devices

To ensure the safety and health of our contractors, and subcontractors, the safe operation of a Motor Vehicle while conducting CH2M HILL business, requires abiding by all driving laws and regulations and the following, Distracted Driving policy.

All CH2M HILL contractors and subcontractors are prohibited from using mobile (cell) phones while operating any motor vehicle on DoD installations. Furthermore, wearing of any portable headphones, earphones, or other listening devices and use of Wireless Devices while operating a CH2M HILL- or CH2M HILL client-owned, leased, or rented Motor Vehicle, or while operating any other Motor Vehicle on a CH2M HILL project site (including DoD installations) is prohibited.

Wireless device prohibitions while driving includes, but is not limited to the following:

- Dialing or speed dialing a Wireless Device
- Using a hands-free or voice recognition (blue tooth) device to dial or speed dial a Wireless Device
- Engaging in conversation or listening to a conversation using a Wireless Device
- Checking emails or surfing the internet using a Wireless Device
- Texting or e-mailing (reading, sending, or screening) with a Wireless Device
- Programming or entering coordinates into a global positioning system (GPS) device (following directions by a GPS is permitted)
- Using a Wireless Device for voice recording or dictation

Contractors, and subcontractors who need to engage in using a Wireless Device while operating a Motor Vehicle that otherwise would be in violation of this Policy must pull off the road to a safe location, with the vehicle securely stopped, prior to initiating the use of such Wireless Devices or wait until they reach their destination. Violation of this Policy may result in disciplinary action, up to and including termination.

To avoid distractions from mobile phones, smartphones, voice recognition systems, PDAs, notebook, tablets (or similar devices), or laptops, contractors, and subcontractors are encouraged to turn off or silence such Wireless Devices before operating a Motor Vehicle.

## 8.4 Field Vehicles

- Field vehicles may be personal vehicles, rental vehicles, fleet vehicles, or project vehicles.
- Maintain a first aid kit, bloodborne pathogen kit, and fire extinguisher in the field vehicle at all times.
- Utilize a rotary beacon on the vehicle if working adjacent to active roadway.
- Familiarize yourself with rental vehicle features before operating the vehicle:
  - Vision fields and blind spots
  - Vehicle size
  - Mirror adjustments
  - Seat adjustments
  - Cruise control features, if offered
  - Pre-program radio stations and global positioning system, if equipped
- Always wear seatbelt while operating vehicle.
- Adjust headrest to proper position.
- Tie down loose items if using a van or pickup truck.
- Close car doors slowly and carefully. Fingers can get pinched in doors.

- Park vehicle in a location where it can be accessed easily in an emergency. If not possible, carry a phone.
- Have a designated place for storing the field vehicle keys when not in use.
- Ensure backup alarms are functioning, if equipped. Before backing a vehicle, take a walk around the vehicle to identify obstructions or hazards. Use a spotter when necessary to back into or out of an area.
- See the Vehicle Accident Guidance attached to this SSHP if a vehicle incident is experienced in a rental or fleet vehicle.

## 8.5 Electrical Safety

(Reference CH2M HILL SOP HSE-206, *Electrical Safety*)

The hazard controls and safe work practices to follow when using electrical tools, extension cords, and/or other electrical-powered equipment or when exposed to electrical hazards are listed below. Ensure the requirements of the referenced SOP are followed:

- Only qualified personnel are permitted to work on unprotected energized electrical systems.
- Only authorized personnel are permitted to enter high-voltage areas.
- CH2M HILL employees who might from time to time work in an environment influenced by the presence of electrical energy must complete the online Awareness Level Electrical Safety Training, located on the CH2M HILL Virtual Office (VO) intranet system.
- Do not tamper with electrical wiring and equipment unless qualified to do so. All electrical wiring and equipment must be considered energized until LO/TO procedures are implemented.
- Inspect electrical equipment, power tools, and extension cords for damage before use. Do not use defective electrical equipment and remove it from service.
- CH2M HILL has selected ground fault circuit interrupters (GFCIs) as the standard method for protecting employees from the hazards associated with electric shock.
  - GFCIs shall be used on all 120-volt, single phase 15- and 20-ampere receptacle outlets that are not part of the permanent wiring of the building or structure.
- An assured equipment grounding conductor program may be required under the following scenarios:
  - GFCIs cannot be used
  - Client requires such a program to be implemented
  - Business group decides to implement the program in addition to GFCI protection.
- Extension cords must be equipped with third-wire grounding. Cords passing through work areas must be covered, elevated, or protected from damage. Cords should not be routed through doorways unless protected from pinching. Cords should not be fastened with staples, hung from nails, or suspended with wire.
- Electrical power tools and equipment must be effectively grounded or double-insulated and Underwriters Laboratory-approved.
- Operate and maintain electric power tools and equipment according to manufacturers' instructions.
- Maintain safe clearance distances between overhead power lines and any electrical conducting material unless the power lines have been de-energized and grounded, or where insulating barriers have been installed to prevent physical contact. Maintain at least 10 feet (3 meters) from overhead power lines for voltages of 50 kilovolts (kV) or less, and 10 feet (3 meters) plus 0.4 inches (1.0 centimeter) for every 1 kV over 50 kV.
- Temporary lights shall not be suspended by their electric cord unless designed for suspension. Lights shall be protected from accidental contact or breakage.
- Protect all electrical equipment, tools, switches, and outlets from environmental elements.

## 8.6 Fire Prevention

(Reference CH2M HILL SOP HSE-403, *Hazardous Material Handling*)

Follow the fire prevention and control procedures listed below.

### 8.6.1 Fire Extinguishers and General Fire Prevention Practices

- Fire extinguishers shall be provided so that the travel distance from any work area to the nearest extinguisher is less than 100 feet (30.5 meters). When 5 gallons (19 liters) or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet (15.2 meters). Extinguishers must:
  - be maintained in a fully charged and operable condition
  - be visually inspected each month
  - 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 (3 meters) from any building.
- Solvent waste and oily rags must be kept in a fire-resistant, covered container until removed from the site.
- Keep work areas neat. Housekeeping is important.

### 8.6.2 Dispensing of Flammable/Combustible Liquids

- Areas in which flammable or combustible liquids are dispensed in quantities greater than 5 gallons (22.7 liters) shall be separated from other operations by at least 25 feet (7.6 meters).
- Drainage away from storm drains or surface waters or other means of containment shall be provided to control spills.
- Adequate natural or mechanical ventilation shall be provided to maintain the concentration of flammable vapor at or below 10 percent of the lower flammable limit.
- Dispensing of flammable liquids from one container to another shall be done only when containers are electrically interconnected (bonded).
- Dispensing flammable or combustible liquids by means of air pressure on the container or portable tanks is prohibited.
- Dispensing devices and nozzles for flammable liquids shall be of an approved type.

## 8.7 General Practices and Housekeeping

The following are general requirements applicable to all portions of the work:

- Perform site work during daylight hours whenever possible.
- Practice good housekeeping at all times in all project work areas.
- Establish common paths of travel and keep them 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, or other devices to be used.
- Designate specific areas for the proper storage of materials.
- Store tools, equipment, materials, and supplies in an orderly manner.
- Store neatly or remove scrap and unessential materials from the work area as work progresses.
- Provide containers for collecting trash and other debris and empty them at regular intervals.

- Clean up all spills quickly; clean oil and grease 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 emergencies, occupational illnesses, injuries, vehicle accidents, and near misses immediately.
- Do not remove or make ineffective the 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 the work area to identify any existing problems or hazards.

## 8.8 Hazard Communication

(Reference CH2M HILL SOPs HSE-107, *Hazard Communication*, and HSE-403, *Hazardous Material Handling*)

The hazard communication coordinator is to perform the following:

- Complete an inventory of chemicals brought on site by CH2M HILL using the chemical inventory form provided as an attachment to this SSHP
- Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available
- Request or confirm locations of 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 and list it on the chemical inventory sheet (attached to this SSHP) and add the MSDS to the MSDS attachment section of this SSHP
- Label chemical containers with the identity of the chemical and with hazard warnings, and store properly
- Give employees required chemical-specific hazard communication training using the chemical-specific training form included as an attachment to this SSHP
- Store all materials properly, giving consideration to compatibility, quantity limits, secondary containment, fire prevention, and environmental conditions.

## 8.9 Knife Use

Open-bladed knives (for example, box cutters, utility knives, pocket knives, machetes, and multi-purpose tools with fixed blades such as a Leatherman) are prohibited at worksites, except where the following three conditions are met:

- The open-bladed knife is determined to be the best tool for the job.
- An approved AHA or written procedure is in place that covers the necessary safety precautions (work practices, PPE, and training).
- Knife users have been trained and follow the AHA.

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<b>Responsibilities</b>	<ul style="list-style-type: none"><li>• Supervisors, with assistance from the SC, are responsible for funding and ensuring that the correct tool is being used, employees wear the proper PPE when using knives, and they have reviewed this policy.</li><li>• Employees are responsible for having and using 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.</li></ul>
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<b>Glove Requirements</b>	<ul style="list-style-type: none"><li>• In general, Kevlar cut-resistant gloves are to be worn when using a knife in an occupational setting.</li><li>• 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.</li></ul>
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<b>Training (Ref. VO for additional hand safety topics)</b>	<p>All employees who will use a knife must be trained in its proper use:</p> <ul style="list-style-type: none"><li>• When using a knife, always cut away from yourself.</li><li>• 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.</li><li>• If you use a folding knife, it must be a locking blade type.</li><li>• Never use a knife that will fold under pressure.</li><li>• 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.</li><li>• 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.</li><li>• If you carry a fixed blade knife, use a sheath or holder.</li><li>• Store utility knives safely, retract the blade or sheath and 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.<ul style="list-style-type: none"><li>• Keep your knife sharp. A dull blade requires you to use more force to cut and consequently increases the risk of slip or mistake.</li></ul></li><li>• Knives used on the job, but not carried with you, must be properly stored when not in use</li><li>• Never use a defective knife.</li><li>• 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. Use the knife only to cut. It was not designed to work as a prybar, screwdriver, hole punch, and other assorted functions that make work seem easier.</li><li>• If you get cut, seek medical attention to treat the injury by notifying your supervisor and contacting WorkCare at 1-866-893-2514.</li></ul>
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Examples of preferred tools and Kevlar cut resistant gloves are illustrated below:



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. Never continue cutting while distracted.

As always, utilize the hierarchy of controls and first attempt to engineer out the hazard and frequently ask whether the right tool is available for the job.

## 8.10 Lighting

Lighting shall be evaluated when conducting work inside buildings, confined spaces, or other areas/instances where supplemental light may be needed (such as work before sunrise or after sunset). A light meter can be used to evaluate the adequacy of lighting. The following are common requirements for lighting and the conditions/type of work being performed:

- While work is in progress outside, construction areas shall have at least 33 lux (lx) of illumination.
- Construction work conducted inside buildings should be provided with at least 55 lx of illumination.
- The means of egress shall be illuminated with emergency and non-emergency lighting to provide a minimum 11 lx illumination 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.

## 8.11 Manual Lifting

(Reference CH2M HILL SOP HSE-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. Use the following procedures to mitigate the hazards associated with lifting:

- When possible, the task should be modified to minimize manual lifting hazards.
- Lifting of loads weighing more than 40 pounds (18 kilograms) shall be evaluated by the SC using the Lifting Evaluation Form contained in SOP HSE-112.
- Mechanical lifting devices, such as forklifts, cranes, hoists, and rigging, hand trucks, and trolleys, are the preferred means of lifting heavy objects.
- Personnel shall seek assistance when performing manual lifting tasks that appear beyond their physical capabilities.
- In general, when planning and performing manual lifts, assess the situation before you lift; use good lifting and body positioning practices; and use good carrying and setting down practices.
- All CH2M HILL workers must complete training in proper manual lifting either through the New Employee Orientation or through Manual Lifting training module located on the VO.

## 8.12 Personal Hygiene

Good hygiene is essential for personal health and to reduce the potential of cross-contamination when working on a hazardous waste site. The practices below shall be followed:

- Keep hands away from nose, mouth, and eyes during work.
- Keep areas of broken skin (chapped, burned, etc.) covered.
- Wash hands with soap and water before eating, smoking, or applying cosmetics.

## 8.13 Shipping and Transportation of Hazardous Materials

(Reference CH2M HILL SOP HSE-417, *Hazardous Materials Transportation*)

The U.S. Department of Transportation (DOT) has specific regulations governing shipping of hazardous materials (also called dangerous goods). Chemicals brought to the site might be defined as hazardous materials by DOT. Hazardous wastes that may be shipped offsite are also defined as hazardous materials by DOT. Other wastes may also be DOT-classified as hazardous materials. To confirm whether a material or waste is a DOT-classified hazardous material, check with the ESBG Waste Coordinator (Lisa Schwan/ATL), the project EM, or the CH2M HILL Dangerous Goods Shipping Coordinators (John Blasco/BAO or Rob Strehlow/MKW).

All personnel who are associated with the shipment of hazardous materials, including receiving hazardous materials, preparing profiles or manifests, packaging hazardous wastes, labeling, or transporting hazardous materials by road, are classified as HazMat employees (note that CH2M HILL cannot transport hazardous wastes by public road). HazMat employees must receive CH2M HILL online training in shipping dangerous goods. CH2M HILL's online Dangerous Goods Shipping course can be found on the CH2M HILL Health, Safety, Security, & Environment (HSSE) website on the VO.

All hazardous materials that are shipped (for example, via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by a trained staff member. If the material is a product that is being shipped (for example, calibration gas), use the HazMat ShipRight tool on the CH2M HILL VO (under Company Resources – Online Shipping). Contact the Dangerous Goods Shipping coordinators, the ESG Waste Coordinator, or the project EM for additional information.

49 CFR 172 requires that all hazmat employees be aware of potential transportation security concerns. Hazardous materials security is addressed in CH2M HILL's hazardous materials SOP (HSE-403). The following points are provided as an overview of security measures to increase awareness of this important matter:

- It is essential that each HazMat employee understand the security risks involved with transporting hazardous materials.
- All transporters of hazardous materials must be prequalified by a Contracts Administrator who evaluates the carrier's safety rating, security measures, and employee screening procedures.
- When shipping hazardous materials, check driver credentials and ask about shipping details.
- When receiving a hazardous materials shipment, inspect packages for signs of tampering or damage to the contents. Verify the driver's and company information on the form with the driver.
- If there is suspicious or unusual behavior (for example, driver without credentials, evasive answers) or any discrepancies are identified, do not offer or accept the shipment, and immediately notify the PM or the RHSM.

Employees responsible for shipping hazardous materials must also review the CH2M HILL Transportation Security Plan (HSE-417 Appendix A).

## **8.14 Substance Abuse**

(Reference CH2M HILL SOP HSE-105, *Drug-Free Workplace*)

Employees who work under the influence of controlled substances, drugs, or alcohol may be dangerous or otherwise harmful to themselves, other employees, clients, the company, the company's assets and interests, or the public. CH2M HILL does not tolerate illegal drug use, or any use of drugs, controlled substances, or alcohol that impairs an employee's work performance or behavior.

Prohibitions onsite include:

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

Drug and/or alcohol testing is applicable under CH2M HILL Constructors, Inc. and MR projects performed in the United States. In addition, employees may be required to submit to drug and/or alcohol testing as required by clients. When required, this testing is performed in accordance with SOP HSE-105, *Drug-Free Workplace*.

Employees who are enrolled in drug or alcohol testing are required to complete annual training located on the CH2M HILL VO.

# Project-specific Hazard Controls

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This section discusses the 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 work or the particular hazard. Each person onsite is required to abide by the hazard controls. Always consult the appropriate CH2M HILL SOP to make sure that all requirements are implemented. 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 RISM for clarification.

## 9.1 Chainsaws

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

Below are the hazard controls and safe work practices to follow when working around or operating chainsaws. Ensure the requirements in the referenced SOP are followed.

### 9.1.1 Equipment

Only chainsaws equipped with a spark arrestor and fully functioning chain brake or “safety chain” shall be used. The following safety equipment shall be readily available while operating a chainsaw:

- Chainsaw operator’s manual
- Fully stocked first aid kit
- Multipurpose fire extinguisher
- Grounded extension cord approved for outdoor use and a GFCI for electrically 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

### 9.1.2 PPE Requirements

The following PPE shall be worn while operating chainsaws:

- Safety glasses with side shields and 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 an assigned decibel noise reduction rating —the higher the rating, the greater the protection provided
- 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 (5.08 centimeters) above the ankles. These chaps are made from synthetic fabrics designed to prevent the running saw chain from coming in contact with the operator’s legs.

### 9.1.3 Safe Operation

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

- Inspect the chainsaw before use.
- Hold chainsaws 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 the saw so that it is between the waist and mid-chest level. Avoid overreaching or cutting above the mid-chest height.
- 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 crookedly, results in fine sawdust instead of chips, or generates a smell of burnt wood. Do not use a dull chain.
- Keep bystanders and helpers at a safe distance from operation.
- Do not operate a chainsaw when fatigued and take frequent breaks.
- Work slowly and don't rush.
- Make sure a fire extinguisher is present at all times when operating the chainsaw in forest or brushy areas.

#### **9.1.4 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

## **9.2 Drum and Portable Tank Handling**

Below are the hazard controls and safe work practices to follow when overseeing the movement of drums or when handling drums:

- Ensure that personnel are trained in proper lifting and moving techniques to prevent back injuries.
- Ensure drum or tank bungs and lids are secured and are labeled before moving.
- Ensure that drums and tanks remain covered except when removing or adding material or waste. Secure covers and/or lids properly at the end of each workday.
- Provide equipment to keep the operator removed from the drums to lessen the likelihood of injury. Such equipment might include: a drum grappler attached to a hydraulic excavator, a small front-end loader that can be either loaded manually or equipped with a bucket sling, a rough terrain forklift, roller conveyor equipped with solid rollers, or drum carts designed specifically for drum handling.
- Make sure the vehicle selected has sufficient rated load capacity to handle the anticipated loads and that it can operate smoothly on the available road surface.
- Ensure there are appropriately designed Plexiglas cab shields on loaders, backhoes, etc., when handling drums containing potentially explosive materials.

- Make sure that equipment cabs are supplied with fire extinguishers; they should be air-conditioned to increase operator efficiency.
- Supply operators with appropriate respiratory protective equipment when needed.
- Ensure that drums are secure and are not in the operator's view of the roadway.
- Before handling, warn all personnel about hazards of handling.
- Before moving anything, consider the most appropriate sequence in which the various drums, portable tanks, and other containers should be moved. For example, small containers may have to be removed first to permit heavy equipment to enter and move the drums.
- Keep over-pack drums and an adequate volume of absorbent near areas where minor spills may occur.
- Use containers or over-packs that are compatible with the waste or materials.
- Provide drums containing liquids or hazardous waste with secondary containment and do not locate them near a storm water inlet or conveyance.
- Allow enough aisle space between drum pallets and between drums and other equipment to allow the drums to be easily accessed (at least 2 to 3 feet) by fire control equipment and similar equipment.
- Make sure that a spill kit is available in drum or tank storage areas (or where liquids are transferred from one vessel to another).

### **9.3 Drum Sampling Safety**

Personnel are permitted to handle and/or sample drums containing certain types of waste (drilling waste, IDW, waste from known sources) only. Handling or sampling drums with unknown contents requires a plan revision or amendment approved by the RHSM. The following control measures will be taken when sampling drums:

- Minimize transportation of drums.
- Sample only labeled drums or drums from a known waste stream.
- Do not sample bulging or swollen drums. Contact the RHSM.
- If drums contain, or potentially contain, flammable materials, use non-sparking tools to open.
- Use the proper tools to open and seal drums.
- Reseal bung holes or plugs whenever possible.
- Avoid mixing incompatible drum contents.
- Sample drums without leaning over the drum opening.
- Transfer/sample the content of drums using a method that minimizes contact with material.
- Use the PPE and perform air monitoring as specified in the PPE and Site Monitoring sections of this SSHP.
- Take precautions to prevent contaminated media from contacting the floor or ground, such as having plastic under the sampling area, having a spill kit accessible during sampling activities.
- If transferring/sampling drums containing flammable or combustible liquids, drums and liquid transfer equipment should be grounded and bonded to reduce the potential of a static discharge.

## 9.4 Excavation Activities

(Reference CH2M HILL SOP HSE-307, *Excavation and Trenching Safety*)

The requirements in this section shall be followed whenever excavation is being performed. Refer to the Earthmoving Equipment section and SOP for additional requirements applicable to operating/oversight of earthmoving equipment. Below are the hazard controls and safe work practices to follow when working around or performing excavation. Ensure the requirements in the referenced SOP are followed.

- If the project site is suspected of MEC contamination, the requirements of the *Explosives Usage and Munitions Response (MR)*, SOP HSE-610, shall be followed. MECs include UXO, discarded military munitions, MPPEH, CWM, MC, and contaminated soil or groundwater. Downhole avoidance support may be required to prevent accidental contact with UXO. Safety requirements will be based on the risk assessment identified within the MR Safety Risk Evaluation.
- Do not enter the excavations unless completely necessary, and only after the competent person has completed the daily inspection and has authorized entry. An inspection shall be conducted by the competent person before work begins, as needed throughout the shift, after every rainstorm, and after any hazard-increasing occurrence. Documentation of the inspection must be maintained onsite at all times.
- Follow all excavation entry requirements established by the competent person and any excavation permit being used.
- Sloping, benching, shoring, shielding, or other protective systems are required to protect personnel from cave-ins except when the excavation is made entirely in stable rock or is less than 5 feet deep (1.5 meters) and there is no indication of possible cave-in, as determined by the competent person. Protective systems for excavations deeper than 20 feet (6.1 meters) must be designed or approved by a registered professional engineer.
- Trenches more than 4 feet (1.2 meters) deep shall be provided with a ladder, stairway, or ramp positioned so that the maximum lateral travel distance is no more than 25 feet (7.6 meters).
- The atmosphere of excavations more than 4 feet (1.2 meters) deep shall be tested before entry when a hazardous atmosphere exists or could reasonably be expected to exist, such as excavations in landfills, hazardous waste dumps, areas containing sewer or gas utility systems or petroleum distillates, or areas where hazardous substances are stored nearby.
- Spoil piles, material, and equipment must be kept at least 2 feet (61 centimeters) from the edge of the excavation, or a retaining device must be used to prevent the material from falling into the excavation.
- Excavations shall not be entered when:
  - Protective systems are damaged or unstable.
  - Objects or structures above the work location may become unstable and fall into the excavation.
  - The potential for a hazardous atmosphere exists, unless the air has been tested and found to be at safe levels.
  - Water has accumulated in the excavation, unless precautions have been taken to prevent excavation cave-in.
- The excavation self-assessment checklist shall be used to evaluate excavations before entry.

### Excavation Operations

Refer to the Excavation Entry section when entering excavations controlled by other parties. When CH2M HILL performs the excavating, a CH2M HILL-designated competent person will oversee all excavation operations and entry into excavations. The competent person shall:

- Complete the CH2M HILL Excavation Permit (attached to this SSHP) to ensure HSE requirements have been satisfied during excavation activities.

- Complete the CH2M HILL Daily Excavation Inspection Checklist (attached to this SSHP) to ensure HSE requirements have been satisfied, document that an inspection has been conducted, and to authorize entry into the excavation. A new checklist shall be completed each day, authorizing excavation entry. Inspections should be continued as needed throughout the work shift, and after any event that could increase the potential for cave-in (for example, rainfall).
- Conduct daily safety briefings before excavation entry.

## 9.5 Forklift Operations

(Reference CH2M HILL, SOP HSE-309, *Forklifts*)

Below are the hazard controls and safe work practices to follow when working around or operating forklifts. Ensure the requirements in the referenced SOP are followed.

- A rated lifting capacity must be posted in a location readily visible to the operator.
- A forklift truck must not be used to elevate employees unless a platform with guardrails, a back guard, and a kill switch is provided on the vehicle. When guardrails are not possible, fall arrest protection is required.
- The subcontractor operating the forklift must post and enforce a set of operating rules for forklift trucks.
- Only certified forklift operators shall operate forklifts.
- Stunt driving and horseplay are prohibited.
- Employees must not ride on the forks.
- Employees must never be permitted under the forks (unless forks are blocked).
- The driver must inspect the forklift once a shift and document this inspection.
- The operator must look in the direction of travel and must not move the vehicle until all persons are clear of the vehicle.
- Forks must be carried as low as possible.
- The operator must lower the forks, shut off the engine, and set the brakes (or block the wheels) before leaving the forklift operator's position unless maintenance or safety inspections require the forklift to be running.
- Trucks must be blocked and have brakes set when forklifts are driven onto their beds.
- Extreme care must be taken when tilting elevated loads.
- Every forklift must have operable brakes capable of safely stopping it when fully loaded.
- Forklifts must have parking brakes and an operable horn.
- When the operator is exposed to possible falling objects, industrial trucks must be equipped with overhead protection (canopy).
- If certified CH2M HILL forklift operators are being used, forklifts must be inspected and documented daily using the forklift inspection form.

## 9.6 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 using hand and power tools. Ensure the requirements in the referenced SOP are followed:

- Inspect tools before use and tag and remove damaged tools from service.
- Use or operate hand tools for their intended use and 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.
- Plug portable power tools into GFCI-protected outlets.
- Ensure that portable power tools are Underwriters Laboratories-listed and have a three-wire grounded plug or are 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).
- Ensure that safety guards on tools remain installed while the tool is in use and are 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.
- Confirm that if a cordless tool is connected to its recharge unit, both pieces of equipment conform strictly with electrical standards and manufacturer's specifications.
- Confirm that tools used in an explosive environment are 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.
- Unplug jammed equipment only when equipment has been shut down; all sources of energy have been isolated; and equipment has been locked/tagged and tested.
- Ensure that equipment to undergo maintenance and repair that results in the removal of guards or would otherwise put anyone at risk is locked out before beginning work.

## **9.7 Munitions and Explosives of Concern and Material Potentially Presenting an Explosive Hazard**

(Reference CH2M HILL, SOP HSE-610, *Explosives Usage and Munitions Response*)

The following will be required before any MR related field work:

- Setting up a conference call with all required personnel to conduct a basic safety risk assessment.
- Providing written directions detailing job-specific requirements and what actions to take to ensure safety during the work.
- 3R Training (Recognize, Retreat, and Report) will be required for all affected project personnel.

### **9.7.1 Hazard Identification**

The nature of activities on this project will result in the potential of encountering Munitions and Explosives of Concern (MEC) and Material Potentially Presenting an Explosive Hazard (MPPEH) items that have been fired, disposed, or abandoned, but may still represent a hazard. Non-Unexploded Ordnance (UXO) trained personnel will avoid all contact with MEC/MPPEH.

The Off-Base SDZs was comprised of the following former ranges:

- Rocket Range Number 1 (ASR #2.33)
- Direct Fire Artillery Range (G-7) (ASR #2.61)
- G-6 Artillery Range (ASR #2.62)
- Impact Area N-1 (ASR 2.207), which includes Bomb Target (BT)-3

In summary, the following items may have been used at these ranges:

- Rockets: 2.75-inch, 3.5-inch, 5-inch, and 11.75-inch
- Artillery: 37mm, 57mm, 90mm, 105mm
- Mortars: 60mm, 81mm, 4.2mm (all types), 75mm cannon
- Recoilless rifle (all types unless specified): 57mm, 75mm, 90mm, 105mm (HEP-T), 106mm
- AA (all types): 37mm, 40mm, 90mm, 120mm
- Tank gun (all types): 90mm, 105mm (all types except toxics), 120mm, 40mm grenades
- Howitzer (all types except toxics): 75mm, 105mm, 8-inch, 155mm (Howitzer/gun), TOW missile
- HE bombs (old style): 100-pound, 250-pound, 500-pound
- HE bombs (low drag): 250-pound, 500-pound, practice bombs

The Explosives Safety Submission (ESS) Amendment covers the types of munitions likely used and the intrusive activities at the Off Base SDZs MRA. All work will follow the approved Work Plan Addendum, which is based on the DDESB-approved ESS Amendment.

## **9.7.2 Hazard Mitigation/Prevention**

All field personnel will be given munitions recognition training prior to working on the site. The training will be verified by signature on the site training form. Personnel will be instructed to be alert for MEC/MPPEH. The following general precautions concerning suspect MEC will be observed at all times:

- Suspect MEC item(s) WILL NOT be touched or moved regardless of the markings or apparent condition. Only UXO trained personnel are allowed to handle MEC/MPPEH.
- Radios or cellular phones WILL NOT be used in the vicinity of suspect MEC items.
- Areas where the ground cannot be seen WILL NOT be traveled across without escort.
- Vehicles WILL NOT be driven into suspected MEC areas; clearly marked lanes will be used.
- Matches, cigarettes, lighters, or other flame-producing devices WILL NOT be carried on to a munitions response site (MRS).
- Color codes WILL NOT be relied upon for positive identification of MEC items or their contents.
- Suspect MEC items will be approached from the side whenever possible; approaching the front or rear areas will be avoided.
- Personnel will always assume that a MEC item contains a live charge until it can be determined otherwise.
- Earth Moving Equipment (EME) Operations within an EZ will be performed under the supervision of a UXO technician III
- EME will not be used to excavate soils within 12 inches of an anomaly.
- Anomaly investigation personnel are not permitted to enter an excavation greater than four feet in depth. If an investigation needs to be performed in an excavation deeper than four feet, operations at that work area will be halted and the Site Safety & Health Officer (SSHO) will be notified. If further investigation is warranted, the SSHO will notify the Health & Safety Manager (HSM) to determine the appropriate safety measures (e.g. sloping, shoring, etc.) to be implemented. The implementation of excavation safety provisions will require an amendment to this SSHP.

- When anomaly investigation personnel must be in the area of EME:
  - Sufficient separation between ground support personnel and operating EME must be maintained.
  - Wear reflective vests or high visibility clothing to promote visibility of ground personnel by equipment operators.
  - Isolate equipment swing areas from workers, fixed objects or other equipment. Ground personnel shall avoid positioning themselves between fixed object and operating equipment.
  - Make/maintain eye contact with operators before approaching equipment. Do not approach equipment from rear or from blind spot of operator. Stay out of the swing radius of operating heavy equipment.
  - Suspended loads shall not be passed over ground personnel and ground personnel shall not walk under or in front of suspended loads.

The following actions will be taken if munitions are found:

- Personnel who are not UXO-qualified will note the area of concern, and leave the immediate vicinity. They WILL NOT touch, move, or otherwise disturb the item.
- Personnel should not be misled by markings on the munitions item stating or indicating that the item is a practice bomb or inert. Even practice bombs may have explosive charges that are used to mark/spot the point of impact, or the item could be incorrectly marked.
- Immediately upon locating any suspect MEC, the Senior UXO Supervisor (SUXOS) and UXO Safety Officer (UXOSO) will be notified. In turn, the SUXOS will notify the Project Manager who will then provide required notifications to the client.
- Operations in the immediate area of the suspect MEC will be halted and the appropriate procedures (as described below) will be implemented.

Removal and disposal of MEC is part of this scope of work and will be undertaken by a MEC support contractor under the oversight of CH2M HILL UXO qualified personnel. MEC will be consolidated, demilitarized, and disposed of in accordance with procedures outline in the approved Work Plan and Explosive Site Submission (ESS).

When MEC is detected and identified as potentially loaded with explosives, chemicals, propellant or pyrotechnics, or when a buried object is exposed and cannot be identified as non-MEC, the MEC support contractor will coordinate with the CH2M HILL SUXOS for assistance. The location of the object will be marked with a yellow survey marker flag and all investigation activities at that location will cease. The MEC support contractor will maintain site access control and ensure personnel safety until Explosive Ordnance Disposal (EOD) Personnel arrive and take control of the site. The contractor must supply the GPS coordinates for each item upon arrival of the Emergency Response Team. The GPS positions must also be noted in the final report. The contractor will allow the Government EOD personnel sufficient time to complete field evaluation, render safe, recover and dispose of MEC, per incident, when MEC that cannot be identified is detected.

### **9.7.3 MEC Avoidance Procedures**

MEC avoidance operations will be required for select non-intrusive tasks associated with the investigation. Avoidance operations will consist of a team composed of one or more UXO Technicians. **Contact with MEC is prohibited during avoidance activities.** The UXO Team will initiate disposal operations for any MEC/MPPEH encountered as discussed in the section above.

## 9.8 Underground Utilities

### Local Utility Mark-Out Services

Name: TBD

Phone:

An assessment must be conducted where there is a potential to contact underground utilities or similar subsurface obstructions during intrusive activities. Intrusive activities include excavation, soil sampling, or similar tasks.

The assessment must be conducted before any intrusive subsurface activity and must include at least the following elements:

1. Making a background and records assessment of known utilities or other subsurface obstructions.
2. Contacting and using the designated local utility locating service (NC ONE call).
3. Because the Off Base SDZs MRA is located within the salt marsh and coastal wetlands area, an independent field survey to identify, locate, and mark potential underground utilities or subsurface obstructions will not be conducted (physical access is limited at best). All excavations will be conducted using hand tools. The underground utility assessment will be based on the NC ONE call results.
4. Conducting a visual survey of the area to validate the chosen location.

When any of these steps identifies an underground utility within 5 feet (1.5 meters) of intrusive work, non-aggressive means must be used to physically locate the utility before a drill rig, backhoe, excavator or other aggressive method is used. Aggressive methods are never allowed within 2 feet of an identified high-risk utility (see section 9.20.6). Any deviation from these requirements must be approved by the RHSM and the PM.

### 9.8.1 Background and Records Assessment of Known Utilities

Identify any client- or location-specific permit and/or procedural requirements (for example, dig permit or intrusive work permit) for subsurface activities. For military installations, contact the Base Civil Engineer and obtain the appropriate form to begin the clearance process. Obtain available utility diagrams and/or as-built drawings for the facility.

Review locations of possible subsurface utilities, including sanitary and storm sewers, electrical lines, water supply lines, natural gas lines, fuel tanks and lines, communication lines, lighting protection systems, etc. Note: Use caution in relying on as-built drawings because they are rarely 100 percent accurate. Request that a facility contact with knowledge of utility locations review and approve proposed locations of intrusive work.

### 9.8.2 Designated Local Utility Locating Service

Contact your designated local utility locating service (for example, NC One Call) to identify and mark the location of utilities. Call 811 or go to [www.call811.com](http://www.call811.com) to identify the appropriate local service group. Contacting the local utility locating service is a legal requirement in most jurisdictions.

### 9.8.3 Visual Assessment before and during Intrusive Activities

Perform a “360-degree” assessment. Walk the area and inspect for utility-related items such as valve caps, previous linear cuts, patchwork in pavement, hydrants, manholes, utility vaults, drains, and vent risers in and around the dig area.

The visual survey shall include all surface landmarks, including manholes, previous liner cuts, patchwork in pavement, pad-mounted transformers, utility poles with risers, storm sewer drains, utility vaults, and fire hydrants. If any unanticipated items are found, conduct further research before beginning intrusive activities and take any actions needed to avoid striking the utility or obstruction.

## 9.8.4 Intrusive Activities within 2 feet of an Underground Utility

Use non-aggressive methods (manual digging, vacuum excavation, etc.) to perform intrusive activities within 2 feet of a high-risk utility (a utility that cannot be de-energized or would cause significant impacts to repair/replace). Hazardous utilities shall be de-energized whenever possible.

## 9.9 Overhead Utilities

### 9.9.1 Proximity to Power Lines

No work is to be conducted within 50 feet (15.2 meters) of overhead power lines without first contacting the utility company to find out the voltage of the system. No aspect of any piece of equipment is to be operated within 50 feet (15.2 meters) of overhead power lines without first obtaining this information.

**Operations adjacent to overhead power lines are PROHIBITED unless one of the following conditions is satisfied:**

- Power has been shut off; positive means (such as lockout) have been taken to prevent the lines from being energized; lines have been tested to confirm the outage; and the utility company has provided a signed certification of the outage.
- The minimum clearances from energized overhead lines listed in the table below are observed, or the equipment is repositioned and blocked to ensure that no part, including cables, can come within the minimum clearances shown in the table.

MINIMUM DISTANCES FROM POWER LINES	
Power Lines Nominal System kV	Minimum Required Distance, Feet (Meters)
0-50	10 (3.0)
50-200	15 (4.6)
201-350	20 (6.1)
351-500	25 (7.6)
501-750	35 (10.7)
751-1,000	45 (13.7)
Over 1,000	Established by utility owner/operator or by a professional engineer in electrical power transmission/distribution

*(These distances eliminate the potential for arcing based on the line voltage.)*

- The power line(s) has been isolated through the use of insulating blankets that have been properly placed by the utility. If insulating blankets are used, the utility will establish the minimum safe operating distance; get this information in writing, including the utility representative's signature.
- All inquiries regarding electric utilities must be made in writing, and a written confirmation of the outage/isolation must be received by the PM before the start of work.

## 9.10 Working Around Material-handling Equipment

When CH2M HILL personnel are working around material-handling equipment, the following safe work practices/hazard controls shall be implemented:

- Never approach operating equipment from the rear. Always make positive contact with the operator, and confirm that the operator has stopped the motion of the equipment.
- Never approach the side of operating equipment; remain outside of the swing and turning radius.
- Maintain distance from pinch points of operating equipment.

- Never turn your back on any operating equipment.
- Never climb onto operating equipment or operate contractor/subcontractor equipment.
- Never ride contractor/subcontractor equipment unless it is designed to accommodate passengers and equipped with firmly attached passenger seat.
- Never work or walk under a suspended load.
- Never use equipment as a personnel lift; do not ride excavator buckets or crane hooks.
- Always stay alert and maintain a safe distance from operating equipment, especially equipment on cross slopes and unstable terrain.
- Wear a high-visibility safety vest or high-visibility clothing.

# Physical Hazards and Controls

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Physical hazards include exposure to temperature extremes, sun, noise, and radiation. If you encounter a physical hazard that has not been identified in this plan, contact the RHSM so that a revision to this plan can be made.

## 10.1 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 exposure 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 develop feasible engineering controls. When engineering controls are not feasible, administrative controls can be developed and appropriate hearing protection will be provided.
- In areas or near equipment emitting noise levels at or above 85 dBA, hearing protection must be worn.
- Employees exposed to 85 dBA or a noise dose of 50 percent 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 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 VO.
- Hearing protection will be maintained in a clean and reliable condition, inspected before use and after any occurrence to identify any deterioration or damage, and damaged or deteriorated hearing protection will be 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 and a copy of the OSHA standard 29 CFR 1910.95 shall be posted in the workplace.

## 10.2 Ultraviolet Radiation (Sun Exposure)

Health effects regarding ultraviolet (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. Implement the following controls to avoid sunburn.

### 10.2.1 Limit Exposure Time

- Rotate staff members 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.

### **10.2.2 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.

### **10.2.3 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. Wraparound- style glasses provide the best protection.

### **10.2.4 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. Most dermatologists advocate a sun protection factor of 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.
- No sunscreen provides 100 percent protection against UV radiation. Other precautions must be taken to avoid overexposure.

## **10.3 Temperature Extremes**

(Reference CH2M HILL SOP HSE-211, *Heat and Cold Stress*)

Each employee is responsible for the following:

- Recognizing the symptoms of heat or cold stress
- Taking appropriate precautionary measures to minimize the risk of exposure to temperature extremes (see following sections)
- Communicating any concerns regarding heat and cold stress to the supervisor or SC

### **10.3.1 Heat**

Heat-related illnesses are caused by more than just temperature and humidity factors.

**Physical fitness** influences a person's ability to perform work under heat loads. At a given level of work, the more fit a person is, less physiological strain is experienced, the heart rate and body temperature are lower ( the latter

indicates less retained body heat—a rise in internal temperature precipitates heat injury), and the sweating mechanism is more efficient.

**Acclimatization** is the degree to which a worker's body has physiologically adjusted or acclimatized to working under hot conditions. Acclimatization affects the ability to do work. Acclimatized individuals sweat sooner and more profusely than un-acclimatized individuals. Acclimatization occurs gradually over 1 to 2 weeks of continuous exposure, but it can be lost in as little as 3 days in a cooler environment.

**Dehydration** reduces body water volume. This reduces the body's sweating capacity and directly affects its ability to dissipate excess heat.

The ability of a body to dissipate heat depends on the ratio of its surface area to its mass (surface area/weight).

**Heat dissipation** is a function of surface area, while heat production depends on body mass. Therefore, overweight individuals (those with a low ratio) are more susceptible to heat-related illnesses because they produce more heat per unit of surface area than if they were thinner. Monitor these persons carefully if heat stress is likely.

When wearing **impermeable clothing**, the weight of an individual is not as important in evaluating the ability to dissipate excess heat because the primary heat dissipation mechanism, evaporation of sweat, is ineffective.

SYMPTOMS AND TREATMENT OF HEAT STRESS					
	Heat Syncope	Heat Rash	Heat Cramps	Heat Exhaustion	Heat Stroke
<b>Signs and Symptoms</b>	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.
<b>Treatment</b>	Move 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.	Move to cooler area. Rest lying down. Increase fluid intake.	Move 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!

### Precautions

- Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50°F to 60°F should be made available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons (7.5 liters) 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 (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 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. PREVENTION and communication is key.

### **Thermal Stress Monitoring**

The following procedures should be implemented when the ambient air temperature exceeds 70°F, the relative humidity is high (greater than 50 percent), or when the workers exhibit symptoms of heat stress:

- The heart rate should be measured by the radial pulse for 30 seconds, as early as possible in the resting period.
- The heart rate at the beginning of the rest period should not exceed 110 beats per minute, or 20 beats per minute above resting pulse.
- If the heart rate 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 110 beats per minute at the beginning of the next rest period, the following work cycle should be further shortened by 33 percent.
- Continue this procedure until the rate is maintained below 110 beats per minute, or 20 beats per minute above resting pulse.
- Alternately, the oral temperature can be measured before the workers have something to drink.
- If the oral temperature exceeds 99.6°F at the beginning of the rest period, the following work cycle should be shortened by 33 percent.
- Continue this procedure until the oral temperature is maintained below 99.6°F. Although it provides an accurate indication of heat stress, oral temperature is difficult to measure in the field.

### **Procedures for when Heat Illness Symptoms are Experienced**

- **Always** contact the RHSM when any heat illness-related symptom is experienced so that controls can be evaluated and modified, if needed.
- In the case of cramps, reduce activity, increase fluid intake, move to shade until recovered.
- In the case of all other heat-related symptoms (fainting, heat rash, heat exhaustion), and if the worker is a CH2M HILL worker, contact the [occupational physician at 1-866-893-2514](tel:1-866-893-2514) and immediate supervisor.
- In the case of heat stroke symptoms, call 911, have a designee give location and directions to ambulance service if needed, follow precautions under the emergency medical treatment of this SSHP.
- Follow the directions provided in Section 22, Incident Notification, Reporting, and Investigation, of this SSHP.

## **10.3.2 Cold**

### **General**

Low ambient temperatures increase the heat lost from the body to the environment by radiation and convection. In cases where the worker is standing on frozen ground, the heat loss is also due to conduction.

Wet skin and clothing, whether because of water or perspiration, may conduct heat away from the body through evaporative heat loss and conduction. As a result, the body cools suddenly when chemical protective clothing is removed if the clothing underneath is perspiration-soaked. Movement of air across the skin reduces the insulating layer of still air just at the skin's surface. Reducing this insulating layer of air increases heat loss by convection. Non-insulating materials in contact or near-contact with the skin, such as boots constructed with a metal toe or shank, conduct heat rapidly away from the body.

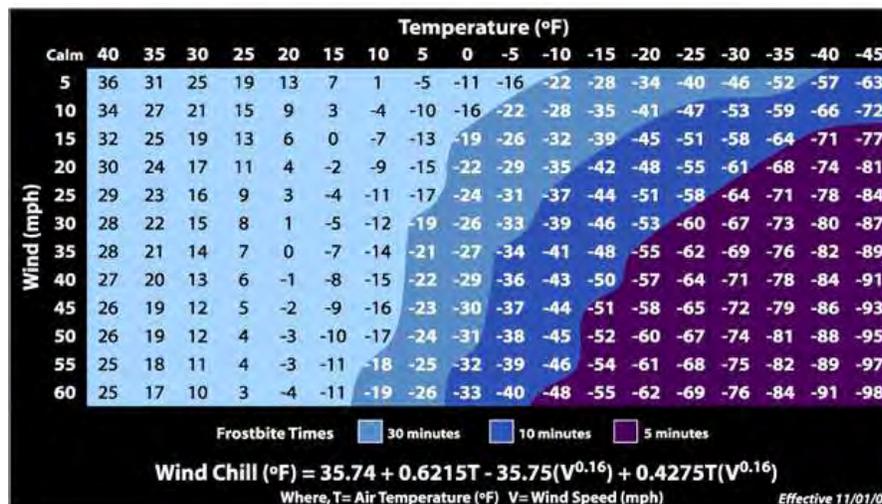
Certain common drugs, such as alcohol, caffeine, or nicotine, may exacerbate the effects of cold, especially on the extremities. These chemicals reduce the blood flow to peripheral parts of the body, which are already high-

risk areas because of their large surface area to volume ratios. These substances may also aggravate an already hypothermic condition.

### Precautions

- 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 wet 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.
- Use the wind-chill index (illustrated below) 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.
- Report initial signs of immersion foot, frostbite, and/or hypothermia should report it immediately to your 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 as well as 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.



## 10.4 Radiological Hazards

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

Hazards	Controls
None Known	None Required

# Biological Hazards and Controls

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Biological hazards are everywhere and change with the region and season. If you encounter a biological hazard that has not been identified in this plan, contact the RHSM so that a revision to this plan can be made. Whether it is contact with a poisonous plant, a poisonous snake, or a bug bite, do not take contact, bites, or stings lightly. If there is a chance of an allergic reaction or infection, or to seek medical advice on how to properly care for the injury, contact the [occupational nurse at 1-866-893-2514](tel:1-866-893-2514).

## 11.1 Bees and Other Stinging Insects

Bees 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 a buddy. If you are stung, [contact the occupational nurse at 1-866-893-2514](tel:1-866-893-2514). If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for an allergic reaction if you have never been stung before. Call 911 if the reaction is severe.

## 11.2 Bird Droppings

Large amounts of bird droppings may present a disease risk. The best way to prevent exposure to fungus spores in bird droppings is to avoid disturbing it. A brief inhalation exposure to highly contaminated dust may be all that is needed to cause infection and subsequent development of fungal disease.

If disturbing the droppings or if removal is necessary to perform work, follow these controls:

- Use dust control measures (wetting with water or HEPA vacuuming) for all activities that may generate dust from the accumulated droppings.
- Wear Tyvek with hoods, disposable gloves and booties, and air-purifying respirators with a minimum N95 rating.
- Put droppings into plastic/poly bags and preferably into a 55-gallon drum to prevent bag from ripping.

## 11.3 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 (for example, a 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, contact the occupational nurse at 1-866-893-2514](tel:1-866-893-2514). Report the incident to the local authorities.

## 11.4 Mosquito Bites

Due to the recent detection of the West Nile virus in the southwestern United States, preventative measures should be taken to reduce the probability of being bitten by mosquitoes whenever possible. Mosquitoes 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 N,N-diethyl-meta-toluamide (DEET) because mosquitoes may bite through thin clothing.
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35 percent DEET. Repellents may irritate the eyes and mouth, so avoid applying repellent to the hands.
- Whenever you use an insecticide or insect repellent, read and follow the manufacturer's DIRECTIONS FOR USE, as printed on the product.

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 to 15 days. Contact the RHSM with questions, and immediately report any suspicious symptoms to your supervisor and the PM, and contact the occupational nurse at 1-866-893-2514.

## 11.5 Poison Ivy, Poison Oak, and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are found more commonly 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 at any time, especially in dry areas. Leaves may achieve bright reds in fall, but plants lose their (yellowed, then brown) leaves in winter, leaving toxic stems. All parts of the plant remain toxic throughout the seasons. These plants contain urushiol, 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 the roots, once aboveground 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 urushiol 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, or vegetation clearing.

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

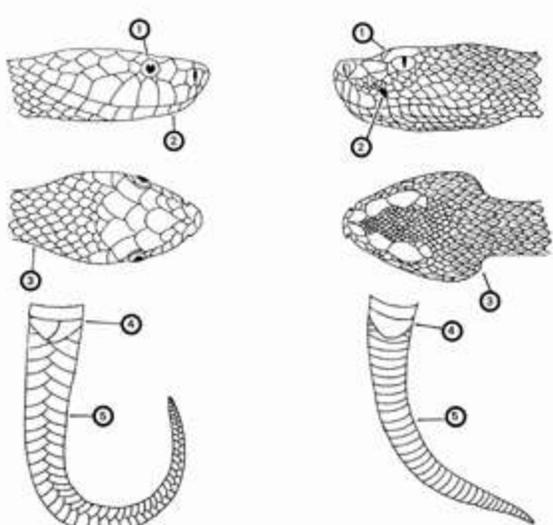
- Do not drive vehicles onto the site where they will come into contact with poison ivy, sumac, or oak. Vehicles that need to work in the area, such as drill rigs or heavy equipment, must be washed as soon as possible after leaving the site.
- All tools used in the poison ivy, sumac or oak area, including 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 onsite decontamination is not possible, use plastic to wrap any tools or equipment until they can be decontaminated.
- PPE, including Tyvek coveralls, gloves, and boot covers, must be worn. PPE must be placed into plastic bags and sealed if 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 Zanfel, Tecnu, or other product designed for removing urushiol. If you do not have Zanfel or Tecnu, wash with cold water. Do not take a bath because 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](tel:1-866-893-2514).

## 11.6 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 bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Call the [occupational nurse at 1-866-893-2514](tel:1-866-893-2514) 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. Below is a guide to identifying poisonous snakes from non-poisonous snakes.

## Identification of Poisonous Snakes

Major Identification Features Non-venomous Snake	Major Identification Features Venomous Snake
<ol style="list-style-type: none"> <li>1. Round pupils</li> <li>2. No sensing pit</li> <li>3. Head slightly wider than neck</li> <li>4. Divided anal plate</li> <li>5. Double row of scales on the underside of the tail</li> </ol>	<ol style="list-style-type: none"> <li>1. Elliptical pupils</li> <li>2. Sensing pit between eye and nostril</li> <li>3. Head much wider than neck</li> <li>4. Single anal plate</li> <li>5. Single scales on the underside of the tail</li> </ol>
	

## 11.7 Spiders - Brown Recluse and Widow

The Brown Recluse spider can be found most anywhere in the United States. It varies in size in shape, but the distinguishing mark is the violin shape on its body. They are typically non-aggressive. Keep an eye out for irregular, pattern-less webs that sometimes appear almost tubular and built in a protected area such as in a crevice or between two rocks. The spider will retreat to this area of the web when threatened.

The Black Widow, Red Widow, and the Brown Widow are all poisonous. Most have globose, shiny abdomens that are predominantly black with red markings (although some may be pale or have lateral stripes), with moderately long, slender legs. These spiders are nocturnal and build a three-dimensional tangled web, often with a conical tent of dense silk in a corner where the spider hides during the day.

### Hazard Controls

- Inspect or shake out any clothing, shoes, towels, or equipment before use.
- Wear protective clothing such as a long-sleeved shirt and long pants, hat, gloves, and boots when handling stacked or undisturbed piles of materials.
- Minimize the empty spaces between stacked materials.
- Remove and reduce debris and rubble from around the outdoor work areas.
- Trim or eliminate tall grasses from around outdoor work areas.
- Store apparel and outdoor equipment in tightly closed plastic bags.
- Keep your tetanus boosters up to date (every 10 years). Spider bites can become infected with tetanus spores.

If you think you have been bit by a poisonous spider, immediately call the occupational nurse at 1-866-893-2514 and follow the guidance below:

- Remain calm. Too much excitement or movement will increase the flow of venom into the blood.
- Apply a cool, wet cloth to the bite or cover the bite with a cloth and apply an ice bag to the bite.
- Elevate the bitten area, if possible.
- Do not apply a tourniquet, do not try to remove venom.
- Try to positively identify the spider to confirm its type. If the spider has been killed, collect it in a plastic bag or jar for identification purposes. Do not try to capture a live spider—especially if you think it is a poisonous spider.

Black Widow



Red Widow



Brown Widow



Brown Recluse



## 11.8 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 ¼ inch (6.4 mm) in size.

Ticks present a year-round hazard for field staff at MCB CamLej. There is some potential for ticks to be present in low grasses, mown lawns, or low tree branches, but they are more likely to be present in wooded areas, bushes, tall grass, and brush. Ticks thrive in tall weeds and grass. Adults will climb into shrubs at shin to waist heights, nymphs are picked up at shin to knee heights, and larvae are typically picked up at shoe levels.

### 11.8.1 Clothing Options

Several clothing options are available for tick prevention, as described below.

- **Self-applied Clothing Treatment** – Permethrin-based repellents such as Permanone have proven to be highly effective in preventing tick bites. Permethrin is actually an insecticide, rather than a traditional repellent, and works primarily by killing ticks on contact with the clothes (although it also has some repellent properties). Repellents containing permethrin are for use on clothing only and are not intended for skin application. These products are formulated as aerosol sprays or pumps, and will typically provide up to 2 weeks of protection from a single treatment (lasting through several washings). Instructions on product labels should be followed for proper application. Typically, these products are applied in a well-ventilated area and allowed to dry for 2 to 4 hours (more time is required for higher-humidity environments). Although skin reactions are not common, it is recommended to avoid contact with face, eyes, or skin when treating clothing.
- **Pretreated Clothing** - Some manufacturers produce clothing that has already been treated with Permethrin. Typically, the fibers are impregnated with the repellent, reportedly making them able to withstand up to 70 wash cycles. Purchasing pre-treated clothing is one alternative to applying a Permethrin-based repellent to your clothing.
- **Bug Suits** – Bug suits are garments assembled with a mesh foundation woven throughout the pants and jacket, along with a mesh/fabric hood. These provide a physical barrier to small insects (including ticks and chiggers). Typically, these garments are not treated with repellents and still are susceptible to infiltration through seams. Additionally, mesh hoods may impair vision. Bug suits add an additional layer of clothing to

the wearer, and may result in increased heat stresses to the body. Bug suits are an approved alternative to treated clothing, but particular attention must be paid to seams, vision impairment, and heat stress when they are worn for tick bite prevention. Bug suits should not be used around heavy equipment or moving parts that could catch the material and pull an individual into the equipment.

- **Tyvek Suits** – Tyvek suits provide a continuous physical barrier for the legs and torso, which makes it very difficult for ticks to infiltrate. The light color also makes it easier to see ticks that have transferred onto the body. The disposable nature of Tyvek also reduces the hazard associated with ticks that go undetected in clothing at the end of the day. Tyvek clothing presents an additional heat stress hazard for employees, which may make use difficult in late spring through early fall.

### **11.8.2 Skin Treatment**

The use of skin-applied repellents is required when working in areas where the presence of ticks is anticipated. Although other repellents may provide some level of protection, DEET-based repellents are preferred for use on CH2M HILL projects. However, alternative repellents that can be used must include one of the following active ingredients: Picaridin, IR3535, oil of lemon eucalyptus (also known as PMD), IR3535, methyl nonyl ketone, and oil of citronella.

These repellents must be reapplied periodically in accordance with manufacturer's recommendations. The effectiveness of DEET on the skin is influenced by the concentration of DEET, absorption through the skin, evaporation, sweating, air temperature, wind, and abrasion of the treated surface by rubbing or washing. Studies have shown that 100 percent DEET may offer up to 12 hours of protection, while lower concentrations of DEET (20 percent-34 percent) may provide between 3 to 6 hours of protection. The Center for Disease Control and Prevention recommends repellents with between 20 percent-30 percent DEET content. Some non-DEET repellent products also provide some level of protection, but to a lesser degree than DEET-based products. DEET will repel ticks and decrease the chance of a tick bite, but it may not deter a tick from walking across the skin to unexposed and untreated areas.

#### **Active Ingredients in Insect Repellents**

##### **Conventional Repellents**

- DEET is the active ingredient found in many insect repellent products. It is used to repel biting pests such as mosquitoes and ticks, including ticks that may carry Lyme disease. Products containing DEET currently are available to the public in a variety of liquids, lotions, sprays, and impregnated materials (for example, wrist bands). Formulations registered for direct application to human skin contain from 4 to 100 percent DEET. Picaridin (chemical name, 2-[2-hydroxyethyl]-1-piperidinecarboxylic acid 1-methylpropyl ester) is a colorless, nearly odorless liquid active ingredient that is used as an insect repellent against biting flies, mosquitoes, chiggers, and ticks. Picaridin products were sold in Europe and Australia for several years before being introduced to the U.S. market in 2005. Products contain a range of 5 to 20 percent of the active ingredient.

##### **Biopesticide Repellents**

- Biopesticides are certain types of pesticides derived from natural materials such as animals, plants, bacteria, and certain minerals. These include: IR3535 (chemical name, 3-[N-Butyl-N-acetyl]-aminopropionic acid, ethyl ester), also called Merck 3535, oil of lemon, P-Mentane-3,8-diol (the chemically synthesized version of oil of lemon eucalyptus), methyl nonyl ketone, and oil of citronella.

##### **Repellents Used on Clothing**

- Permethrin is registered for use as both an insecticide and a repellent. Permethrin products are used on clothing, shoes, bed nets, and camping gear. Permethrin-impregnated clothing such as pre-treated shoes, socks, and pants repel and kill ticks, mosquitoes, and other insects and retain this effect after repeated laundering. Permethrin is also found in treated tents, tarps, bed nets, sleeping bags, and mattresses.

### 11.8.3 Required Protective Actions

Ticks can come in contact with skin anywhere that there is an uncovered area or an opening. Tyvek suits and bug suits provide continuous protection from the legs to the upper torso. The following actions are required for CH2M HILL employees when working in potential tick habitats at MCB CamLej:

- Wear light colored clothing.
- Wear long sleeves and long pants.
- Tuck shirts into pants; shirts should be long enough to not come untucked easily.
- Tuck pants into socks or tape pant legs to boots (close cuff openings).
- Remove clothing within 1 hour of being in the woods (and shower soon afterwards).
- Place clothes in hot dryer for 1 hour (or in sealed plastic bag).
- Apply repellents (both skin and clothing repellents).

TICKS- REQUIRED PROTECTIVE MEASURES	
Body Part	Protective Measure
Head	Light colored hat (recommended) Treat neck with approved repellent (required)
Upper Body	Light-colored long-sleeve shirt (required) Treat exposed skin with approved repellent (required) One of the following must be used: 1) Permethrin clothing treatment 2) Tyvek coverall 3) Bug suit
Lower Body	Long pants (required) One of the following must be used: 1) Permethrin clothing treatment 2) Tyvek coverall 3) Bug suit

### 11.8.4 Tick Checks

By checking ourselves and others for ticks, ticks may be located and removed before they have a chance to attach or transfer diseases. The field personnel will conduct personal checks often; and at lunch and the end of the day, they will perform a full-body check for ticks.

### 11.8.5 Tick Bite and Removal

If bitten by a tick, act promptly. Remove the tick immediately, using tweezers and pulling gently at the point of attachment (head). It is essential to remove the tick as soon as possible (best if found and removed within 24 hours of attachment). Wash your hands and skin after removing the tick. Place the tick in a re-sealable plastic bag for testing at a later date. Call the occupational nurse at 1-866-893-2514 as soon as possible, and provide as much information as possible regarding the date, time, and location of the bite. Report the tick bite to your supervisor and PM. Complete the Hours and Incident Tracking System (HITS) report. Follow the nurse's advice regarding monitoring symptoms and follow-up contact.

Be aware of the symptoms of Lyme disease or RMSF. Lyme disease begins with a rash that looks like a bullseye with a small welt in the center. RMSF begins with 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, contact the occupational nurse at 1-866-893-2514 and seek medical attention.

Take precautions to avoid exposure by including pre-planning measures for biological hazards before starting field work. Avoid habitats where possible and reduce the abundance through habitat disruption or application of

acaricide. If these controls aren't feasible, contact your local or regional warehouse for preventative equipment such as repellants, protective clothing, and tick removal kits. Use the buddy system and perform tick inspections before 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 the tick fact sheet attached to this SSHP for further precautions and controls to implement when ticks are present. If bitten by a tick, follow the removal procedures found in the tick fact sheet, and call the occupational nurse at 1-866-893-2514.

**Be sure to complete an Incident Report (either use the HITS on the VO) if you do come in contact with a tick.**

SECTION 12

# Contaminants of Concern

Any contaminants of concern (COCs) related to the MR intrusive field effort would be associated with any potential munitions found with the site and would include MRA related explosive compounds and accelerants. The table below summarizes the potential COCs and their occupational exposure limit and signs and symptoms of exposure.

Contaminant	Exposure Limit <sup>b</sup>	IDLH <sup>c</sup>	Symptoms and Effects of Exposure	PIP
2,4-Dinitrotoluene	1.5 mg/m <sup>3</sup>	50 mg/m <sup>3</sup> Ca	Anoxia, cyanosis; anemia, jaundice; reproductive effects; [potential occupational carcinogen]	UK
2,4,6-Trinitrotoluene	1.5 mg/m <sup>3</sup>	500 mg/m <sup>3</sup>	Irritated skin, liver damage, sneezing, cough, sore throat, muscle pain	UK
Nitrobenzene	1 ppm	25	Toxic by skin exposure. Skin, eye, and mucous membrane irritant. Respiratory disruption. Anemia	9.92
Nitrotoluenes	5 ppm	200 ppm	Head ache, dizziness, nausea, vomiting	9.50
Nitroglycerine	0.2 ppm	75 mg/m <sup>3</sup>	Throbbing head, dizziness, nausea, abdominal pain, hypertension, flushing, palpitations, delirium, CNS depressant, angina, skin irritation	UK
Perchlorate	NA	NA	Disrupts the iodide uptake in the thyroid gland. Can result in hypothyroidism. Tiredness, depression, muscle cramps, dry/itchy skin.	UK

<sup>b</sup> OSHA PEL; <sup>c</sup> NIOSH 2005

SECTION 13

## Site Monitoring

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(Reference CH2M HILL SOP HSE-207, *Exposure Monitoring for Airborne Chemical Hazards*)

When performing site monitoring, record all the information in a field logbook or equivalent. Note date and time, describe monitoring location (for example, in breathing zone, at source and site location), and what the reading is. If any action levels are reached, note it in the field logbook and note the action taken.

Exposure records (air sampling) must be preserved for the duration of project team members' employment plus 30 years. Ensure that copies of the field logbook are maintained in the project file.

Copies of all project exposure records (for example, copies of field logbook pages where air monitoring readings are recorded and associated calibration) shall be sent to the RHSM for retention and maintained in the project files.

# Personal Protective Equipment

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

## 14.1 Required PPE

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 who approved this plan. The items below need to be followed when using any form of PPE:

- Employees must be trained to properly wear and maintain the PPE.
- Employees must be trained in the limitations of 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 before 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 the 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<sup>a</sup>**

Task	Level	Body	Head	Respirator <sup>b</sup>
<ul style="list-style-type: none"> <li>• Site reconnaissance</li> <li>• Vegetation clearing</li> <li>• Utility locating</li> <li>• Mob/Demob</li> </ul>	NA	<b>Body:</b> Work clothes <b>Boots:</b> Safety toed leather work boots <b>Gloves:</b> Leather gloves (if necessary)	Hardhat <sup>c</sup> Safety glasses with side shields Ear protection <sup>d</sup>	None required
<ul style="list-style-type: none"> <li>• MEC intrusive investigations</li> <li>• Soil sampling</li> <li>• IDW management</li> </ul>	Modified D	<b>Body:</b> Cotton coveralls (Uncoated Tyvek if contact with dusts cannot be avoided, Polycoated Tyvek if contact with water cannot be avoided) <b>Boots:</b> Safety-toe, chemical-resistant boots OR Safety -toe, leather work boots. <b>Gloves:</b> Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat <sup>c</sup> Safety glasses with side shields Ear protection <sup>d</sup>	None required
Those tasks requiring upgrade according to Section 13.1	C	<b>Body:</b> Coated Tyvek® <b>Boots:</b> Safety-toe, chemical-resistant boots OR Safety -toe, leather work boots with outer rubber boot covers <b>Gloves:</b> Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat <sup>c</sup> Splash shield <sup>c</sup> Ear protection <sup>d</sup> Spectacle inserts	APR, full face, (MSA Advantage 1000 or equivalent w/ GME-H/P100 cartridges or equivalent.

## Project-Specific PPE Requirements<sup>a</sup>

Task	Level	Body	Head	Respirator <sup>b</sup>
Work near vehicular traffic ways	All	Appropriate level of ANSI/ISEA 107-2010 high-visibility safety vests.	Hardhat <sup>c</sup> Splash shield <sup>c</sup> Safety glasses with side shields Ear protection	None required.

### Reasons for Upgrading or Downgrading Level of Protection (with approval of the RHSM)

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

<sup>a</sup> Modifications are as indicated. CH2M HILL will provide PPE only to CH2M HILL employees.

<sup>b</sup> No facial hair that would interfere with respirator fit is permitted.

<sup>c</sup> Hardhat and splash-shield areas are to be identified by the SC.

<sup>d</sup> Ear protection should be worn when conversations cannot be held at distances of 3 feet (1 meter) or less without shouting.

<sup>e</sup> See cartridge change-out schedule.

<sup>f</sup> Performing a task that requires an upgrade to a higher level of protection (for example, 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.

## 14.2 Respiratory Protection

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

Implement the following when using 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 as attachment to this plan to verify compliance with CH2M HILL’s respiratory protection program.

**Respirator Change-Out Schedule**

- Regulatory agencies require that a cartridge or canister change-out schedule is established and implemented when air-purifying respirators (APR) without cartridge or canister end-of-service-life indicators (ESLI) appropriate for the workplace conditions are used for protection against gases and vapors.

**14.2.1 Respirator Change-Out Schedule**

Contaminant	Change-Out Schedule
Nitrobenzene	End-of-service life or end of shift (whichever occurs first)
Nitrotoluene	End-of-service life or end of shift (whichever occurs first)

# Worker Training and Qualification

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## 15.1 CH2M HILL Worker Training

(Reference CH2M HILL SOP HSE-110, *Training*)

### 15.1.1 Hazardous Waste Operations Training

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

### 15.1.2 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 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.

### 15.1.3 Three-Day Actual Field Experience

General site workers for hazardous waste operations shall receive 3 days of actual experience (on-the-job training) under the direct supervision of a trained, qualified supervisor and the training 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.

### 15.1.4 Refresher Training

General site workers and treatment, storage, and disposal workers shall receive 8-hours of refresher training annually (within the previous 12-month period) to maintain qualifications for field work. 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.

### 15.1.5 Eight-Hour Supervisory Training

Onsite managers or supervisors who will be directly responsible for or supervise employees engaged in hazardous waste site operations, will receive at least 8 hours of additional specialized training on managing such operations. Employees designated as the SC – Hazardous Waste are considered 8-hour HAZWOPER Site Safety Supervisor-trained.

### 15.1.6 First Aid/CPR

First aid and CPR training consistent with the requirements of a nationally recognized organization such as the American Red Cross Association or National Safety Council shall be administered by a certified trainer. A minimum of two personnel per active field operation will have first aid and CPR training. Bloodborne pathogen training located on CH2M HILL's VO is also required for those designated as first aid-/CPR-trained.

### **15.1.7 SC Training**

SCs are trained to implement the HSE program on CH2M HILL field projects. A qualified SC is required to be identified in the site-specific SSHP for CH2M HILL field projects. SCs must also meet the requirements of the worker category appropriate to the type of field project (construction or hazardous waste). In addition, the SCs shall complete additional safety training required by the specific work activity on the project that qualifies them to implement the HSE program (for example, fall protection or excavation).

### **15.1.8 Site-Specific Training**

Before field activities begin, all field personnel assigned to the project will have completed site-specific training that will address the contents of applicable SSHPs, including the activities, procedures, monitoring, and equipment used in the site operations. Site-specific training will also include site and facility layout, potential hazards, risks associated with identified emergency response actions, and available emergency services. This training allows field workers to ask for clarification about anything they do not understand and to reinforce their responsibilities regarding safety and work operations for their particular activity.

### **15.1.9 Project-Specific Training Requirements**

Project-specific training for this project includes:

- Training on this and subcontractor SSHPs/AHAs
- Training qualifications outlined in SOP HSE-610, *Explosives Usage and Munitions Response* (for all UXO personnel)
- 3R training for non-UXO personnel
- Training on SOPs on the VO as applicable:
  - Chromium
  - Drum Handling
  - Manual Lifting
  - Traffic Safety

# Medical Surveillance and Qualification

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(Reference CH2M HILL SOP HSE-113, *Medical Surveillance*)

All site workers participating in HAZWOPER activities will maintain an adequate medical surveillance program in accordance with 29 CFR 1910.120 or 29 CFR 1926.65 and other applicable OSHA standards. Documentation of employee medical qualification (for example, physician's written opinion) will be maintained in the project files and made available for inspection.

## 16.1 HAZWOPER Activities

CH2M HILL personnel expected to participate in onsite HAZWOPER tasks are required to have a current medical qualification for performing this work. Medical qualification shall consist of a qualified physician's written opinion regarding fitness for duty at a hazardous waste site, including any recommended limitations on the employee's assigned work. The physician's written opinion shall state whether the employee has any detected medical conditions that would place the employee's health at increased risk of material impairment by performing HAZWOPER tasks or from respirator use.

## 16.2 Job or Site-specific Medical Surveillance

Because of the nature of hazards for a particular job or work site, specialized medical surveillance may be necessary. This surveillance could include air temperature and humidity level monitoring for specific site conditions or specialized medical examinations.

## 16.3 Respirator User Qualification

Personnel required to wear respirators must have a current medical qualification to wear respirators. Medical qualification shall consist of a qualified physician's written opinion regarding the employee's ability to safely wear a respirator in accordance with 29 CFR 1910.134.

## 16.4 Hearing Conservation

Personnel working in hazardous waste operations or operations that are subject to the requirements of 29 CFR 1910.95 and exposed to noise levels in excess of the 85dBA time-weighted average shall participate in a hearing conservation program that includes annual audiometric testing.

# Site Control Plan

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## 17.1 Site Control Procedures

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

Site control is established to prevent the spread of contamination throughout the site and to ensure that only authorized individuals are permitted into potentially hazardous areas.

The SC will implement site control procedures that include the following items:

- Establish support, contamination reduction, and exclusion zones, delineated with flags or cones as appropriate. The Support Zone (SZ) should be upwind of the site. Use access control at entry and exit from each work zone.
- Establish onsite communication consisting of:
  - 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.”

## 17.2 Controlled Areas

Work areas may need to be controlled because of the presence of an uncontrolled hazard, to warn workers of requirements, or to prevent unauthorized entry. Examples include controlled detonation areas, general construction work areas, open excavations, high-noise areas, vehicle access areas, and similar activities or limited access locations. These areas shall be clearly demarcated with physical barriers (fencing, cones, or reinforced caution tape or rope) as necessary and posted with appropriate signage.

# Decontamination

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

Decontamination areas will be established for work in potentially contaminated areas to prevent the spread of contamination. Decontamination areas should be located upwind of the EZ where possible and should consider any adjacent or nearby projects and personnel. 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.

No eating, drinking, or smoking is permitted in contaminated areas and in EZ or decontamination zone. The SC should establish areas for eating, drinking, and smoking.

## 18.1 Contamination Prevention

Preventing or avoiding contamination of personnel, tools, and equipment will be considered in planning work activities at all field locations. Good contamination prevention and avoidance practices will assist in preventing worker exposure and result in a more-efficient decontamination process. Procedures for contamination prevention and avoidance include the following:

- Do not walk through areas of obvious or known contamination.
- Do not directly handle or touch contaminated materials.
- Make sure there are no cuts or tears in PPE.
- Fasten all closures in suits and cover them with duct tape, if appropriate.
- Take particular care to protect any skin injuries.
- Stay upwind of airborne contamination, where possible.
- Do not eat or drink in contaminated work areas.
- Do not carry food, beverages, tobacco, or flame-producing equipment into contaminated work areas.
- Minimize the number of personnel and amount of equipment in contaminated areas to that necessary for accomplishing the work.
- Choose tools and equipment with nonporous exterior surfaces that can be easily cleaned and decontaminated.
- Cover monitoring and sampling equipment with clear plastic, leaving openings for the sampling ports, as necessary.
- Minimize the number of tools and equipment necessary in contaminated areas.

## 18.2 Personnel and Equipment Decontamination

Personnel exiting an EZ must ensure that they are not spreading potential contamination into clean areas or increasing their potential for ingesting or inhaling potential contaminants. Personal decontamination may range from removing outer gloves when exiting the EZ, to proceeding through an outer layer doffing station, including a boot and glove wash and rinse, washing equipment, etc. Equipment that has come into contact with contaminated media must also be cleaned/decontaminated when it is brought out of the EZ.

## **18.3 Decontamination during Medical Emergencies**

Standard personnel decontamination practices will be followed whenever possible. For emergency life-saving first aid and/or medical treatment, normal decontamination procedures may need to be abbreviated or omitted. In this situation, site personnel shall accompany contaminated victims to advise emergency response personnel on potential contamination present and proper decontamination procedures.

Outer garments may be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Protective clothing can be cut away. If the outer garments cannot be safely removed, a plastic barrier between the individual and clean surfaces should be used to help prevent contaminating the inside of ambulances or medical personnel. Outer garments can then be removed at the medical facility.

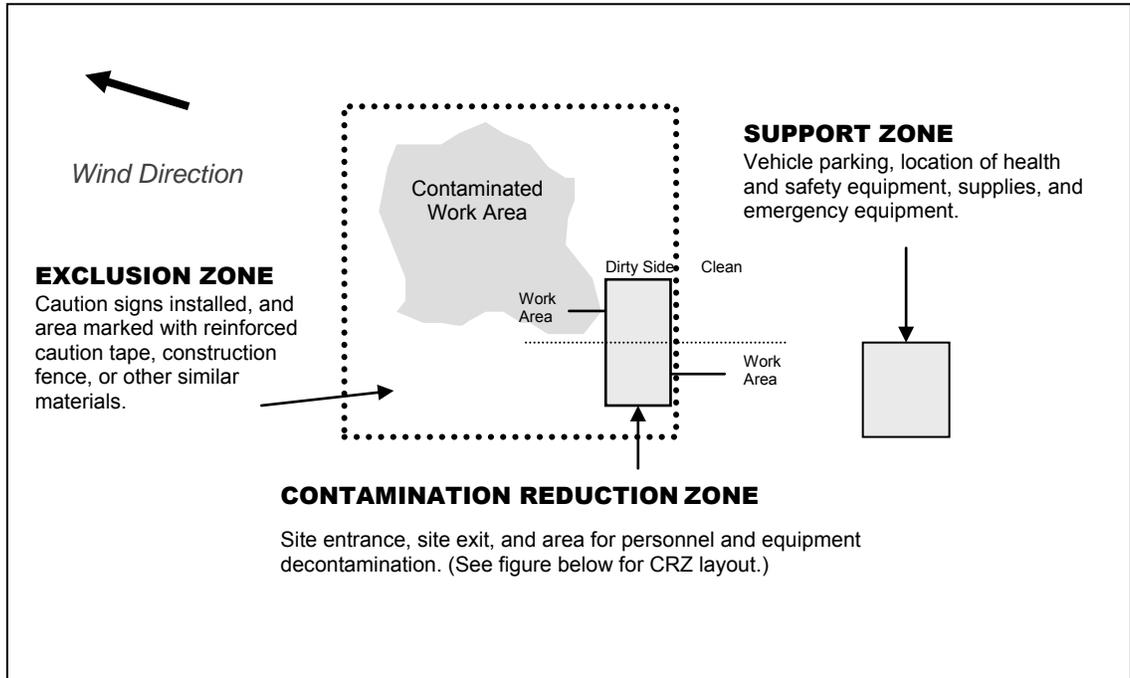
## **18.4 Waste Collection and Disposal**

All contaminated material generated through the personnel and equipment decontamination processes (for example, contaminated disposable items, gross debris, liquids, sludges) will be properly accumulated in containers and labeled, stored at a secure location, and disposed in accordance with the project plans.

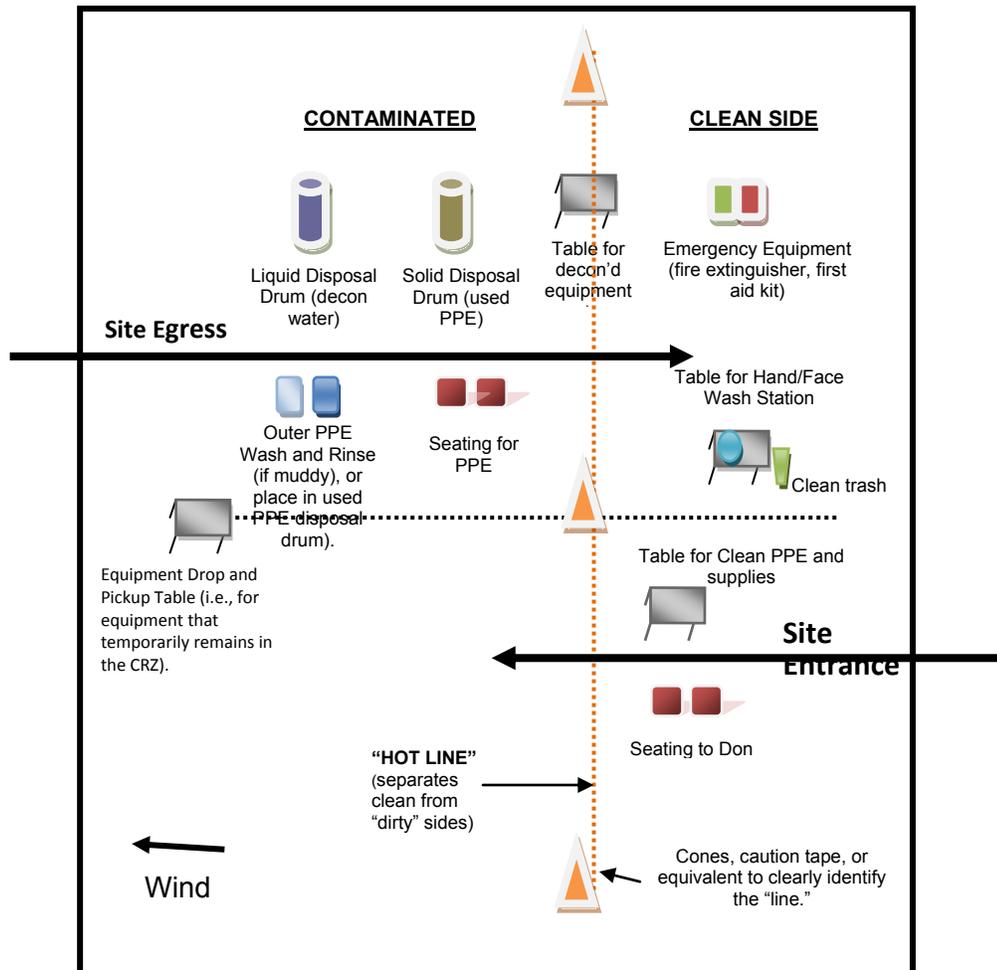
## **18.5 Diagram of Personnel-Decontamination Line**

The following figure 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.

**Work Area - Set up appropriately based on wind direction**



**Typical Contamination Reduction Zone**



# Emergency Response Plan

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

## 19.1 Pre-Emergency Planning

The ERC, typically the SC or designee, 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. Pre-Emergency planning activities performed by the ERC include:

- Review the facility emergency and contingency plans where applicable.
- Find out what onsite communication equipment is available (two-way radio, air horn).
- Identify what offsite communication equipment is needed (nearest telephone, cell phone).
- Confirm and post the “Emergency Contacts” page and route to the hospital located in this section in project trailer(s) and keep a copy in field vehicles, along with information about evacuation routes and assembly areas. Communicate the information to onsite personnel and keep it updated.
- 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.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases to project personnel.
- Rehearse the emergency response plan before site activities begin. This may include a “tabletop” exercise or an actual drill depending on the nature and complexity of the project. Drills should take place periodically but at least once a year.
- Brief new workers on the emergency response plan.
- Evaluate emergency response actions and initiate appropriate follow-up actions.

## 19.2 Emergency Equipment and Supplies

The ERC shall ensure the following emergency equipment is on the site. Verify and update the locations of this equipment as needed. The equipment will be inspected in accordance with manufacturer’s recommendations. The inspection shall be documented in a field logbook or similar means to be kept in the project files.

Emergency Equipment and Supplies	Location
20-lb (or two 10-lb) fire extinguisher (A, B, and C classes)	Support Zone/Heavy Equipment
First aid kit	Support Zone/Field Vehicle
Eye wash	Support & Decon Zone/Field Vehicle
Potable water	Support & Decon Zone/Field Vehicle
Bloodborne-pathogen kit	Support Zone/Field Vehicle
Additional equipment (specify):	

## 19.3 Incident Response

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

- 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 client 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 the Incident Notification, Reporting, and Investigation section of this SSHP.

## 19.4 Emergency Medical Treatment

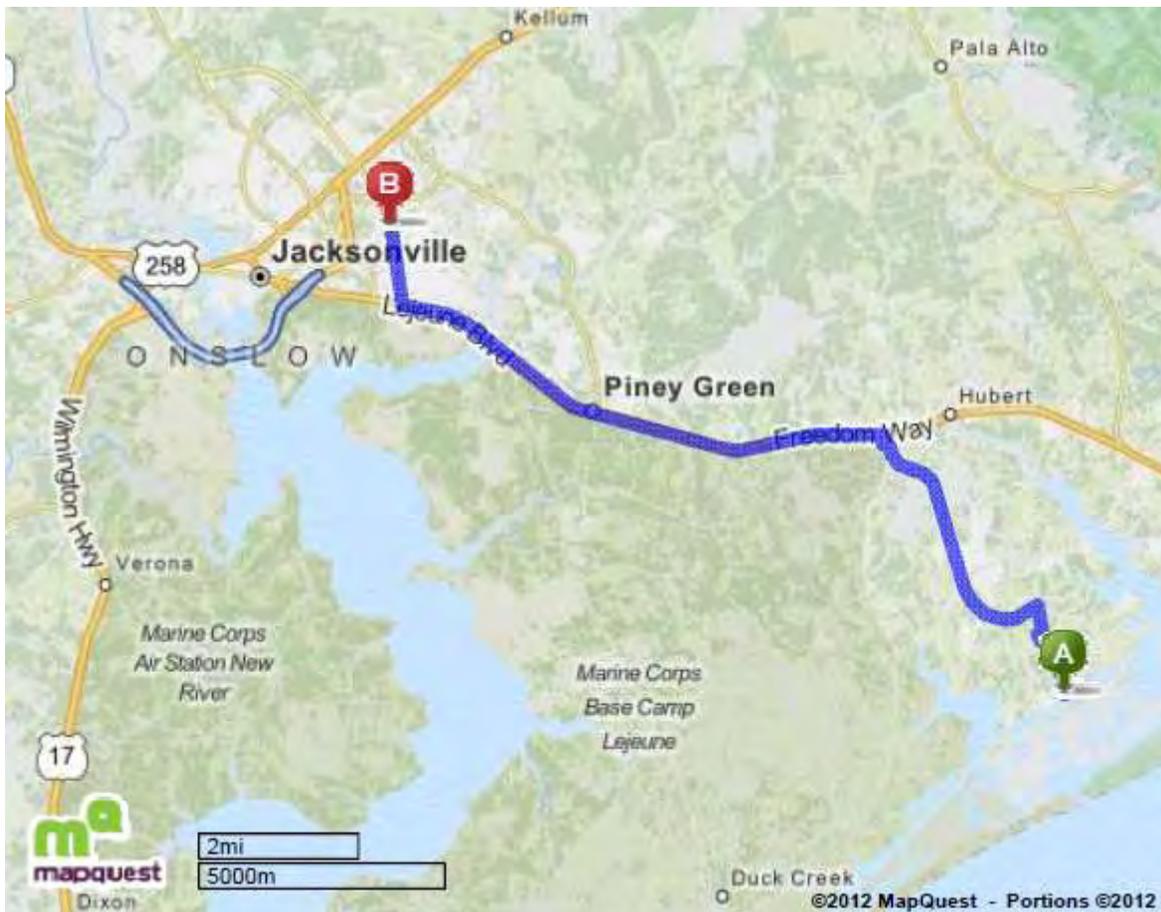
Emergency medical treatment is needed when there is a life-threatening injury (such as severe bleeding, loss of consciousness, breathing or heart has stopped). When in doubt as to whether an injury is life-threatening, treat it as needing emergency medical treatment.

- Notify 911 or other appropriate emergency response authorities as listed in the “Emergency Contacts” page located in this section.
- 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; 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 HSE 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 HSE SOP-111 and complete incident report using the HITS system on the VO or if not feasible, use the hard copy forms provided as an attachment to this SSHP.
- Notify and submit reports to client as required in contract.

## 19.5 Directions to Hospital

### Directions to Onslow County Memorial Hospital:

1. From Hogans Road, drive north towards Nicholas Way (1.3 miles)
2. Turn right onto Bear Creek Road (0.1 mile)
3. Take the 1<sup>st</sup> left onto Queens Creek Road (0.4 miles)
4. Turn left onto Sand Ridge Road (4.6 miles)
5. Turn left onto Starling Road (0.1 mile)
6. Take 1<sup>st</sup> right onto NC-172 (0.2 mile)
7. Turn left onto Freedom Way/NC-24 (9 miles)
8. Turn right onto Western Blvd (1.4 miles)
9. The Onslow County Memorial Hospital is on the left, approximately 2 miles (fifth stop light) from Highway 24.
10. Follow the signs to the emergency room.



Route to Onslow County Memorial Hospital (B)

## 19.6 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 22, Incident Notification, Reporting and Investigation, of this SSHP.

## 19.7 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.

## 19.8 Inclement Weather

Sudden inclement weather can rapidly encroach upon field personnel. Preparedness and caution are the best defenses. Field crew members performing work outdoors should carry clothing appropriate for inclement weather. Personnel are to take heed of the weather forecast for the day and pay attention for signs of changing weather that indicate an impending storm, such as towering thunderheads, darkening skies, or a sudden increase in wind. If stormy weather ensues, field personnel should discontinue work and seek shelter until the storm has passed.

Protective measures during a lightning storm include seeking shelter; avoiding projecting above the surrounding landscape (don't stand on a hilltop--seek low areas); staying away from open water, metal equipment, railroad tracks, wire fences, and metal pipes; and positioning people several yards apart. Some other general precautions include:

- Know where to go and how long it will take to get there. If possible, take refuge in a large building or vehicle. Do not go into a shed in an open area.
- The inclination to see trees as enormous umbrellas is the most frequent and most deadly mistake. Do not go under a large tree that is standing alone. Likewise, avoid poles, antennae, and towers.
- If the area is wide open, go to a valley or ravine, but be aware of flash flooding.
- If you are caught in a level open area during an electrical storm and you feel your hair stand on end, drop to your knees, bend forward and put your hands on your knees or crouch. The idea is to make yourself less vulnerable by being as low to the ground as possible and taking up as little ground space as possible. Lying down is dangerous because the wet earth can conduct electricity. Do not touch the ground with your hands.

- Do not use telephones during electrical storms, except in the case of emergency.

Remember that lightning may strike several miles from the parent cloud, so work should be stopped and restarted accordingly. The lightning safety recommendation is 30-30: Seek refuge when thunder sounds within 30 seconds after a lightning flash, and do not resume activity until 30 minutes after the last thunder clap.

High winds can cause unsafe conditions, and activities should be halted until wind dies down. High winds can also knock over trees, so walking through forested areas during high-wind situations should be avoided. If winds increase, seek shelter or evacuate the area. Proper body protection should be worn in case the winds hit suddenly because body temperature can decrease rapidly.

## SECTION 20

# Spill Containment Procedures

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CH2M HILL and subcontractor personnel working at the project site shall be knowledgeable of the potential HSE concerns associated with petroleum and other substances that could be released at the project site.

The following criteria must be addressed in CH2M HILL's or the subcontractor's plans in the event of a spill or release. In the event of a large spill, notify emergency services. Personnel discovering a spill shall (only if safe to do so):

- Stop or contain the spill immediately (if possible) or note source. Shut off the source (for example, pump or treatment system) if possible. If unsafe conditions exist, then leave the area, call emergency services, inform nearby personnel, notify the site supervisors, and initiate incident reporting process. Notify the SC immediately.
- Extinguish sources of ignition (flames, sparks, hot surfaces, cigarettes).
- Clear personnel from the spill location and barricade the area.
- Use available spill control equipment in an effort to ensure that fires, explosions, and releases do not occur, recur, or spread.
- Use sorbent materials to control the spill at the source.
- Construct a temporary containment dike of sorbent materials, cinder blocks, bricks or other suitable materials to help contain the spill.
- Attempt to identify the character, exact source, amount, and extent of the released materials. Identification of the spilled material should be made as soon as possible so that the appropriate cleanup procedure can be identified.
- Assess possible hazards to human health or the environment as a result of the release, fire, or explosion.
- Follow directions given in Section 22, Incident Notification, Reporting, and Investigation, of this plan.

# Inspections

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## 21.1 Project Activity Self-Assessment Checklists

In addition to the hazard controls specified in this document, Project Activity Self-Assessment Checklists are contained as an attachment to this SSHP. These checklists are based upon minimum regulatory compliance, and some site-specific requirements may be more stringent. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. The self-assessment checklists, including documented corrective actions, shall be made part of the permanent project records and maintained by the SC.

The self-assessment checklists will also be used by the SC in evaluating the subcontractors and any client contractors' compliance on site.

The self-assessment checklists for the following tasks and exposures are required when the task or exposure is initiated and weekly thereafter while the task or exposure is taking place. The checklists shall be completed by the SC or other CH2M HILL representative and maintained in project files.

- Biological
- Chainsaw
- Forklifts
- Excavations
- Hand and Power Tools
- Intentional Detonations
- Manual Lifting
- PPE
- Traffic Control

## 21.2 Safe Behavior Observations

Safe Behavior Observations (SBOs) are used by supervisors 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 SBO each week for any field work performed by subcontractors or when there are at least two CH2M HILL personnel performing field work.

The SC or designee shall complete the SBO form (attached to this SSHP) for the task/operation being observed and submit them weekly.

For federal projects, SBOs may be submitted electronically by e-mailing them to the address, "CH2M HILL ES FED Safe Behavior Observations" when connected to the network or at [CH2MHILLESFEDSafeBehaviorObservation@ch2m.com](mailto:CH2MHILLESFEDSafeBehaviorObservation@ch2m.com).

# Incident Notification, Reporting, and Investigation

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

## 22.1 General Information

This section applies to the following:

- All injuries involving employees, third parties, or members of the public
- Damage to property or equipment
- Interruptions to work or public service (for example, hitting a utility)
- Incidents that attract negative media coverage
- Near-misses
- Spills, leaks, or regulatory violations
- Motor vehicle accidents

Documentation, including incident reports, investigation, analysis, and corrective measure taken, shall be kept by the SC and maintained onsite for the duration of the project.

## 22.2 Section Definitions

### 22.2.1 Incident

An incident is an event that causes or could have caused undesired consequences. An incident may be caused by natural forces, employees, subcontractors, or third parties in any location associated with CH2M HILL operations, including offices, warehouses, project sites, private property, or public spaces. Incidents include:

- Injury or illness to a CH2M HILL employee or subcontractor employee, or member of the public
- Property damage
- Spill or release
- Environmental requirement or permit violation
- A near-miss
- Other (for example, fire, explosion, bomb threat, workplace violence, threats)
- **Accident:** an incident involving actual loss through injury, damage to assets, or environmental harm.

### 22.2.2 Near-miss

A near-miss occurs when an intervening factor prevented an injury or illness, property damage, spill or release, permit violation, or other event from occurring. Examples of near-miss situations include: a hard hat or other PPE prevented an injury; secondary containment or emergency shutoff prevented a spill; or an alert co-worker prevented an incident.

### 22.2.3 Serious Incident

Serious incidents that must be immediately reported to senior management include the following:

- Work-related death, or life-threatening injury or illness of a CH2M HILL employee, subcontractor, or member of the public
- Kidnapped/missing person
- Acts or threats of terrorism
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in greater than \$500,000 in damage
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community, or the environment.

## 22.3 Reporting Requirements

All employees and subcontractors' employees shall immediately report any incident (including near-misses, as defined in the section above) in which they are involved or witness to their supervisor.

The CH2M HILL or subcontractor supervisor, upon receiving an incident report, shall inform his immediate superior and the CH2M HILL SC.

The SC shall immediately report the following information to the RHSM and PM by phone and e-mail:

- Project Name and Field Team Leader
- Date and time of incident
- Description of incident
- Extent of known injuries or damage
- Level of medical attention
- Preliminary root cause/corrective actions

The RHSM shall immediately inform the EM (or available alternate) of spills, potential environmental permit compliance, or any environmental situation that could result in a notice of violation from an agency.

The CH2M HILL team shall comply with all applicable statutory incident reporting requirements such as those to OSHA, the police, or state or federal environmental agency.

## 22.4 HITS and Incident Report Form

CH2M HILL maintains a HITS entry and/or Incident Report Form (IRF) for all work-related injuries and illnesses sustained by its employees in accordance with recordkeeping and insurance requirements. A HITS entry and/or IRF will also be maintained for other incidents (property damage, fire or explosion, spill, release, potential violation, and near-misses) as part of our loss prevention and risk reduction initiative.

The SC shall complete an entry into the HITS database located on CH2M HILL's VO (or if VO not available, use the hard copy IRF and Root Cause Analysis Form and forward it to the RHSM) within 24 hours and finalize those forms within 3 calendar days.

## 22.5 Injury Management/Return-to-Work (for US/Puerto Rico-based CH2M HILL Staff Only)

(Reference CH2M HILL, SOP HSSE-124, *Injury Management/Return-to-Work*)

### 22.5.1 Background

The CH2M HILL Injury Management Program has been established to provide orderly, effective, and timely medical treatment and return-to-work transition for an employee who sustains a work-related injury or illness. It also provides guidance and assistance with obtaining appropriate treatment to aid recovery, keep supervisors informed of employee status, and to quickly report and investigate work-related injury/illnesses to prevent recurrence.

To implement the Injury Management/Return-to-Work Program successfully, supervisors and/or the SC should:

- Ensure employees are informed of the Injury Management/Return-to-Work Program
- Become familiar with the Notification Process (detailed below)
- Post the Injury Management/Return-to-Work Notification Poster

### 22.5.2 Injury Management/Return-to-Work Notification Process

- Employee informs his or her supervisor of an injury.
- Employee calls the Injury Management Program's toll-free number 1-866-893-2514 immediately and speaks with the occupational nurse. This number is operable 24 hours per day, 7 days a week.

- Supervisor ensures that employee immediately calls the Injury Management Program number. If necessary, supervisor makes the call with or for the injured worker.
- Nurse assists employee with obtaining appropriate medical treatment, as necessary, and schedules a clinic visit for employee (calls ahead, and assists with any necessary follow-up treatment). The supervisor or SC accompanies the employee if a clinic visit is necessary to ensure that employee receives appropriate and timely care.
- Supervisor or SC completes the HITS entry or IRF immediately (within 24 hours) and forwards it to the PM and RHSM.
- Nurse notifies appropriate CH2M HILL staff by e-mail (supervisor, Health & Safety, Human Resources, Workers' Compensation) of the injury.
- Nurse communicates and coordinates with and for employee on treatment through recovery.
- Supervisor ensures suitable duties are identified and available for injured or ill workers who are found to be medically fit to return to work on transitional duty (temporary and progressive).
- Supervisor ensures medical limitations prescribed (if any) by physician are followed until the worker is released to full duty.

## 22.6 Serious Incident Reporting Requirements

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

The serious incident reporting requirements ensure timely notification and allow for positive control of information so that the incident is handled effectively, efficiently, and in conjunction with appropriate corporate entities. This standard notification process integrates HSSE and firm-wide security operations requirements for the consistent reporting of and managing of serious events throughout our operations.

### 22.6.1 Serious Incident Determination

The following are general criteria for determining whether an incident on CH2M HILL-owned or -managed facilities or program sites is considered serious and must be immediately reported up to Group President level through the reporting/notification process:

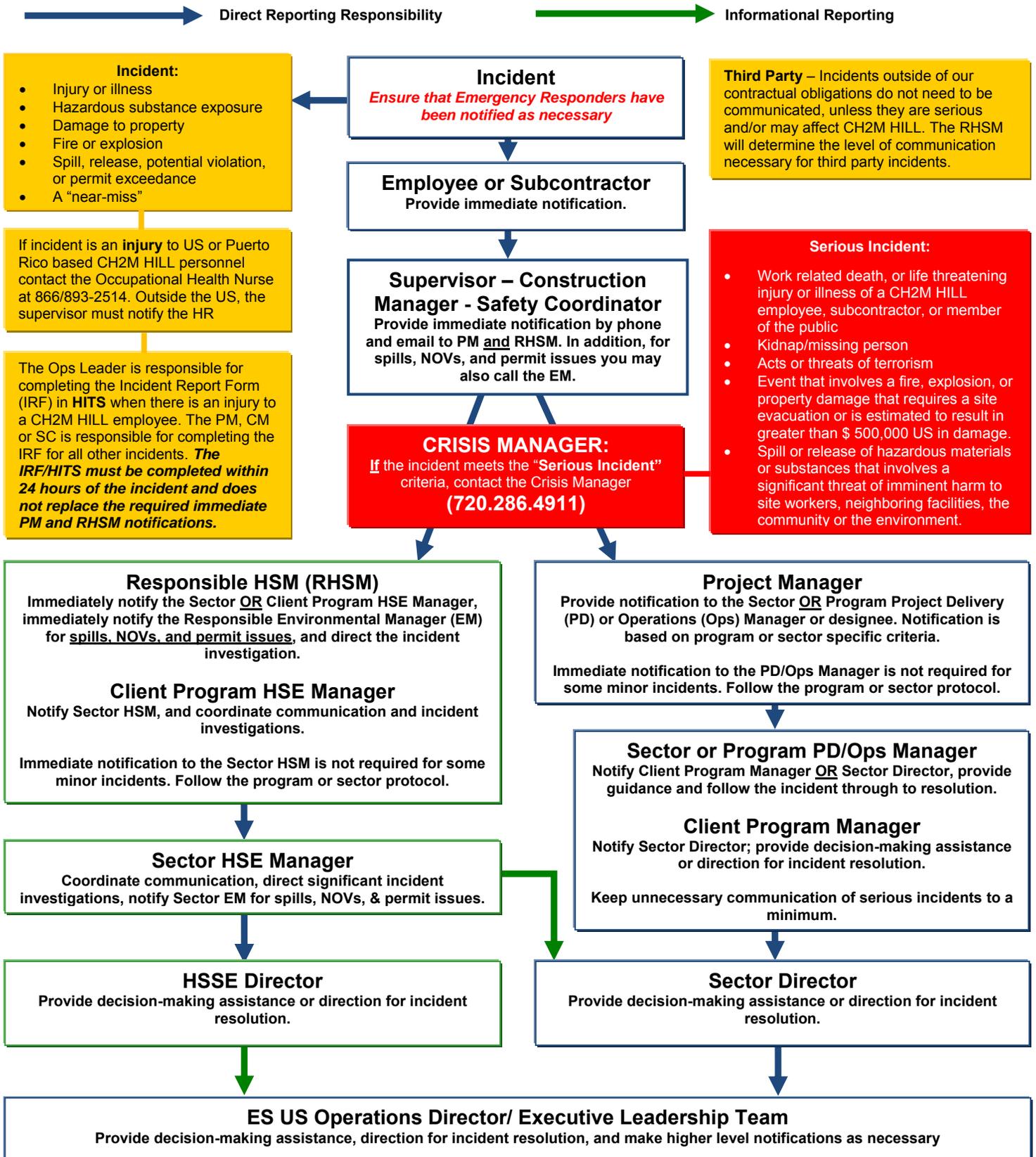
- Work-related death, or life-threatening injury or illness of a CH2M HILL employee, subcontractor, or member of the public
- Kidnapped or missing person
- Acts or threats of terrorism
- Event that involves a fire, explosion, or property damage that requires a site evacuation or is estimated to result in more than \$500,000 in damage
- Spill or release of hazardous materials or substances that involves a significant threat of imminent harm to site workers, neighboring facilities, the community, or the environment.

### 22.6.2 Serious Incident Reporting

***If an incident meets the "Serious Incident" criteria, the Project Manager is to immediately contact the Crisis Manager at 720-286-4911, then follow the standard incident reporting procedure.***

For all serious incidents, this standard reporting process is implemented immediately in order to achieve notification to the Business Group President within 2 hours of incident onset or discovery, and notification to appropriate corporate Crisis Management Support Team.

# ESBG US Operations Incident Reporting Flow Diagram



**Post-emergency incident communications regarding serious incidents at a CH2M HILL office or project (regardless of the party involved) shall be considered sensitive in nature and must be controlled in a confidential manner.**

## 22.7 Incident Root Cause Analysis

Analysis is essential if all causes of an incident are to be identified in order that the correct remedial actions can be taken to prevent the same or similar type of incident from recurring. Root Cause Analyses (RCAs) shall be completed for all recordable injuries, property damage incidents in excess of \$5,000, environmental permit violations, spills and releases that are required to be reported to regulatory agencies, and any other incident, including near-misses for which the RHSM or PM decides an RCA is appropriate. The RHSM/EM is responsible for ensuring each RCA is completed and the results entered in the IRF in HITS. RCAs must be completed by a team that includes, at least the RHSM or designee, the involved party(ies), a responsible operations representative (for example PM, construction manager, or crew supervisor), and an independent management representative not associated with the incident.

The RCA form must be completed for all loss incidents and near-loss incidents. This form must be submitted to the investigation team for review.

For minor losses or near-losses, the information may be gathered by the supervisor or other personnel immediately following the loss. Based on the complexity of the situation, this information may be all that is necessary to enable the investigation team to analyze the loss, identify the root cause, and develop recommendations. More-complex situations may require the investigation team to revisit the loss site or re-interview key witnesses to obtain answers to questions that may arise during the investigation process.

Photographs or videotapes of the scene and damaged equipment should be taken from all sides and from various distances. This task is especially important when the investigation team will not be able to review the loss scene.

The investigation team must follow the Root Cause Analysis Flow Chart (see Appendix E of the Work Plan) to assist in identifying the root cause(s) of a loss. Any loss may have one or more root causes and contributing factors. The root cause is the primary or immediate cause of the incident, and a contributing factor is a condition or event that contributes to the incident happening but is not the primary cause of the incident. Root causes and contributing factors that relate to the person involved in the loss, his or her peers, or the supervisor should be referred to as "personal factors." Causes that pertain to the system within which the loss or injury occurred should be referred to as "job factors."

Personal factors include:

- Lack of skill or knowledge
- Correct way takes more time and/or requires more effort
- Short-cutting standard procedures is positively reinforced or tolerated
- Person thinks there is no personal benefit to always doing the job according to standards

Job factors include:

- Lack of or inadequate operational procedures or work standards
- Inadequate communication of expectations regarding procedures or standards
- Inadequate tools or equipment.

The root cause(s) could be any one or a combination of these seven possibilities or some other uncontrollable factor. In the vast majority of losses, the root cause is very much related to one or more of these seven factors. Uncontrollable factors should be cited rarely and only after a thorough review eliminates all seven other factors.

### 22.7.1 Corrective Actions

Include all corrective actions taken or those that should be taken to prevent recurrence of the incident IRF. Include the specific actions to be taken, the employer and personnel responsible for implementing the actions, and a timeframe for completion. Be sure the corrective actions address the causes.

Once the IRF has been completed, the PM shall hold a review meeting to discuss the incident and provide recommendations. The responsible supervisors shall be assigned to carry out the recommendations, and shall inform the SC upon successful implementation of all recommended actions.

- Evaluation and follow-up of the IRF will be completed by the type of incident by the RHSM, EM, or FTL.
- Incident investigations must be initiated and completed as soon as possible but no later than 72 hours after the incident.

# Records and Reports

---

An organized project filing system is essential for good documentation and recordkeeping. There are many benefits to an organized filing system:

- Other CH2M HILL employees can easily and quickly find documents.
- Records are readily available for review.
- Records may be needed during OSHA investigations, audits, or other legal matters.
- Records may be needed on short notice in case of an accident, illness or other emergency.
- Systematic recordkeeping aids in overall project organization.

The project filing system shall be established at the beginning of the project and maintained throughout all phases of construction and archived in accordance with CH2M HILL's records retention policy. The information contained in the filing system shall be updated regularly and/or as specified in this SSHP. The PM and SC are responsible for collecting documentation, including subcontractor documentation, and maintaining a complete and organized filing system.

Below are examples of records that must be maintained as the project progresses:

- Exposure records such as air monitoring data (including calibration records), MSDSs, and exposure modeling results
- Physical hazard exposure records such as noise levels, ionizing radiation, non-ionizing radiation, vibration, and laser exposure assessments and measurements
- Respiratory fit test records
- Training records
- Incident reports, investigations, and associated backup information such as agency notifications, calculations, and corrective actions taken
- Federal or state agency inspection records
- Other records:
  - Ergonomic evaluations
  - HSE audits and assessments
  - Project-specific HSE plans
  - Confined space entry permits
  - Equipment inspections
  - Equipment maintenance
  - Emergency equipment inspection records
  - SBOs
  - Self-assessment checklists
- The RHSM shall coordinate with the PM or designee to ensure that final project-specific HSE records described in this section, including negative exposure determinations, are maintained with the project files in accordance with the CH2M HILL records retention schedule, or forwarded to the Medical Surveillance Program Administrator, as appropriate. Records retention requirements are detailed in the *Recordkeeping and Access to Records*, SOP HSE-119.

# SSHP Attachments

**CH2M HILL Health and Safety Plan**  
**Attachment 1**

**SSHP Employee Sign-off Form**



**CH2M HILL Health and Safety Plan**  
**Attachment 2**

**Chemical Inventory/Register Form**

**CHEMICAL INVENTORY/REGISTER FORM**

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Refer to SOP HSE-107, Attachment 1, for instructions on completing this form.

Location:	CTO-WE41 / MCB CamLej, Multiple MMRP Sites		
HCC:			
<input type="checkbox"/> Office	<input type="checkbox"/> Warehouse	<input type="checkbox"/> Laboratory	<input checked="" type="checkbox"/> Project:
Project No.:	418824		

Regulated Product	Location	Container labeled (✓if yes)	MSDS available (✓if yes)

MSDS for the listed products will be maintained at:
---

**CH2M HILL Health and Safety Plan**  
**Attachment 3**

**Chemical-Specific Training Form**

**CHEMICAL-SPECIFIC TRAINING FORM**

Refer to SOP 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**

Chainsaw

Hand and Power Tools

Intentional Detonation of MEC or MPPEH

Manual Lifting

Personal Protective Equipment

Traffic Control

**CH2M HILL Health and Safety Plan**  
**Attachment 5**

**Key Target Zero Program Elements**

**Activity Hazard Analysis**

**Pre-Task Safety Plans**

**Safe Behavior Observation**

**Incident Report and Investigation**

(use electronic form when possible)

[HITS](#)

**Lessons Learned Template**



**ACTIVITY HAZARD ANALYSIS**

<b>Work Activity Sequence</b> (Identify the principal steps involved and the sequence of work activities)	<b>Potential Health and Safety Hazards</b> (Analyze each principal step for potential hazards)	<b>Hazard Controls</b> (Develop specific controls for each potential hazard)

<b>Equipment to be used</b> (List equipment to be used in the work activity)	<b>Inspection Requirements</b> (List inspection requirements for the work activity)	<b>Training Requirements</b> (List training requirements including hazard communication)

ACTIVITY HAZARD ANALYSIS

PRINT NAME

SIGNATURE

Supervisor Name: \_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

Safety Officer Name: \_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

Employee Name(s): \_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

# CH2MHILL

## Pre-Task Safety Plan (PTSP) and Safety Meeting Sign-in Sheet

Project: _____ Location: _____ Date: _____		
Supervisor: _____ Job Activity: _____		
Attendees:	Print Name	Sign Name
List Tasks and verify that applicable AHAs have been reviewed:		
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
<input type="checkbox"/> Underground Utilities	<input type="checkbox"/> Security	<input type="checkbox"/> Poor communications
Other Potential Hazards (Describe):		

**Hazard Control Measures (Check All That Apply):**

<b>PPE</b> <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 <input type="checkbox"/> Hard Hat	<b>Protective Systems</b> <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 <input type="checkbox"/> Entry Permits/notification	<b>Fire Protection</b> <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	<b>Electrical</b> <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 <input type="checkbox"/> Overhead line clearance <input type="checkbox"/> Underground utils ID'd
<b>Fall Protection</b> <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	<b>Air Monitoring</b> <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"/> No visible dust <input type="checkbox"/> Other	<b>Proper Equipment</b> <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	<b>Welding &amp; Cutting</b> <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
<b>Confined Space Entry</b> <input type="checkbox"/> Isolation <input type="checkbox"/> Air monitoring <input type="checkbox"/> Trained personnel <input type="checkbox"/> Permit completed <input type="checkbox"/> Rescue	<b>Medical/ER</b> <input type="checkbox"/> First-aid kit <input type="checkbox"/> Eye wash <input type="checkbox"/> FA-CPR trained personnel <input type="checkbox"/> Route to hospital	<b>Heat/Cold Stress</b> <input type="checkbox"/> Work/rest regime <input type="checkbox"/> Rest area <input type="checkbox"/> Liquids available <input type="checkbox"/> Monitoring <input type="checkbox"/> Training	<b>Vehicle/Traffic</b> <input type="checkbox"/> Traffic control <input type="checkbox"/> Barricades <input type="checkbox"/> Flags <input type="checkbox"/> Signs
<b>Permits</b> <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	<b>Demolition</b> <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	<b>Inspections:</b> <input type="checkbox"/> Ladders/aerial lifts <input type="checkbox"/> Lanyards/harness <input type="checkbox"/> Scaffolds <input type="checkbox"/> Heavy equipment <input type="checkbox"/> Drill rigs/geoprobe rigs <input type="checkbox"/> Cranes and rigging <input type="checkbox"/> Utilities marked	<b>Training:</b> <input type="checkbox"/> Hazwaste (current) <input type="checkbox"/> Construction <input type="checkbox"/> Competent person <input type="checkbox"/> Task-specific <input type="checkbox"/> FA/CPR <input type="checkbox"/> Confined Space <input type="checkbox"/> Hazard communication
<b>Underground Utilities</b> <input type="checkbox"/> Dig alert called <input type="checkbox"/> 3 <sup>rd</sup> Party locator <input type="checkbox"/> As-builts reviewed <input type="checkbox"/> Interview site staff <input type="checkbox"/> Client review <input type="checkbox"/> soft locate necessary?	<b>Incident Communications</b> <input type="checkbox"/> Work stops until cleared by TM/CM <input type="checkbox"/> Immediate calls to TM/CM <input type="checkbox"/> Client notification <input type="checkbox"/> 24 hour notification setup <input type="checkbox"/> Clear communications	<b>AHA' s</b> <input type="checkbox"/> reviewed and approved by HSM <input type="checkbox"/> on site and current <input type="checkbox"/> applicable for this day's work <input type="checkbox"/> Communication and incident processes included?	

Field Notes (including observations from prior day, etc.):

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---



---

Name (Print): \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

<b>Safe Behavior Observation Form</b>			
<input type="checkbox"/> Federal or <input type="checkbox"/> Commercial Sector (check one)		<input type="checkbox"/> Construction or <input type="checkbox"/> Consulting (check one)	
Project Number:		Client/Program:	
Project Name:		Observer:	Date:
Position/Title of worker observed:		Background Information/comments:	
Task/Observation Observed: _____			
<ul style="list-style-type: none"> <li>❖ Identify and reinforce safe work practices/behaviors</li> <li>❖ Identify and improve on at-risk practices/acts</li> <li>❖ Identify and improve on practices, conditions, controls, and compliance that eliminate or reduce hazards</li> <li>❖ Proactive PM support facilitates eliminating/reducing hazards (do you have what you need?)</li> <li>❖ Positive, corrective, cooperative, collaborative feedback/recommendations</li> </ul>			
Actions & Behaviors	Safe	At-Risk	Observations/Comments
Current & accurate Pre-Task Planning/Briefing (Project safety plan, STAC, AHA, PTSP, tailgate briefing, etc., as needed)			<b>Positive Observations/Safe Work Practices:</b>
Properly trained/ qualified/ experienced			
Tools/equipment available and adequate			
Proper use of tools			<b>Questionable Activity/Unsafe Condition Observed:</b>
Barricades/work zone control			
Housekeeping			
Communication			
Work Approach/Habits			
Attitude			<b>Observer's Corrective Actions/Comments:</b>
Focus/attentiveness			
Pace			
Uncomfortable/unsafe position			
Inconvenient/unsafe location			
Position/Line of fire			<b>Observed Worker's Corrective Actions/Comments:</b>
Apparel (hair, loose clothing, jewelry)			
Repetitive motion			
Other...			

For ES Federal Sector projects please email completed forms to: [CH2M HILL ES FED Safe Behavior Observation](#)  
 For ES Commercial Sector projects please email completed forms to: [CH2M HILL ES COM Safe Behavior Observation](#)  
 For CNR ES staff please email completed forms to: [cnressafe@ch2m.com](mailto:cnressafe@ch2m.com)

# HITS Incident Report Hardcopy (Phase 1 – Initial Entry)

## Phase 1 – Initial Entry

### Type of Incident (May select more than one)

- |  |   |                                    |
|--|---|------------------------------------|
| <input type="checkbox"/> Injury/Illness  | <input type="checkbox"/> Spill/Release      | <input type="checkbox"/> Near Miss |
| <input type="checkbox"/> Property Damage | <input type="checkbox"/> Environment/Permit | <input type="checkbox"/> 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: \_\_\_\_\_



# Lessons Learned

[Date] ESBG LL-11-xx

<b>Subject</b>	<b>[Insert Descriptive Name of Lessons Learned]</b>
<b>CH2M HILL Project?</b>	[Yes or No]
<b>Situation</b>	[Describe incident or situation that occurred in general terms. Try to be brief and avoid unnecessary details such as names of people or projects, business groups, divisions, dates, location, etc.]
<b>Lessons Learned (Recommendations and Comments)</b>	<ul style="list-style-type: none"><li>• Bullet out any lessons learned, recommendations or other important “take away” information that would benefit others. Tie the recommendations to the incident or event, and avoid including information that is not directly tied to the event.</li></ul>
<b>Submitted By</b>	[Name/Office Location/Phone]
<b>Additional Information Contact</b>	[Name/Office Location/Phone]
<b>Keywords/Categories</b>	[Insert any keywords or incident categories that would aid in a search for this lessons learned]

Send completed Lessons Learned to the ESBG HSSE Director for posting and distribution. Please include a recommended distribution list.

# **CH2M HILL Health and Safety Plan**

## **Attachment 6**

### **Fact Sheets**

#### **Tick Fact Sheet**

#### **Vehicle Accident Guidance**

#### **Working Alone**

## 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



Rocky Mountain Wood Tick



## 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:

- 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.
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. Should you wish to save the tick for identification, place it in a plastic bag, with the date of the tick bite, and place in your freezer. It may be used at a later date to assist a physician with making an accurate diagnosis (if you become ill).



**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.

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.

## Vehicle Accident Guidance—ESBG

Remember that if you are renting a non-CH2M HILL owned vehicle (short-term rental) in the U.S., you should carry the insurance card from the state where your driver's license is issued.

If you operate a fleet vehicle, carry the insurance card where the vehicle is registered.

Please see link below to print out an insurance card (for **CH2M HILL employees** only). The page shows state-specific restrictions and the definitions of hired, owned, etc., vehicles.

[https://communities.int.ch2m.com/legal/insurance/Shared%20Documents/AutoID\\_Cards.aspx?PageView=Shared](https://communities.int.ch2m.com/legal/insurance/Shared%20Documents/AutoID_Cards.aspx?PageView=Shared)

### **For ALL Vehicles if you are in an accident:**

1. 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 feel you have not been injured, contact the RHSM for guidance on whether calling the CH2M HILL occupational nurse/physician is applicable.
2. **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.
3. Notify Supervisor, (and PM/RHSM if working on a project site)
4. Complete a HITS report on the VO.

### **Additional Steps 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:

1. **Fill out and Auto Loss Notice on the Virtual Office** (click "Company Resources," then "Corporate Groups," then "Insurance"). See screen shot below.

CH2M HILL Virtual Office - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites

Address: https://www.int.ch2m.com

My Virtual Office

CH2MHILL Operating Divisions Client Services Company Resources Employee Resources Geographies Employee Contact Search

## Insurance

HOME

BOND REQUEST FORMS

BEST PRACTICES - RISK MANAGEMENT IN DIFFICULT ECONOMIC TIMES

CERTIFICATE REQUEST FORMS

CLAIMS RESOURCE INFO

- How Do I Report a Claim?
- Automobile Loss Notice Form
- Claim Contacts Form
- General Liability Form
- Property and Equipment Form

### How Do I Report a Claim?

Domestic

- Business Auto-All

**Initial Report:** Employee involved in auto accident reports claim as soon as possible directly to Insurer.

**Copy:** Jennifer Bindah/DEN/Legal & Insurance Department

**Form:** [Automobile Loss Notice](#) (completed by employee)

**Insurer:** ZURICH AMERICAN INSURANCE

**Phone:** Toll Free: 1 (877) 246-3478 or 1 (800) 987-3373

**Fax:** Toll Free: 1 (877) 962-2567

Click on form, it will be submitted electronically.

- Business Auto-Owned by Leasing Company, Rental Agency, etc.
- Workers' Compensation



**2. Contact Zurich** (1-877-246-3478 or 1-800-987-3373).

**3. Contact 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).

**Additional Steps for RENTALS:**

**1. Fill out and Auto Loss Notice on the Virtual Office** (click “Company Resources,” then “Corporate Groups,” then “Insurance”). See screen shot above.

**2. 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).

**3. Call Zurich** (1-877-246-3478 or 1-800-987-3373).

**4. Call the rental company** (Budget, National, Enterprise, etc.).

**5. Call Jennifer Rindahl/DEN** at 720-286-2449.

**For 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 with proof of insurance and deductible.

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.

**Additional Resources:**

Business Auto Insurance Manual

[https://www.int.ch2m.com/webuploads/newsgenerator/travel/news/business\\_auto\\_manual\[1\].pdf](https://www.int.ch2m.com/webuploads/newsgenerator/travel/news/business_auto_manual[1].pdf)

Claims Resource Manual

<https://www.int.ch2m.com/intrnl/voffice/corp/insurance/InsHome.asp>

**WORKING ALONE PROTOCOL  
CALL – IN CONTACT FORM**

Date of site work: \_\_\_\_\_ Expected start time: \_\_\_\_\_

Name of CH2M HILL employee in the field: \_\_\_\_\_

Name of CH2M HILL employee responsible to receive contact: \_\_\_\_\_

Client Emergency Contact (if any): \_\_\_\_\_

CH2M HILL employee’s contact numbers:

Radio # \_\_\_\_\_

Cell Phone # \_\_\_\_\_

Address and Location of work: \_\_\_\_\_

Directions/Map:

Planned Activity: \_\_\_\_\_

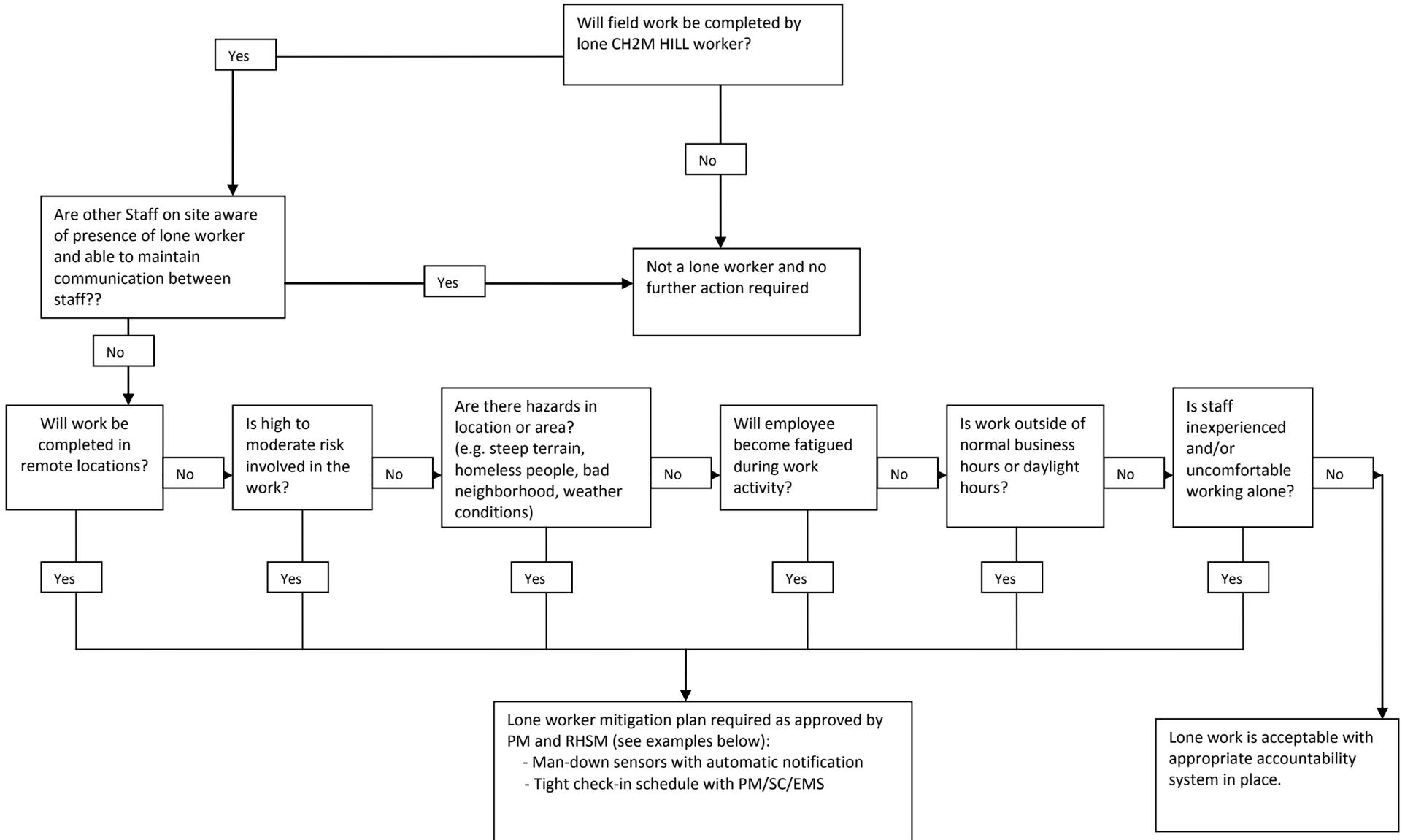
Specified Frequency and time for call in: \_\_\_\_\_

Time	Verified	Location

If lone worker fails to call in at specified frequency/time:

- 1) Call worker’s radio and cell to determine if an emergency exists.
- 2) If no reply, immediately call Client security/emergency service if there is one at the site.
- 3) If there is no client security, call Emergency Services (911). Inform the dispatcher there is a lone worker that cannot be contacted and there may be an emergency on site. Provide the lone worker’s name, their last known location, and your contact information.
- 4) After Emergency Services have been contacted, call the other emergency contacts, Project Manager, and Responsible Health and Safety Manager.

# Lone Worker Protocol



**CH2M HILL Health and Safety Plan**  
**Attachment 7**

**Observed Hazard Form**

**OBSERVED HAZARD FORM**

Name/Company of Observer (*optional*):  
\_\_\_\_\_

Date reported: \_\_\_\_\_

Time reported: \_\_\_\_\_

Contractor/s performing unsafe act or creating unsafe condition:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

Unsafe Act or Condition:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Location of Unsafe Act or Condition:  
\_\_\_\_\_

**Name of CH2M HILL Representative:**  
\_\_\_\_\_

Corrective Actions Taken: \_\_\_\_\_ Date: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Project Safety Committee Evaluation: \_\_\_\_\_ Date: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**CH2M HILL Health and Safety Plan**  
**Attachment 8**

**Stop Work Order Form**

# Stop Work Order

**REPORT PREPARED BY:**

Name:	Title:	Signature:	Date:

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**ISSUE OF NONPERFORMANCE:**

Description:	Date of Nonperformance:

**SUBCONTRACTOR SIGNATURE OF NOTIFICATION:**

Name:	Title:	Signature:	Date:

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*\* Corrective action is to be taken immediately. Note below the action taken, sign and return to CCI.\* Work may not resume until authorization is granted by CH2M HILL Constructors, Inc. Representative,*

**SUBCONTRACTOR'S CORRECTIVE ACTION**

Description:	Date of Nonperformance:

**SUBCONTRACTOR SIGNATURE OF CORRECTION**

Name:	Title:	Signature:	Date:

**CH2M HILL Health and Safety Plan**  
**Attachment 9**

**Agency Inspection Target Zero Bulletin**



**Subject: HSSE Agency Inspections (OSHA, EPA, DOT, State Health Department)**

**Do you know what YOU would do if an agency inspector arrived at your site unannounced?**

Recently, a State Occupational Safety and Health Administration (OSHA) inspector made an unannounced visit to one of our Federal project sites. OSHA, U.S. Environmental Protection Agency (EPA), and authorized state or local agencies have authority to inspect any facility that is subject to health, safety, and environmental legislation. Inspections may be announced or unannounced. This particular inspector indicated that the project was targeted for an inspection because the work was funded by the American Recovery and Reinvestment Act (ARRA).

Enterprise Standard Operating Procedure (SOP) HSE-201, *Agency Inspections and Communications*, describes the responsibilities, procedures, and requirements associated with inspections conducted by external regulatory agencies, as well as the methods for communicating information to key individuals. This Target Zero Bulletin is a brief summary of what to do in the event of an agency inspection at your site. Refer to the SOP for more specific guidance.

**Notification of Inspections**

- If the inspection is an announced regulatory agency inspection, the Project Manager (PM) should notify the Responsible Health and Safety Manager (RHSM) and Responsible Environmental Manager (REM) well in advance of the inspection.
- If an unannounced agency inspector visits one of our projects, Field personnel must immediately notify the project Emergency Response Coordinator (ERC). Typically the ERC is the Safety Coordinator (SC).
- The **ERC must immediately notify the RHSM/REM**, as appropriate, of unannounced inspections, or designate someone to call the RHSM/REM. The RHSM/REMs can provide guidance to the field staff and PM.

**Inspector Credential Verification**

- Upon arrival, the ERC must request the inspector to provide official credentials. Record the inspector's name and office phone number or obtain the inspector's business card.
- The inspector shall sign the visitors log and be given a site-specific health, safety, and environmental protection briefing.
- The inspector shall meet any site access requirements associated with security clearances, specialized training, and medical monitoring. The CH2M HILL representative shall verify that the inspector possesses these requirements; access will only be granted to those areas where appropriate access requirements are met. Some inspectors have the authority to gain access to any work area at any time, such as an inspector with a search warrant. In these cases, we can stop work operations as necessary to protect the safety of the inspector(s).

**Opening Conference**

- The CH2M HILL Project Manager, ERC, RHSM, or REM, and the inspector shall determine attendees for the opening conference. The RHSM (for OSHA and other worker health and safety inspections) or REM (for environmental inspections) shall join the opening conference via conference call.
- The inspector shall inform CH2M HILL of the purpose of the inspection and provide a copy of the complaint, if applicable.
- The inspector shall outline the scope of the inspection, including employee interviews conducted in private, physical inspection of the workplace and records, possible referrals, discrimination complaints, and the closing conference(s).

**Requests for OSHA Logs**

- An OSHA inspector may request to review the project OSHA Injury/Illness log, better known as the OSHA 300 Log. Contact your RHSM for assistance in obtaining the OSHA 300 Log.

- Field projects with a continuous duration of one year or longer are considered to be separate establishments and are required to maintain an OSHA 300 log specific to the project. The project OSHA 300 log should be maintained onsite and kept current.
- Recordable injuries and illnesses sustained on field projects less than one year in duration are maintained on the CH2M HILL office log where the injured employee is based.

### **The Inspection**

- The scope of the inspection shall be limited to that indicated by the inspector in the opening conference. The inspector shall be escorted to relevant areas only. The ERC or other designated by the RHSM or REM must accompany the inspector during the inspection.
- Ensure that the inspection is limited to the scope that the inspector disclosed during the opening conference. The ERC should always take notes which identify: areas inspected, machinery or equipment and materials examined, employees or other persons interviewed, and photographs taken by the inspector.
- The inspector will observe safety, health, and environmental conditions and practices and document the inspection process. The inspector may also take photos and instrument readings, examine records, collect air samples, measure noise levels, survey existing engineering controls, and monitor employee exposure to toxic vapors, gases, and dusts.
- CH2M HILL should gather duplicate information (photographs, readings, samples) in the same manner and condition as the inspector. If the equipment needed to take duplicate samples is not onsite, ask the inspector if the sampling can wait until the equipment is available. If samples are taken, request a description of the tests that the agency intends to perform on the samples and request results as soon as they are available.
- Employees may be questioned during the inspection tour. The employee can refuse to speak to an inspector, can speak to the inspector with a company representative (including management) present, or can speak to the inspector privately. It is CH2M HILL policy that employees who wish to speak to the inspector are not discriminated against, intimidated, or otherwise mistreated for exercising their rights during compliance inspections.
- Copies of documents should not be provided to the inspector without the approval of the RHSM or REM or Legal Insurance Department (LID). **DO NOT** voluntarily release documents. Respond only to inspection team requests.
- During the course of the inspection, the inspector may point out violations. For each violation, the CH2M HILL representative should ask the inspector to discuss possible corrective action. Where possible, violations detected by the inspector should be corrected immediately and noted by the inspector as corrected.
- For those items which cannot be corrected immediately, an action plan shall be formulated for timely correction. In any instance, employees exposed to hazards shall be removed from the area.

### **Closing Conference**

After the inspection, a closing conference is normally held as follows:

- The CH2M HILL PM, ERC, RHSM or REM shall be involved via conference call in the closing conference, at a minimum;
- The inspector shall describe the apparent violations found during the inspection and other pertinent issues as deemed necessary by the inspector. CH2M HILL shall be advised of their rights to participate in any subsequent conferences, meetings or discussions. Any unusual circumstances noted during the closing conference shall be documented by the ERC;
- The inspector shall discuss violations observed during the inspection and indicate for which violations a citation and a proposed penalty may be issued or recommended;
- The ERC shall request receipts for all samples and approved documents photocopied by the inspector, request a photocopy of the inspector's photograph log, and request a copy of the final inspection report; and
- Any documentation from an agency inspection must be transmitted immediately to the RHSM or REM, and LID.

**Unannounced regulatory agency inspections may happen at any time on our projects -**

**Get your RHSM/REM and PM involved immediately if an Inspector arrives.**

# **CH2M HILL HEALTH AND SAFETY PLAN**

## **Attachment 10**

### **Completed CH2M HILL AHAs**

**Contract Task Order WE26 MCB Camp Lejeune-  
ACTIVITY HAZARD ANALYSIS – Mobilization/Site Preparation**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Mobilization/Site Preparation	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Be aware of poor footing, potential slipping/tripping hazards in the work area, such as wet/steep slopes, stumps/roots, unprotected holes, ditches, rip rap, utilities, ground protrusions. Observe and avoid areas of unprotected holes, ramps and ground penetrations or protrusions (stumps, roots, holes curbs, utility structures etc). Use sturdy hard toe work boots with sufficient ankle support.</li> <li>Institute and maintain good housekeeping practices.</li> </ul>	Standard Level D PPE * * Work clothes, reflective vests/high visibility clothing, hard hat, safety glasses and sturdy hard toed work boots, hand and hearing protection, as dictated by task.
	Heavy Equipment	<ul style="list-style-type: none"> <li>Workers to remain beyond the swing radius of heavy equipment.</li> <li>Communicate with equipment operators with clear hand signals.</li> </ul>	Standard Level D PPE
	Manual Lifting	<ul style="list-style-type: none"> <li>CH2M HILL or subcontract personnel must notify supervisors or safety representatives of preexisting medical conditions that may be aggravated or re-injured by lifting activities.</li> <li>When lifting objects, lift using knees not back. For repetitive lifting tasks, the use of lifting braces/supports may be considered. If heavy equipment isn't available to have someone assist with the lift— especially for heavy (&gt; 50lbs.) or awkward loads. Use heavy equipment to transfer heavy or awkward loads wherever possible.</li> <li>Plan storage and staging to minimize lifting or carrying distances. Make sure the path of travel is clear prior to the lift.</li> <li>Avoid carrying heavy objects above shoulder level.</li> </ul>	Standard Level D PPE
	Noise	<ul style="list-style-type: none"> <li>Personnel exposed to loud working environments shall wear hearing protection.</li> </ul>	Standard Level D PPE
	High Ambient Temperature	<ul style="list-style-type: none"> <li>Provide fluids to prevent worker dehydration.</li> <li>Monitor for heat stress in accordance with SSHP (maintain use of buddy system).</li> <li>Institute a proper work-break regiment to avoid heat stress symptoms and overexertion.</li> </ul>	Standard Level D PPE (light colored clothing)
	Struck/pinched	<ul style="list-style-type: none"> <li>Wear reflective warning vests or high visibility clothing.</li> <li>Isolate equipment swing areas from workers, fixed objects or other equipment.</li> <li>Make/maintain eye contact with operators before approaching equipment. Do not approach equipment from rear or from blind spot of operator.</li> <li>Understand and review hand signals. Designate one person to provide hand signals to equipment operators.</li> <li>Ensure equipment has operable back-up alarms.</li> <li>Avoid positioning between fixed objects and operating equipment.</li> <li>No one shall walk under or in front of suspended loads. Only tagged, load rated and inspected rigging shall be used to lift loads. Become familiar with vertical, basket and choker load ratings of rigging.</li> </ul>	Standard Level D PPE

**Contract Task Order WE26 MCB Camp Lejeune-  
ACTIVITY HAZARD ANALYSIS – Mobilization/Site Preparation**

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment
Mobilization/Site Preparation (continued)	Biological	<ul style="list-style-type: none"> <li>• Observe ground surfaces especially in wet or grassy areas, tree trunks, and rock piles for evidence and presence of snakes (poisonous).</li> <li>• Observe ground surfaces or surrounding vegetation or structures for presence fire ants, spiders, bee/wasp hives etc.</li> <li>• Observe areas for presence of stinging insects. <b>Notify supervisors of known allergies to stinging insects and location of antidotes.</b></li> <li>• Use insect repellent. Tape pant legs to boots. Frequently check body and clothing for ticks, chiggers, spiders.</li> <li>• Avoid exposure to blood borne pathogens</li> </ul>	Standard Level D PPE
	Electric Hazards	<ul style="list-style-type: none"> <li>• If/when electrical extension cords are required to complete work, extension cords must be:               <ul style="list-style-type: none"> <li>- Equipped with third-wire grounding.</li> <li>- Covered, elevated, or protected from damage when passing through work areas.</li> <li>- Protected from pinching if routed through doorways.</li> </ul> </li> <li>- Not fastened with staples, hung from nails, or suspended with wire.</li> <li>- Extension cords and electrical power tools, must have ground fault circuit interrupters (GFCIs) installed.</li> <li>- Rated to handle the voltage/amperage of equipment.</li> </ul>	Standard Level D PPE
	Fire Prevention	<ul style="list-style-type: none"> <li>• Use only metal safety cans for storage and transfer of fuel.</li> <li>• Use funnels and nozzles during fueling operations.</li> <li>• Allow warm engine parts (generator motor) to cool before refueling.</li> <li>• Appropriately sized, easily accessible ABC fire extinguisher in work area.</li> </ul>	Standard Level D PPE
	Pressure Washing/Equipment Decon	<ul style="list-style-type: none"> <li>• Only qualified personnel will operate high pressure water cleaning equipment.</li> <li>• Operator will be aware of surroundings at all times.</li> <li>• Operator will never point pressure wand in direction of other personnel.</li> <li>• Pressure wands shall not be modified in field (i.e. shortened, bent, or trigger tied open).</li> <li>• Non-operating support personnel must never walk in front of operator during operation.</li> <li>• High pressure equipment shall be equipped with pressure dump safety valves.</li> <li>• Operator to wear pressure resistant foot wear and face splash shield.</li> <li>• Operator shall inspect high pressure hoses, fittings and safety equipment daily.</li> </ul>	Modified Level D PPE with pressure resistant footwear and face splash shield

**Contract Task Order WE26 MCB Camp Lejeune-  
ACTIVITY HAZARD ANALYSIS – Mobilization/Site Preparation**

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment
Mobilization/Site Preparation (continued)	Other	<ul style="list-style-type: none"> <li>• Always using a seat belt while driving on military/government facilities. Always observe posted speed limits, traffic signs and signals. Never using a cell phone or two way radio <u>while driving on</u> military/government facilities. Violating these rules may result in loss of military/government facility driving privileges.</li> <li>• Shut down operations in heavy rain and lightning.</li> <li>• Buddy System maintained for all phases of work.</li> <li>• Base Emergency Dispatch numbers programmed into CH2M HILL personnel cellular phones. Have hospital route maps readily available.</li> <li>• Report all unsafe conditions and acts, injury/illness or property damage to supervisors immediately.</li> <li>• Site work should always be performed with adequate lighting.</li> <li>• Site equipment, materials, and waste should be maintained according to good housekeeping practices.</li> </ul>	NA
EQUIPMENT REQUIRED		INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
<ul style="list-style-type: none"> <li>• Fire extinguisher (with fuel and electrical sources)</li> <li>• Eye wash (small portable type)</li> <li>• Miscellaneous power and manual hand tools.</li> <li>• Miscellaneous rigging.</li> </ul>		<ul style="list-style-type: none"> <li>• Visual Inspections of designated work areas identify and address hazardous conditions.</li> <li>• Equipment inspections and maintenance.</li> <li>• Inspections of hand tools (power) and extension cords if used.</li> </ul>	<ul style="list-style-type: none"> <li>• Review AHA with all task personnel</li> <li>• Review Site Specific Health and Safety Plan for new site personnel.</li> <li>• Review operations/safety manuals for all equipment utilized.</li> <li>• Behavior Based Loss Prevention Training (supervisors).</li> <li>• Power tool and equipment operators qualified by previous training or experience.</li> </ul>

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Supervisor Name:

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Date/Time: \_\_\_\_\_

Safety Officer Name:

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Date/Time: \_\_\_\_\_

Site Personnel:

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Date/Time: \_\_\_\_\_



**Contract Task Order WE26 MCB Camp Lejeune- ACTIVITY HAZARD ANALYSIS – Soil Sampling**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Soil and Groundwater Sampling	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Be aware of poor footing, potential slipping/tripping hazards in the work area, such as wet/steep slopes, stumps/roots, unprotected holes, ditches, rip rap, utilities, ground protrusions. Observe and avoid areas of unprotected holes, ramps and ground penetrations or protrusions (stumps, roots, holes curbs, utility structures etc). Use sturdy hard toe work boots with sufficient ankle support.</li> <li>Institute and maintain good housekeeping practices.</li> </ul>	Standard Level D PPE * * Work clothes, reflective vests/ high visibility clothing, hard hat, safety glasses and sturdy hard toed work boots, hand and hearing protection, as dictated by task.
	Chemical Exposure	<ul style="list-style-type: none"> <li>All personnel performing this task shall be trained in accordance with 29CFR1910.120 and be deemed “fit for duty” by a licensed occupation physician.</li> <li>Follow PPE and action level requirements identified in the site specific SSHP.</li> <li>Do not allow dermal contact or incidental ingestion of impacted soil or groundwater. Skin contact with contaminated water, soils, debris, or equipment shall be avoided at all times. Do not kneel or step in potentially contaminated media (soil or ground water).</li> <li>Exercise good hygiene practices. Always wash hands before eating, drinking, smoking and leaving site. Only eat, drink, smoke or chew tobacco in designated areas.</li> <li>Following sample collection, sample container lids should be tightened securely to prevent any leaks, and the containers should be rinsed with clean water to ensure that they are free of chemical constituents.</li> </ul>	Modified Level D PPE (see table in Section 14)
	Manual Lifting	<ul style="list-style-type: none"> <li>CH2M HILL or subcontract personnel must notify supervisors or safety representatives of preexisting medical conditions that may be aggravated or re-injured by lifting activities.</li> <li>When lifting objects, lift using knees not back. For repetitive lifting tasks, the use of lifting braces/supports may be considered. If heavy equipment isn’t available to have someone assist with the lift— especially for heavy (&gt; 50lbs.) or awkward loads. Use heavy equipment to transfer heavy or awkward loads wherever possible.</li> <li>Plan storage and staging to minimize lifting or carrying distances. Make sure the path of travel is clear prior to the lift.</li> <li>Avoid carrying heavy objects above shoulder level.</li> </ul>	Standard Level D PPE
	Noise	<ul style="list-style-type: none"> <li>Personnel exposed to loud working environments shall wear hearing protection.</li> </ul>	Standard Level D PPE
	High Ambient Temperature	<ul style="list-style-type: none"> <li>Provide fluids to prevent worker dehydration.</li> <li>Monitor for heat stress in accordance with SSHP (maintain use of buddy system).</li> <li>Institute a proper work-break regiment to avoid heat stress symptoms and overexertion.</li> </ul>	Standard Level D PPE (light colored clothing)

**Contract Task Order WE26 MCB Camp Lejeune- ACTIVITY HAZARD ANALYSIS – Soil Sampling**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Soil and Groundwater Sampling (continued)	Struck/pinched	<ul style="list-style-type: none"> <li>• Wear reflective warning vests or high visibility clothing.</li> <li>• Isolate equipment swing areas from workers, fixed objects or other equipment.</li> <li>• Make/maintain eye contact with operators before approaching equipment. Do not approach equipment from rear or from blind spot of operator.</li> <li>• Understand and review hand signals. Designate one person to provide hand signals to equipment operators.</li> <li>• Ensure equipment has operable back-up alarms.</li> <li>• Avoid positioning between fixed objects and operating equipment.</li> <li>• No one shall walk under or in front of suspended loads. Only tagged, load rated and inspected rigging shall be used to lift loads. Become familiar with vertical, basket and choker load ratings of rigging.</li> </ul>	Standard Level D PPE
	Biological	<ul style="list-style-type: none"> <li>• Observe ground surfaces especially in wet or grassy areas, tree trunks, and rock piles for evidence and presence of snakes (poisonous).</li> <li>• Observe ground surfaces or surrounding vegetation or structures for presence fire ants, spiders, bee/wasp hives etc.</li> <li>• Observe areas for presence of stinging insects. <b>Notify supervisors of known allergies to stinging insects and location of antidotes.</b></li> <li>• Use insect repellent. Tape pant legs to boots. Frequently check body and clothing for ticks, chiggers, spiders.</li> <li>• Avoid exposure to blood borne pathogens</li> </ul>	Standard Level D PPE Bug-out suits if needed
	Electric Hazards	<ul style="list-style-type: none"> <li>• If/when electrical extension cords are required to complete work, extension cords must be:                             <ul style="list-style-type: none"> <li>- Equipped with third-wire grounding.</li> <li>- Covered, elevated, or protected from damage when passing through work areas.</li> <li>- Protected from pinching if routed through doorways.</li> <li>- Not fastened with staples, hung from nails, or suspended with wire.</li> <li>- Extension cords and electrical power tools, must have ground fault circuit interrupters (GFCIs) installed.</li> <li>- Rated to handle the voltage/amperage of equipment.</li> </ul> </li> </ul>	Standard Level D PPE
	Fire Prevention	<ul style="list-style-type: none"> <li>• Use only metal safety cans for storage and transfer of fuel.</li> <li>• Use funnels and nozzles during fueling operations.</li> <li>• Allow warm engine parts (generator motor) to cool before refueling.</li> <li>• Appropriately sized, easily accessible ABC fire extinguisher in work area.</li> </ul>	Standard Level D PPE

**Contract Task Order WE26 MCB Camp Lejeune- ACTIVITY HAZARD ANALYSIS – Soil Sampling**

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment
Soil and Groundwater Sampling (continued)	Pressure Washing/Equipment Decon	<ul style="list-style-type: none"> <li>• Only qualified personnel will operate high pressure water cleaning equipment.</li> <li>• Operator will be aware of surroundings at all times.</li> <li>• Operator will never point pressure wand in direction of other personnel.</li> <li>• Pressure wands shall not be modified in field (i.e. shortened, bent, or trigger tied open).</li> <li>• Non-operating support personnel must never walk in front of operator during operation.</li> <li>• High pressure equipment shall be equipped with pressure dump safety valves.</li> <li>• Operator to wear pressure resistant foot wear and face splash shield.</li> <li>• Operator shall inspect high pressure hoses, fittings and safety equipment daily.</li> </ul>	Modified Level D PPE with pressure resistant footwear and face splash shield
	Chemical Exposure	<ul style="list-style-type: none"> <li>• All personnel performing this task shall be trained in accordance with 29CFR1910.120 and be deemed “fit for duty” by a licensed occupation physician.</li> <li>• Follow PPE and action level requirements identified in the site specific SSHP.</li> <li>• Do not allow dermal contact or incidental ingestion of impacted soil or groundwater. Skin contact with contaminated water, soils, debris, or equipment shall be avoided at all times. Do not kneel or step in potentially contaminated media (soil or ground water).</li> <li>• Exercise good hygiene practices. Always wash hands before eating, drinking, smoking and leaving site. Only eat, drink, smoke or chew tobacco in designated areas.</li> <li>• Following sample collection, sample container lids should be tightened securely to prevent any leaks, and the containers should be rinsed with clean water to ensure that they are free of chemical constituents.</li> </ul>	Modified Level D PPE (see table in Section 14)
	Other	<ul style="list-style-type: none"> <li>• Always using a seat belt while driving on military/government facilities. Always observe posted speed limits, traffic signs and signals. Never using a cell phone or two way radio <u>while driving</u> on military/government facilities. Shut down operations in heavy rain and lightning.</li> <li>• Buddy System maintained for all phases of work.</li> <li>• Base Emergency Dispatch numbers programmed into CH2M HILL personnel cellular phones. Have hospital route maps readily available.</li> <li>• Report all unsafe conditions and acts, injury/illness or property damage to supervisors immediately.</li> <li>• Site work should always be performed with adequate lighting.</li> <li>• Site equipment, materials, and waste should be maintained according to good housekeeping practices.</li> </ul>	NA

**Contract Task Order WE26 MCB Camp Lejeune- ACTIVITY HAZARD ANALYSIS – Soil Sampling**

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment
<p align="center"><b>EQUIPMENT REQUIRED</b></p>	<p align="center"><b>INSPECTION REQUIREMENTS</b></p>	<p align="center"><b>TRAINING REQUIREMENTS</b></p>	
<ul style="list-style-type: none"> <li>• Fire extinguisher (with fuel and electrical sources)</li> <li>• Eye wash (small portable type)</li> <li>• Miscellaneous power and manual hand tools.</li> <li>• Miscellaneous rigging.</li> </ul>	<ul style="list-style-type: none"> <li>• Visual Inspections of designated work areas identify and address hazardous conditions.</li> <li>• Equipment inspections and maintenance.</li> <li>• Inspections of hand tools (power) and extension cords if used.</li> </ul>	<ul style="list-style-type: none"> <li>• Review AHA with all task personnel</li> <li>• Review Site Specific Health and Safety Plan for new site personnel.</li> <li>• Review operations/safety manuals for all equipment utilized.</li> <li>• Behavior Based Loss Prevention Training (supervisors).</li> <li>• Power tool and equipment operators qualified by previous training or experience.</li> </ul>	

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**Supervisor Name:** \_\_\_\_\_

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**Date/Time:** \_\_\_\_\_

**Safety Officer Name:** \_\_\_\_\_

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**Date/Time:** \_\_\_\_\_

**Site Personnel:** \_\_\_\_\_

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**Contract Task Order WE26 MCB Camp Lejeune- ACTIVITY HAZARD ANALYSIS – IDW Handling and Management**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
IDW Handling and Management	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>• Be aware of poor footing, potential slipping/tripping hazards in the work area, such as wet/steep slopes, stumps/roots, unprotected holes, ditches, rip rap, utilities, ground protrusions. Observe and avoid areas of unprotected holes, ramps and ground penetrations or protrusions (stumps, roots, holes curbs, utility structures etc). Use sturdy hard toe work boots with sufficient ankle support.</li> <li>• Institute and maintain good housekeeping practices.</li> </ul>	Standard Level D PPE * * Work clothes, reflective vests/ high visibility clothing, hard hat, safety glasses and sturdy hard toed work boots, hand and hearing protection, as dictated by task.
	Heavy Equipment/Haul Trucks	<ul style="list-style-type: none"> <li>• Operator experienced with safe operation of excavation/loading equipment.</li> <li>• Workers to remain beyond the swing radius of heavy equipment.</li> <li>• Workers to remain out of the haul route when possible.</li> <li>• Communicate with equipment and haul truck operators with clear hand signals.</li> </ul>	Standard Level D PPE
	Manual Lifting	<ul style="list-style-type: none"> <li>• CH2M HILL or subcontract personnel must notify supervisors or safety representatives of preexisting medical conditions that may be aggravated or re-injured by lifting activities.</li> <li>• When lifting objects, lift using knees not back. For repetitive lifting tasks, the use of lifting braces/supports may be considered. If heavy equipment isn't available to have someone assist with the lift— especially for heavy (&gt; 50lbs.) or awkward loads. Use heavy equipment to transfer heavy or awkward loads wherever possible.</li> <li>• Plan storage and staging to minimize lifting or carrying distances. Make sure the path of travel is clear prior to the lift.</li> <li>• Avoid carrying heavy objects above shoulder level.</li> </ul>	Standard Level D PPE
	Noise	<ul style="list-style-type: none"> <li>• Personnel exposed to loud working environments shall wear hearing protection.</li> </ul>	Standard Level D PPE
	High Ambient Temperature	<ul style="list-style-type: none"> <li>• Provide fluids to prevent worker dehydration.</li> <li>• Monitor for heat stress in accordance with SSHP (maintain use of buddy system).</li> <li>• Institute a proper work-break regiment to avoid heat stress symptoms and overexertion.</li> </ul>	Standard Level D PPE (light colored clothing)

**Contract Task Order WE26 MCB Camp Lejeune- ACTIVITY HAZARD ANALYSIS – IDW Handling and Management**

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment
IDW Handling and Management (continued)	Struck/pinched	<ul style="list-style-type: none"> <li>• Wear reflective warning vests or high visibility clothing.</li> <li>• Isolate equipment swing areas from workers, fixed objects or other equipment.</li> <li>• Make/maintain eye contact with operators before approaching equipment. Do not approach equipment from rear or from blind spot of operator.</li> <li>• Understand and review hand signals. Designate one person to provide hand signals to equipment operators.</li> <li>• Ensure equipment has operable back-up alarms.</li> <li>• Avoid positioning between fixed objects and operating equipment.</li> <li>• No one shall walk under or in front of suspended loads. Only tagged, load rated and inspected rigging shall be used to lift loads. Become familiar with vertical, basket and choker load ratings of rigging.</li> </ul>	Standard Level D PPE
	Biological	<ul style="list-style-type: none"> <li>• Observe ground surfaces especially in wet or grassy areas, tree trunks, and rock piles for evidence and presence of snakes (poisonous).</li> <li>• Observe ground surfaces or surrounding vegetation or structures for presence fire ants, spiders, bee/wasp hives etc.</li> <li>• Observe areas for presence of stinging insects. <b>Notify supervisors of known allergies to stinging insects and location of antidotes.</b></li> <li>• Use insect repellent. Tape pant legs to boots. Frequently check body and clothing for ticks, chiggers, spiders.</li> <li>• Avoid exposure to blood borne pathogens</li> </ul>	Standard Level D PPE
	Fire Prevention	<ul style="list-style-type: none"> <li>• Use only metal safety cans for storage and transfer of fuel.</li> <li>• Use funnels and nozzles during fueling operations.</li> <li>• Allow warm engine parts (generator motor) to cool before refueling.</li> <li>• Appropriately sized, easily accessible ABC fire extinguisher in work area.</li> </ul>	Standard Level D PPE
	Overhead/Suspended Loads	<ul style="list-style-type: none"> <li>• No personnel are allowed to walk under elevated buckets on excavation equipment</li> <li>• If personnel have to work beneath elevated buckets for maintenance purpose, then safety blocks must be positioned on hydraulic arms to prevent lowering.</li> <li>• Hardhats to be worn at all times if potential for falling objects</li> </ul>	Standard Level D PPE

**Contract Task Order WE26 MCB Camp Lejeune- ACTIVITY HAZARD ANALYSIS – IDW Handling and Management**

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment
IDW Handling and Management (continued)	Chemical Exposure	<ul style="list-style-type: none"> <li>• All personnel performing this task shall be trained in accordance with 29CFR1910.120 and be deemed “fit for duty” by a licensed occupation physician.</li> <li>• Follow PPE and action level requirements identified in the site specific SSHP.</li> <li>• Do not allow dermal contact or incidental ingestion of impacted soil or groundwater. Skin contact with contaminated water, soils, debris, or equipment shall be avoided at all times. Do not kneel or step in potentially contaminated media (soil or ground water).</li> <li>• Exercise good hygiene practices. Always wash hands before eating, drinking, smoking and leaving site. Only eat, drink, smoke or chew tobacco in designated areas.</li> <li>• Following sample collection, sample container lids should be tightened securely to prevent any leaks, and the containers should be rinsed with clean water to ensure that they are free of chemical constituents.</li> </ul>	Modified Level D <sub>1</sub> or D <sub>2</sub> PPE (see table G5-1)
	Other	<ul style="list-style-type: none"> <li>• Always using a seat belt while driving on military/government facilities. Always observe posted speed limits, traffic signs and signals. Never using a cell phone or two way radio <u>while driving</u> on military/government facilities. Violating these rules may result in loss of military/government facility driving privileges.</li> <li>• Shut down operations in heavy rain and lightning.</li> <li>• Buddy System maintained for all phases of work.</li> <li>• Base Emergency Dispatch numbers programmed into CH2M HILL personnel cellular phones. Have hospital route maps readily available.</li> <li>• Report all unsafe conditions and acts, injury/illness or property damage to supervisors immediately.</li> <li>• Site work should always be performed with adequate lighting.</li> <li>• Site equipment, materials, and waste should be maintained according to good housekeeping practices.</li> </ul>	NA
<b>EQUIPMENT REQUIRED</b>		<b>INSPECTION REQUIREMENTS</b>	<b>TRAINING REQUIREMENTS</b>
<ul style="list-style-type: none"> <li>• Fire extinguisher (with fuel and electrical sources)</li> <li>• Eye wash (small portable type)</li> <li>• Miscellaneous power and manual hand tools.</li> <li>• Miscellaneous rigging.</li> </ul>		<ul style="list-style-type: none"> <li>• Visual Inspections of designated work areas identify and address hazardous conditions.</li> <li>• Equipment inspections and maintenance.</li> <li>• Inspections of hand tools (power) and extension cords if used.</li> </ul>	<ul style="list-style-type: none"> <li>• Review AHA with all task personnel</li> <li>• Review Site Specific Health and Safety Plan for new site personnel.</li> <li>• Review operations/safety manuals for all equipment utilized.</li> <li>• Behavior Based Loss Prevention Training (supervisors).</li> <li>• Power tool and equipment operators qualified by previous training or experience.</li> </ul>

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**Contract Task Order WE26 MCB Camp Lejeune-  
ACTIVITY HAZARD ANALYSIS – Demobilization / Cleanup**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Demobilization/ Cleanup	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>• Be aware of poor footing, potential slipping/tripping hazards in the work area, such as wet/steep slopes, stumps/roots, unprotected holes, ditches, rip rap, utilities, ground protrusions. Observe and avoid areas of unprotected holes, ramps and ground penetrations or protrusions (stumps, roots, holes curbs, utility structures etc). Use sturdy hard toe work boots with sufficient ankle support.</li> <li>• Institute and maintain good housekeeping practices.</li> </ul>	<p>Standard Level D PPE *</p> <p>* Work clothes, reflective vests/ high visibility clothing, hard hat, safety glasses and sturdy hard toed work boots, hand and hearing protection, as dictated by task.</p>
	Heavy Equipment/Haul Trucks	<ul style="list-style-type: none"> <li>• Operator experienced with safe operation of excavation/loading equipment.</li> <li>• Workers to remain beyond the swing radius of heavy equipment.</li> <li>• Workers to remain out of the haul route when possible.</li> <li>• Communicate with equipment and haul truck operators with clear hand signals.</li> </ul>	Standard Level D PPE
	Manual Lifting	<ul style="list-style-type: none"> <li>• CH2M HILL or subcontract personnel must notify supervisors or safety representatives of preexisting medical conditions that may be aggravated or re-injured by lifting activities.</li> <li>• When lifting objects, lift using knees not back. For repetitive lifting tasks, the use of lifting braces/supports may be considered. If heavy equipment isn't available to have someone assist with the lift— especially for heavy (&gt; 50lbs.) or awkward loads. Use heavy equipment to transfer heavy or awkward loads wherever possible.</li> <li>• Plan storage and staging to minimize lifting or carrying distances. Make sure the path of travel is clear prior to the lift.</li> <li>• Avoid carrying heavy objects above shoulder level.</li> </ul>	Standard Level D PPE
	Noise	<ul style="list-style-type: none"> <li>• Personnel exposed to loud working environments shall wear hearing protection.</li> </ul>	Standard Level D PPE
	High Ambient Temperature	<ul style="list-style-type: none"> <li>• Provide fluids to prevent worker dehydration.</li> <li>• Monitor for heat stress in accordance with SSHP (maintain use of buddy system).</li> <li>• Institute a proper work-break regiment to avoid heat stress symptoms and overexertion.</li> </ul>	Standard Level D PPE (light colored clothing)

**Contract Task Order WE26 MCB Camp Lejeune-  
ACTIVITY HAZARD ANALYSIS – Demobilization / Cleanup**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Demobilization/ Cleanup (continued)	Struck/pinched	<ul style="list-style-type: none"> <li>• Wear reflective warning vests or high visibility clothing.</li> <li>• Isolate equipment swing areas from workers, fixed objects or other equipment.</li> <li>• Make/maintain eye contact with operators before approaching equipment. Do not approach equipment from rear or from blind spot of operator.</li> <li>• Understand and review hand signals. Designate one person to provide hand signals to equipment operators.</li> <li>• Ensure equipment has operable back-up alarms.</li> <li>• Avoid positioning between fixed objects and operating equipment.</li> <li>• No one shall walk under or in front of suspended loads. Only tagged, load rated and inspected rigging shall be used to lift loads. Become familiar with vertical, basket and choker load ratings of rigging.</li> </ul>	Standard Level D PPE
	Biological	<ul style="list-style-type: none"> <li>• Observe ground surfaces especially in wet or grassy areas, tree trunks, and rock piles for evidence and presence of snakes (poisonous).</li> <li>• Observe ground surfaces or surrounding vegetation or structures for presence fire ants, spiders, bee/wasp hives etc.</li> <li>• Observe areas for presence of stinging insects. <b>Notify supervisors of known allergies to stinging insects and location of antidotes.</b></li> <li>• Use insect repellent. Tape pant legs to boots. Frequently check body and clothing for ticks, chiggers, spiders.</li> <li>• Avoid exposure to blood borne pathogens</li> </ul>	Standard Level D PPE
	Electric Hazards	<ul style="list-style-type: none"> <li>• If/when electrical extension cords are required to complete work, extension cords must be: <ul style="list-style-type: none"> <li>- Equipped with third-wire grounding.</li> <li>- Covered, elevated, or protected from damage when passing through work areas.</li> <li>- Protected from pinching if routed through doorways.</li> <li>- Not fastened with staples, hung from nails, or suspended with wire.</li> <li>- Extension cords and electrical power tools, must have ground fault circuit interrupters (GFCIs) installed.</li> </ul> </li> <li>- Rated to handle the voltage/ampereage of equipment.</li> </ul>	Standard Level D PPE
	Fire Prevention	<ul style="list-style-type: none"> <li>• Use only metal safety cans for storage and transfer of fuel.</li> <li>• Use funnels and nozzles during fueling operations.</li> <li>• Allow warm engine parts (generator motor) to cool before refueling.</li> <li>• Appropriately sized, easily accessible ABC fire extinguisher in work area.</li> </ul>	Standard Level D PPE

**Contract Task Order WE26 MCB Camp Lejeune-  
ACTIVITY HAZARD ANALYSIS – Demobilization / Cleanup**

Task Breakdown	Potential Hazards	Critical Safety Practices	Personal Protective Clothing and Equipment
Demobilization/ Cleanup (continued)	Pressure Washing/Equipment Decon	<ul style="list-style-type: none"> <li>• Only qualified personnel will operate high pressure water cleaning equipment.</li> <li>• Operator will be aware of surroundings at all times.</li> <li>• Operator will never point pressure wand in direction of other personnel.</li> <li>• Pressure wands shall not be modified in field (i.e. shortened, bent, or trigger tied open).</li> <li>• Non-operating support personnel must never walk in front of operator during operation.</li> <li>• High pressure equipment shall be equipped with pressure dump safety valves.</li> <li>• Operator to wear pressure resistant foot wear and face splash shield.</li> <li>• Operator shall inspect high pressure hoses, fittings and safety equipment daily.</li> </ul>	Modified Level D PPE with pressure resistant footwear and face splash shield
	Overhead/Suspended Loads	<ul style="list-style-type: none"> <li>• No personnel are allowed to walk under elevated buckets on excavation equipment</li> <li>• If personnel have to work beneath elevated buckets for maintenance purpose, then safety blocks must be positioned on hydraulic arms to prevent lowering.</li> <li>• Hardhats to be worn at all times if potential for falling objects</li> </ul>	Standard Level D PPE
	Other	<ul style="list-style-type: none"> <li>• Always using a seat belt while driving on military/government facilities. Always observe posted speed limits, traffic signs and signals. Never using a cell phone or two way radio <u>while driving</u> on military/government facilities. Violating these rules may result in loss of military/government facility driving privileges.</li> <li>• Shut down operations in heavy rain and lightning.</li> <li>• Buddy System maintained for all phases of work.</li> <li>• Base Emergency Dispatch numbers programmed into CH2M HILL personnel cellular phones. Have hospital route maps readily available.</li> <li>• Report all unsafe conditions and acts, injury/illness or property damage to supervisors immediately.</li> <li>• Site work should always be performed with adequate lighting.</li> <li>• Site equipment, materials, and waste should be maintained according to good housekeeping practices.</li> </ul>	NA
EQUIPMENT REQUIRED		INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
<ul style="list-style-type: none"> <li>• Fire extinguisher (with fuel and electrical sources)</li> <li>• Eye wash (small portable type)</li> <li>• Miscellaneous power and manual hand tools.</li> <li>• Miscellaneous rigging.</li> </ul>		<ul style="list-style-type: none"> <li>• Visual Inspections of designated work areas identify and address hazardous conditions.</li> <li>• Equipment inspections and maintenance.</li> <li>• Inspections of hand tools (power) and extension cords if used.</li> </ul>	<ul style="list-style-type: none"> <li>• Review AHA with all task personnel</li> <li>• Review Site Specific Health and Safety Plan for new site personnel.</li> <li>• Review operations/safety manuals for all equipment utilized.</li> <li>• Behavior Based Loss Prevention Training (supervisors).</li> <li>• Power tool and equipment operators qualified by previous training or experience.</li> </ul>

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**Supervisor Name:**

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**Date/Time:** \_\_\_\_\_

**Safety Officer Name:**

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**Date/Time:** \_\_\_\_\_

**Site Personnel:**

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**Date/Time:** \_\_\_\_\_



**TASK ORDER 026 MCB CAMP LEJEUNE**

## ACTIVITY HAZARD ANALYSIS – Boating Operations

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Review emergency procedures	Delays/Inadequate response to emergency situations	Review AHA, Float Plan, Pre-Task Safety Plan	N/A
Stage equipment at boat, boarding (and leaving)	Slips, Trips, Falls	Ensure safe footing. Keep area around boat clear of obstructions. Maintain good housekeeping inside and outside of boat. Special care will be taken when boarding/leaving when dock facilities are unavailable (personal assist, ladders, platforms).	Standard Level D PPE, Life Jacket, Weather Appropriate Clothing
	Fires	Maintain an operational fire extinguisher on the boat. Ensure all boat occupants have had fire extinguisher training. No smoking will be permitted due to the presence of flammable fuels.	N/A
Check Communication Equipment	Delays/Inadequate response to emergency response	Ensure cell phones are fully charged. Air horn on the boat and functional. Radios fully charged, functional and frequencies set. Steps for loss prevention should be used (lanyard to user/boat/flotation device/waterproof bag.	N/A
Boat Use	General Operation	Boat must be operated in accordance with U.S. Coast Guard regulations for: speed, lighting, right-of-way, safety equipment (including PFDs, throwing rings, radios, fire extinguishers, etc).  All operations will be directed by a qualified and experienced boater as the team leader. The boat captain/ operator will give a daily safety briefing to passengers and crew regarding safe boat operations, in addition to the daily tailgate (ptsp) briefing.  Observe and comply with safety markers.	Standard Level D PPE, Life Jacket, Weather Appropriate Clothing, Waiters (if necessary)
	Injuries and Illness	Boating team must include at least one person qualified in First Aid. First aid kit required in boat.	
	Struck-by Hazard, run into equipment or debris	Aware of proper boat operation (right-of-way), drive defensively, keep wide berth from other boats/equipment, post bowman watch for floating debris, etc. Monitor radio for announcements.  Be aware of tides, currents and changing water depth.	

**TASK ORDER 026 MCB CAMP LEJEUNE**

## ACTIVITY HAZARD ANALYSIS – Boating Operations

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
	Inclement Weather	<p>Monitor weather radio broadcasts for watches and warnings. Any “observable” lightning or thunder – alert field team. Additionally, sea state, windspeeds and fog/visibility shall all be considered regarding “safe to launch” criteria. Windspeed meter will provide a double check on local conditions.</p> <p>Use sun protection (sun screen, hats, shaded eye protection) when appropriate.</p>	
	Working from Boat	<ul style="list-style-type: none"><li>• Water crafts shall be licensed and identified in accordance with state regulations.</li><li>• The captain of any chartered boats shall complete a float plan prior to leaving the dock.</li><li>• A copy of the float plan shall be left with a reliable individual who will notify the coast guard if the vessel does not return according to the float plan schedule.</li><li>• The vessel captain shall operate the vessel in accordance with state regulations (i.e., 6 pack license).</li><li>• A minimum of two members of the crew or passengers shall be certified in first aid and CPR.</li><li>• The vessel shall be equipped with fire extinguishers or a fixed fire extinguishing systems.</li><li>• PFDs are required for all personnel.</li><li>• The Marine Distress Communications Form shall be completed and posted near the radio-telephone on vessels requiring this equipment.</li></ul>	Standard Level D PPE *
	Poor Visibility	<p>U.S. Coast Guard approved lighting, including running lights, shall be on the boat and used during poor visibility operations, such as at dawn and dusk. A flashlight will be made available for personnel on the boat.</p>	Standard Level D PPE *, Reflective PFDs
	Other	<p>Shut down operations in heavy rain, wind and/or lightning. At first sight of lightning, operations shall be stopped and only resumed when conditions permit. The lightning safety recommendation is 30-30: Seek refuge when thunder sounds within 30 seconds after a lightning flash; and do not resume activity until 30 minutes after the last thunder clap.</p> <p>Buddy System maintained for all phases of work.</p> <p>Base or local Emergency Dispatch numbers programmed into cellular phones. Have hospital route maps readily available.</p> <p>Report all conditions which may create accidents, injury, illness or property damage to supervisors immediately.</p>	NA

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Supervisor Name:

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Date/Time: \_\_\_\_\_

Safety Officer Name:

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Date/Time: \_\_\_\_\_

Site Personnel:

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**TASK ORDER 026 MCB CAMP LEJEUNE****ACTIVITY HAZARD ANALYSIS – Field Reconnaissance**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Field Reconnaissance	Manual Lifting, Back Injury	<p>CH2M HILL personnel must notify supervisors or safety representatives of preexisting medical conditions that may be aggravated or re-injured by lifting activities.</p> <p>When lifting objects, lift using knees not back. For repetitive lifting tasks, the use of lifting braces/supports may be considered. If heavy equipment isn't available to have someone assist with the lift— especially for heavy (&gt; 40lbs.) or awkward loads. Use heavy equipment to transfer heavy or awkward loads wherever possible.</p> <p>Plan storage and staging to minimize lifting or carrying distances. Make sure the path of travel is clear prior to the lift.</p> <p>Avoid carrying heavy objects above shoulder level.</p> <p>Do not climb on objects not designed for access by personnel without proper fall protection.</p>	<p>Standard Level D PPE *</p> <p>* Work clothes, reflective vests/ high visibility clothing, hard hat, safety glasses and sturdy leather work boots, hand and hearing protection, as dictated by task.</p> <p>Appropriate cold weather clothing as temperature and weather dictate.</p>
	Slips, Trips, Falls	<p>Be aware of poor footing, potential slipping/tripping hazards in the work area, such as wet/steep slopes, stumps/roots, unprotected holes, ditches, rip rap, utilities, ground protrusions. Observe, mark and avoid these identified site areas. Use sturdy, leather work boots with sufficient ankle support.</p> <p>Institute and maintain good housekeeping practices.</p>	Standard Level D PPE *
	Visible Lighting	<p>Perform tasks in daylight hours whenever possible. If dawn, dusk or dark work is to be performed portable lighting must be provided to sufficient illuminate work area(s).</p> <p>Do not enter poorly lit areas without first providing portable illumination.</p>	Standard Level D PPE *

**TASK ORDER 026 MCB CAMP LEJEUNE****ACTIVITY HAZARD ANALYSIS – Field Reconnaissance**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Field Reconnaissance (continued)	Biological	<p>Observe areas for presence of stinging or biting or stinging insects and nests such as spiders (widows/recluse), bee/wasp hives, fire ants mounds etc.</p> <p>Prior to starting field activities, notify supervisors of known allergies to stinging insects and location and quantity of antidote in the event the employee becomes incapacitated as a result of an insect bite.</p> <p>Observe work area for presence of snakes (cottonmouth as primary, copperhead and rattlers as secondary).</p> <p>Observe wetland/creek, river areas for presence of alligators (nests, eggs)</p> <p>Frequently check body and clothing for ticks, chiggers, spiders.</p> <p>Protect yourself from and avoid exposure to blood borne pathogens when administering first aid.</p> <p>Exposure to some insect and reptile biological hazards may be temperature dependant.</p> <p>Clear eye protection providing maximum visibility is essential when working in areas of vegetation where vegetation presents eye-level hazards such as thorns or obstructing tree branches.</p>	Standard Level D PPE *
	Vehicle (boat) Traffic	The boat will be operated by a qualified person, and will be operated according to U.S. Coast Guard regulations.	Standard Level D PPE *
	Weather Exposure	<p>Provide fluids to prevent worker dehydration.</p> <p>Monitor for heat stress and cold stress s in accordance with SSHP (maintain use of buddy system).</p> <p>Institute a proper work-break regiment to avoid heat stress symptoms and overexertion.</p> <p>Use sun protection (sun screen, hats, shaded eye protection, etc.) when appropriate.</p>	Standard Level D PPE (weather appropriate clothing)
	Working Near Water	<ul style="list-style-type: none"><li>• U.S. Coast Guard-approved personal flotation devices (PFDs), or life jacket, provided for each employee will be worn.</li><li>• PFDs will be inspected before and after each use. Defective equipment will not be used.</li><li>• A minimum of one ring buoy with 90 feet of 3/8-inch solid-braid polypropylene (or equal) rope will be provided for emergency rescue.</li></ul>	Standard Level D PPE *

**TASK ORDER 026 MCB CAMP LEJEUNE****ACTIVITY HAZARD ANALYSIS – Field Reconnaissance**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Field Reconnaissance (continued)	Working from Boat	<ul style="list-style-type: none"><li>• Water crafts shall be licensed and identified in accordance with state regulations.</li><li>• The captain of any chartered boats shall complete a float plan prior to leaving the dock.</li><li>• A copy of the float plan shall be left with a reliable individual who will notify the coast guard if the vessel does not return according to the float plan schedule.</li><li>• The vessel captain shall operate the vessel in accordance with state regulations (i.e., 6 pack license).</li><li>• A minimum of two members of the crew or passengers shall be certified in first aid and CPR.</li><li>• The vessel shall be equipped with fire extinguishers or a fixed fire extinguishing systems.</li><li>• Wearing of PFDs are required for all personnel while on board the vessel.</li><li>• The Marine Distress Communications Form shall be completed and posted near the radio-telephone on vessels requiring this equipment.</li></ul> <p>Radios shall be op checked prior to commencing boating operations. VHF radios being line of site, periodic communications checks will be performed to ensure personnel are within communications range.</p> <p>Channel 16 will be used only for hailing purposes. Communication will be kept to an absolute minimum. Identification will be clearly made, with immediate switching to an appropriate channel for further conversation.</p>	Standard Level D PPE *
	Cuts & Abrasions	Wear long sleeve clothing and proper PPE (eye protection, leather gloves, sturdy leather boots) when traversing through wooded areas.	Standard Level D PPE *

**TASK ORDER 026 MCB CAMP LEJEUNE****ACTIVITY HAZARD ANALYSIS – Field Reconnaissance**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Field Reconnaissance (continued)	Other	<p>Shut down operations in heavy rain, wind and/or lightning. At first sight of lightning, operations shall be stopped and only resumed when conditions permit. The lightning safety recommendation is 30-30: Seek refuge when thunder sounds within 30 seconds after a lightning flash; and do not resume activity until 30 minutes after the last thunder clap. A lightning meter will be used as a backup for distance estimation.</p> <p>Buddy System shall be maintained for all phases of work.</p> <p>Base or local Emergency Dispatch numbers programmed into cellular phones. Have hospital route maps readily available.</p> <p>Report all conditions which may create accidents, injury, illness or property damage to supervisors immediately and report via use of HITS reporting system as required.</p>	NA

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Safety Officer Name:

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Date/Time: \_\_\_\_\_

Site Personnel:

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**TASK ORDER 026 MCB CAMP LEJEUNE****ACTIVITY HAZARD ANALYSIS – Vegetation removal**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Vegetation removal	Manual Lifting, Back Injury	<p>CH2M HILL personnel must notify supervisors or safety representatives of preexisting medical conditions that may be aggravated or re-injured by lifting activities.</p> <p>When lifting objects, lift using knees not back. For repetitive lifting tasks, the use of lifting braces/supports may be considered. If heavy equipment isn't available to have someone assist with the lift— especially for heavy (&gt; 40lbs.) or awkward loads. Use heavy equipment to transfer heavy or awkward loads wherever possible.</p> <p>Plan storage and staging to minimize lifting or carrying distances. Make sure the path of travel is clear prior to the lift.</p> <p>Avoid carrying heavy objects above shoulder level.</p> <p>Do not climb on objects not designed for access by personnel without proper fall protection.</p>	Standard Level D PPE * * Work clothes, reflective vests/ high visibility clothing, hard hat, safety glasses and sturdy hard toed work boots or sturdy leather work boots, hand and hearing protection, as dictated by task.
	Slips, Trips, Falls	<p>Be aware of poor footing, potential slipping/tripping hazards in the work area, such as wet/steep slopes, stumps/roots, unprotected holes, ditches, rip rap, utilities, ground protrusions. Observe, mark and avoid these identified site areas. Use sturdy leather work boots with sufficient ankle support.</p> <p>Institute and maintain good housekeeping practices.</p>	Standard Level D PPE *
	High Ambient Temperature	<p>Provide fluids to prevent worker dehydration.</p> <p>Monitor for heat stress in accordance with SSHP (maintain use of buddy system).</p> <p>Institute a proper work-break regiment to avoid heat stress symptoms and overexertion.</p>	Standard Level D PPE (light colored/weight, breathable clothing)
	Fire Prevention	<p>Use only metal safety cans for storage and transfer of fuel.</p> <p>Secure flammable storage lock-up (vented) for flammable/combustible material storage.</p> <p>Use funnels and nozzles during fueling operations.</p> <p>Appropriately sized, easily accessible ABC fire extinguisher in work area.</p> <p>Review and be cognizant of MCB LEJUENE Fire Prevention Procedures and Requirements</p>	Standard Level D PPE *
	Visible Lighting	<p>Perform tasks in daylight hours whenever possible. If dawn, dusk or dark work is to be performed portable lighting must be provided to sufficient illuminate work area(s).</p> <p>Do not enter poorly lit areas without first providing portable illumination.</p>	Standard Level D PPE *

**TASK ORDER 026 MCB CAMP LEJEUNE****ACTIVITY HAZARD ANALYSIS – Vegetation removal**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Vegetation Removal (continued)	Biological	Observe areas for presence of stinging or biting or stinging insects and nests such as spiders (widows/recluse), bee/wasp hives, fire ants mounds etc. Prior to starting field activities, notify supervisors of known allergies to stinging insects and location and quantity of antidote in the event the employee becomes incapacitated as a result of an insect bite. Observe work area for presence of snakes (cottonmouth as primary, copperhead and rattlers as secondary). Observe wetland/creek, river areas for presence of alligators (nests, eggs) Frequently check body and clothing for ticks, chiggers, spiders. Protect yourself from and avoid exposure to blood borne pathogens when administering first aid. Exposure to some insect and reptile biological hazards may be temperature dependant.	Standard Level D PPE *
	Vehicle (boat) Traffic	The boat will be operated by a qualified person, and will be operated according to U.S. Coast Guard regulations.	Standard Level D PPE *
	Weather Exposure	Provide fluids to prevent worker dehydration. Monitor for heat stress and cold stress s in accordance with SSHP (maintain use of buddy system). Institute a proper work-break regiment to avoid heat stress symptoms and overexertion. Use sun protection (sun screen, hats, shaded eye protection, etc.) when appropriate.	Standard Level D PPE (weather appropriate clothing)
	Working Near Water	<ul style="list-style-type: none"><li>• U.S. Coast Guard-approved personal flotation devices (PFDs), or life jacket, provided for each employee will be worn.</li><li>• PFDs will be inspected before and after each use. Defective equipment will not be used.</li><li>• Sampling and other equipment will be used according to the manufacturers' instructions.</li><li>• A minimum of one ring buoy with 90 feet of 3/8-inch solid-braid polypropylene (or equal) rope will be provided for emergency rescue.</li></ul>	

**TASK ORDER 026 MCB CAMP LEJEUNE****ACTIVITY HAZARD ANALYSIS – Vegetation removal**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Vegetation Removal Vegetation Removal (continued)	Working from Boat	<ul style="list-style-type: none"><li>• Water crafts shall be licensed and identified in accordance with state regulations.</li><li>• The captain of any chartered boats shall complete a float plan prior to leaving the dock.</li><li>• A copy of the float plan shall be left with a reliable individual who will notify the coast guard if the vessel does not return according to the float plan schedule.</li><li>• The vessel captain shall operate the vessel in accordance with state regulations.</li><li>• A minimum of two members of the crew or passengers shall be certified in first aid and CPR.</li><li>• The vessel shall be equipped with fire extinguishers or a fixed fire extinguishing systems.</li><li>• PFDs are required for all personnel.</li><li>• The Marine Distress Communications Form shall be completed and posted near the radiotelephone on vessels requiring this equipment.</li></ul> <p>Personnel shall be trained on the operation of small boats. Training shall be equivalent to USCG Auxiliary or Power Squadron training</p>	
	Cuts & Abrasions	Wear long sleeve clothing and proper PPE (eye protection, hard hats, leather gloves, sturdy leather boots) when traversing through wooded areas.	Standard Level D PPE *

**TASK ORDER 026 MCB CAMP LEJEUNE**

## ACTIVITY HAZARD ANALYSIS – Vegetation removal

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
	Other	<p>Always using a seat belt while driving on military/government facilities. Always observe posted speed limits, traffic signs and signals. Never using a cell phone or two way radio <u>while driving</u> on military/government facilities. Violating these rules may result in loss of military/government facility driving privileges.</p> <p>Drive 5 mph when driving past troops on maneuvers. If drive past troops on maneuvers could interrupt their activities, vehicle drivers are to bring vehicles to a complete stop in a safe location and yield to troop activities.</p> <p>Shut down operations in heavy rain, wind and/or lightning. At first sight of lightning, operations shall be stopped and only resumed when conditions permit. The lightning safety recommendation is 30-30: Seek refuge when thunder sounds within 30 seconds after a lightning flash; and do not resume activity until 30 minutes after the last thunder clap.</p> <p>Buddy System maintained for all phases of work.</p> <p>Base or local Emergency Dispatch numbers programmed into cellular phones. Have hospital route maps readily available.</p> <p>Report all conditions which may create accidents, injury, illness or property damage to supervisors immediately.</p>	NA

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Safety Officer Name:

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Date/Time: \_\_\_\_\_

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**TASK ORDER 026 MCB CAMP LEJEUNE****ACTIVITY HAZARD ANALYSIS – Loading Material for Off-site Disposal**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Loading Material for Off-site Disposal	Manual Lifting, Back Injury	<p>CH2M HILL personnel must notify supervisors or safety representatives of preexisting medical conditions that may be aggravated or re-injured by lifting activities.</p> <p>When lifting objects, lift using knees not back. For repetitive lifting tasks, the use of lifting braces/supports may be considered. If heavy equipment isn't available to have someone assist with the lift— especially for heavy (&gt; 40lbs.) or awkward loads. Use heavy equipment to transfer heavy or awkward loads wherever possible.</p> <p>Plan storage and staging to minimize lifting or carrying distances. Make sure the path of travel is clear prior to the lift.</p> <p>Avoid carrying heavy objects above shoulder level.</p> <p>Do not climb on objects not designed for access by personnel without proper fall protection.</p>	Standard Level D PPE * * Work clothes, reflective vests/ high visibility clothing, hard hat, safety glasses and sturdy hard toed or leather work boots (SSC determination), hand and hearing protection, as dictated by task.
	Slips, Trips, Falls	<p>Be aware of poor footing, potential slipping/tripping hazards in the work area, such as wet/steep slopes, stumps/roots, unprotected holes, ditches, rip rap, utilities, ground protrusions. Observe, mark and avoid these identified site areas. Use sturdy, leather work boots with sufficient ankle support.</p> <p>Institute and maintain good housekeeping practices.</p>	Standard Level D PPE *
	High Ambient Temperature	<p>Provide fluids to prevent worker dehydration.</p> <p>Monitor for heat stress in accordance with SSHP (maintain use of buddy system).</p> <p>Institute a proper work-break regiment to avoid heat stress symptoms and overexertion.</p>	Standard Level D PPE (light colored/weight, breathable clothing)
	Fire Prevention	<p>Use only metal safety cans for storage and transfer of fuel.</p> <p>Secure flammable storage lock-up (vented) for flammable/combustible material storage.</p> <p>Use funnels and nozzles during fueling operations.</p> <p>Appropriately sized, easily accessible ABC fire extinguisher in work area.</p> <p>Review and be cognizant of MCB LEJUENE Fire Prevention Procedures and Requirements</p>	Standard Level D PPE *
	Visible Lighting	<p>Perform tasks in daylight hours whenever possible. If dawn, dusk or dark work is to be performed portable lighting must be provided to sufficient illuminate work area(s).</p> <p>Do not enter poorly lit areas without first providing portable illumination.</p>	Standard Level D PPE *

**TASK ORDER 026 MCB CAMP LEJEUNE****ACTIVITY HAZARD ANALYSIS – Loading Material for Off-site Disposal**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Loading Material for Off-site Disposal (continued)	Biological	Observe areas for presence of stinging or biting or stinging insects and nests such as spiders (widows/recluse), bee/wasp hives, fire ants mounds etc. Prior to starting field activities, notify supervisors of known allergies to stinging insects and location and quantity of antidote in the event the employee becomes incapacitated as a result of an insect bite. Observe work area for presence of snakes (cottonmouth as primary, copperhead and rattlers as secondary). Observe wetland/creek, river areas for presence of alligators (nests, eggs) Frequently check body and clothing for ticks, chiggers, spiders. Protect yourself from and avoid exposure to blood borne pathogens when administering first aid. Exposure to some insect and reptile biological hazards may be temperature dependant.	Standard Level D PPE *
	Vehicle (boat) Traffic	The boat will be operated by a qualified person, and will be operated according to U.S. Coast Guard regulations.	Standard Level D PPE *
	Weather Exposure	Provide fluids to prevent worker dehydration. Monitor for heat stress and cold stress s in accordance with SSHP (maintain use of buddy system). Institute a proper work-break regiment to avoid heat stress symptoms and overexertion. Use sun protection (sun screen, hats, shaded eye protection, etc.) when appropriate.	Standard Level D PPE (weather appropriate clothing)
	Working Near Water	<ul style="list-style-type: none"><li>• U.S. Coast Guard-approved personal flotation devices (PFDs), or life jacket, provided for each employee will be worn.</li><li>• PFDs will be inspected before and after each use. Defective equipment will not be used.</li><li>• Sampling and other equipment will be used according to the manufacturers' instructions.</li><li>• A minimum of one ring buoy with 90 feet of 3/8-inch solid-braid polypropylene (or equal) rope will be provided for emergency rescue.</li></ul>	Standard Level D PPE *
	Suspended Loads	Work not permitted under suspended loads.	Standard Level D PPE *
	Cuts & Abrasions	Wear long sleeve clothing and proper PPE (eye protection, hard hats, leather gloves, sturdy leather boots) when traversing through wooded areas.	Standard Level D PPE *

**TASK ORDER 026 MCB CAMP LEJEUNE****ACTIVITY HAZARD ANALYSIS – Loading Material for Off-site Disposal**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
Loading Material for Off-site Disposal (continued)	Other	<p>Always using a seat belt while driving on military/government facilities. Always observe posted speed limits, traffic signs and signals. Never using a cell phone or two way radio <u>while driving</u> on military/government facilities. Violating these rules may result in loss of military/government facility driving privileges.</p> <p>Drive 5 mph when driving past troops on maneuvers. If drive past troops on maneuvers could interrupt their activities, vehicle drivers are to bring vehicles to a complete stop in a safe location and yield to troop activities.</p> <p>Shut down operations in heavy rain, wind and/or lightning. At first sight of lightning, operations shall be stopped and only resumed when conditions permit. The lightning safety recommendation is 30-30: Seek refuge when thunder sounds within 30 seconds after a lightning flash; and do not resume activity until 30 minutes after the last thunder clap.</p> <p>Buddy System maintained for all phases of work.</p> <p>Base or local Emergency Dispatch numbers programmed into cellular phones. Have hospital route maps readily available.</p> <p>Report all conditions which may create accidents, injury, illness or property damage to supervisors immediately.</p>	NA

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Date/Time: \_\_\_\_\_

Safety Officer Name:

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Date/Time: \_\_\_\_\_

Site Personnel:

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Date/Time: \_\_\_\_\_

**TASK ORDER 080 026 MCB CAMP LEJEUNE****ACTIVITY HAZARD ANALYSIS – MEC Demolition**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
MEC Demolition	Manual Lifting, Back Injury	<p>CH2M HILL personnel must notify supervisors or safety representatives of preexisting medical conditions that may be aggravated or re-injured by lifting activities.</p> <p>When lifting objects, lift using knees not back. For repetitive lifting tasks, the use of lifting braces/supports may be considered. If heavy equipment isn't available to have someone assist with the lift— especially for heavy (&gt; 40lbs.) or awkward loads. Use heavy equipment to transfer heavy or awkward loads wherever possible.</p> <p>Plan storage and staging to minimize lifting or carrying distances. Make sure the path of travel is clear prior to the lift.</p> <p>Avoid carrying heavy objects above shoulder level.</p> <p>Do not climb on objects not designed for access by personnel without proper fall protection.</p>	Standard Level D PPE * * Work clothes, reflective vests/ high visibility clothing, hard hat, safety glasses and sturdy hard toed work boots, hand and hearing protection, as dictated by task.
	Flying debris/objects	Maintain distance from helicopter rotors (shielding if necessary).	Standard Level D PPE *
	Noise > 85 decibels (dBA)	Noise protection required if working near the helicopter.	Standard Level D PPE * and ear protection, if necessary
	Slips, Trips, Falls	<p>Be aware of poor footing, potential slipping/tripping hazards in the work area, such as wet/steep slopes, stumps/roots, unprotected holes, ditches, rip rap, utilities, ground protrusions. Observe, mark and avoid these identified site areas. Use sturdy, hard toe work boots with sufficient ankle support.</p> <p>Institute and maintain good housekeeping practices.</p>	Standard Level D PPE *
	High Ambient Temperature	<p>Provide fluids to prevent worker dehydration.</p> <p>Monitor for heat stress in accordance with SSHP (maintain use of buddy system).</p> <p>Institute a proper work-break regiment to avoid heat stress symptoms and overexertion.</p>	Standard Level D PPE (light colored/weight, breathable clothing)
	Fire Prevention	<p>Use only metal safety cans for storage and transfer of fuel.</p> <p>Secure flammable storage lock-up (vented) for flammable/combustible material storage.</p> <p>Use funnels and nozzles during fueling operations.</p> <p>Appropriately sized, easily accessible ABC fire extinguisher in work area.</p> <p>Review and be cognizant of MCB LEJUENE Fire Prevention Procedures and Requirements</p>	Standard Level D PPE *

**TASK ORDER 080 026 MCB CAMP LEJEUNE****ACTIVITY HAZARD ANALYSIS – MEC Demolition**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
MEC Demolition (continued)	Visible Lighting	Perform tasks in daylight hours whenever possible. If dawn, dusk or dark work is to be performed portable lighting must be provided to sufficient illuminate work area(s). Do not enter poorly lit areas without first providing portable illumination.	Standard Level D PPE *
	Biological	Observe areas for presence of stinging or biting or stinging insects and nests such as spiders (widows/recluse), bee/wasp hives, fire ants mounds etc. Prior to starting field activities, notify supervisors of known allergies to stinging insects and location and quantity of antidote in the event the employee becomes incapacitated as a result of an insect bite. Observe work area for presence of snakes (cottonmouth as primary, copperhead and rattlers as secondary). Observe wetland/creek, river areas for presence of alligators (nests, eggs) Frequently check body and clothing for ticks, chiggers, spiders. Protect yourself from and avoid exposure to blood borne pathogens when administering first aid. Exposure to some insect and reptile biological hazards may be temperature dependant.	Standard Level D PPE *
	Vehicle (boat) Traffic	The boat will be operated by a qualified person, and will be operated according to U.S. Coast Guard regulations.	Standard Level D PPE *
	Weather Exposure	Provide fluids to prevent worker dehydration. Monitor for heat stress and cold stress s in accordance with SSHP (maintain use of buddy system). Institute a proper work-break regiment to avoid heat stress symptoms and overexertion. Use sun protection (sun screen, hats, shaded eye protection, etc.) when appropriate.	Standard Level D PPE (weather appropriate clothing)
	Working Near Water	<ul style="list-style-type: none"><li>• U.S. Coast Guard-approved personal flotation devices (PFDs), or life jacket, provided for each employee will be worn.</li><li>• PFDs will be inspected before and after each use. Defective equipment will not be used.</li><li>• Sampling and other equipment will be used according to the manufacturers' instructions.</li><li>• A minimum of one ring buoy with 90 feet of 3/8-inch solid-braid polypropylene (or equal) rope will be provided for emergency rescue.</li></ul>	Standard Level D PPE

**TASK ORDER 080 026 MCB CAMP LEJEUNE****ACTIVITY HAZARD ANALYSIS – MEC Demolition**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
MEC Demolition (continued)	Working from Boat	<ul style="list-style-type: none"><li>• Water crafts shall be licensed and identified in accordance with state regulations.</li><li>• The captain of any chartered boats shall complete a float plan prior to leaving the dock.</li><li>• A copy of the float plan shall be left with a reliable individual who will notify the coast guard if the vessel does not return according to the float plan schedule.</li><li>• The vessel captain shall operate the vessel in accordance with state regulations.</li><li>• A minimum of two members of the crew or passengers shall be certified in first aid and CPR.</li><li>• The vessel shall be equipped with fire extinguishers or a fixed fire extinguishing systems.</li><li>• PFDs are required for all personnel.</li><li>• The Marine Distress Communications Form shall be completed and posted near the radiotelephone on vessels requiring this equipment.</li></ul> <p>Personnel shall be trained on the operation of small boats. Training shall be equivalent to USCG Auxiliary or Power Squadron training</p>	Standard Level D PPE
	Explosion Hazard	Personnel will maintain the exclusion zones as specified in the Explosives Safety Submission.	Standard Level D PPE
	Cuts & Abrasions	Wear long sleeve clothing and proper PPE (eye protection, hard hats, leather gloves, sturdy hard toe boots) when traversing through wooded areas.	Standard Level D PPE *

**TASK ORDER 080 026 MCB CAMP LEJEUNE****ACTIVITY HAZARD ANALYSIS – MEC Demolition**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Critical Safety Practices</b>	<b>Personal Protective Clothing and Equipment</b>
	Other	<p>Always using a seat belt while driving on military/government facilities. Always observe posted speed limits, traffic signs and signals. Never using a cell phone or two way radio <u>while driving</u> on military/government facilities. Violating these rules may result in loss of military/government facility driving privileges.</p> <p>Drive 5 mph when driving past troops on maneuvers. If drive past troops on maneuvers could interrupt their activities, vehicle drivers are to bring vehicles to a complete stop in a safe location and yield to troop activities.</p> <p>Shut down operations in heavy rain, wind and/or lightning. At first sight of lightning, operations shall be stopped and only resumed when conditions permit. The lightning safety recommendation is 30-30: Seek refuge when thunder sounds within 30 seconds after a lightning flash; and do not resume activity until 30 minutes after the last thunder clap.</p> <p>Buddy System maintained for all phases of work.</p> <p>Base or local Emergency Dispatch numbers programmed into cellular phones. Have hospital route maps readily available.</p> <p>Report all conditions which may create accidents, injury, illness or property damage to supervisors immediately.</p>	NA

PRINT

SIGNATURE

Supervisor Name:

\_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

Safety Officer Name:

\_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

Site Personnel:

\_\_\_\_\_

\_\_\_\_\_

Date/Time: \_\_\_\_\_

**CH2M HILL Health and Safety Plan**  
**Attachment 11**

**Boating Operations – Self Assessment Checklist**

# CH2MHILL

## HS&E Self-Assessment Checklist – Boating Operations

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: _____

<p>Check "Yes" if an assessment item is complete/correct.</p> <p>Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the drilling subcontractor. Section 3 must be completed for all items checked "No."</p> <p>Check "N/A" if an item is not applicable.</p> <p>Check "N/O" if an item is applicable but was not observed during the assessment.</p> <p>Numbers in parentheses indicate where a description of this assessment item can be found in SOP HSE-35.</p>
---

	Yes	No	N/A	N/O
<b>General</b>				
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 (PFDs) 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"/>
<b>Boat Transport</b>				
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"/>
<b>Boat Operation</b>				
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"/>



**Boating Float Plan – Camp Lejeune**

CH2M HILL Lead: \_\_\_\_\_

Date: \_\_\_\_\_

Vessel Name: _____ Operator: _____ Registration #: _____ Call Sign: _____	
Personnel On Board:	
Point of Departure:	Time:
Destination:	Operational Purpose:
Point of Return:	Est. Time:
Alternate Communication (cell phones, handheld VHF, etc.)	
Supervisor's Signature: _____ Additional Notes:	

**CH2M HILL Health and Safety Plan**  
**Attachment 12**

**AED Program**

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*Off-Base SDZs AED Program*

## Project/Field Office

# AED Program

**Approved by:**

---

Carl Woods/CIN

Responsible H&S Manager

---

Keith LaTorre/KNV

AED Coordinator, Project Manager

October 2012

**CH2MHILL**

# Table of Contents

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1. Purpose
2. Scope
3. Program Responsibility Matrix
4. Training
5. Program Verification
6. Program Documents

## Attachments:

- 1 Monthly AED Maintenance Checklist
- 2 AED Use Protocol

## 1.0 Purpose

The purpose of this document is to define the AED program specifics for the Off-Base Surface Danger Zones (SDZs) field office/project. This plan supplements the information found in the AED SOP HSE. See Attachment 3 of this document for the specifics of AED usage.

## 2.0 Scope

This document applies to each CH2M HILL facility or project where an AED is located.

## 3.0 Program Responsibility Matrix

Table 1 lists the positions which are defined in Section 4 CH2M HILL SOP HSE 102 – *Automated External Defibrillators* and the incumbents for the Off-Base SDZs project are listed.

**TABLE 1.**  
Off-Base SDZs Project AED Program Staff

Position	Incumbent
Medical Director	Dr. Thomas Mattioni, MD/ Cardiac Science
Responsible Health and Safety Manager (RHSM)	Carl Woods/CIN
AED Coordinator (AEDC), Project Manager	Keith LaTorre/KNV
AED Responders	See HandS database for current responders

## 4.0 Training

All AED responders must be trained in CPR and with AEDs as specified by the manufacturer and SOP 102. Cardiac Science specifies the training must conform to the American Heart Association (AHA) Heartsaver AED standards.

The number of trained AED responders must be determined in accordance with SOP HSE-114, *Office and Warehouse Safety Program*. Per SOP 114 “an adequate number is approximately 10 percent of the total staff in the office, with at least one trained person in each building area and/or floor.” The specific number is determined by the AEDC and RHSM.

## 5.0 Program Verification

The AEDC must complete Attachment 2 at monthly intervals. Completion of the AED Checklist item verifies that the Daily, Monthly and Annual maintenance specified in Attachment 3 *AED Use Protocol* have been completed as specified by the manufacturer.

## 6.0 Program Documents

The program documents located in Attachments 4 – 7 must be current and verified and updated versions must be attached. Current documentation must be evaluated quarterly.

# **Attachment 1 Monthly AED Maintenance Checklist**

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**CH2MHILL**  
**Automatic External Defibrillators**  
**Standard of Practice HSE-102**

**Attachment 1: Monthly AED Maintenance Checklist**

Date: \_\_\_\_\_

Office/Project: \_\_\_\_\_

AED Location/number: \_\_\_\_\_

Inspection Performed By: \_\_\_\_\_

<b>Criteria</b>	<b>Status</b>	<b>Corrective Action/ Comments</b>
<b>AED</b>		
Verify placement is visible, unobstructed and near phone		
Verify battery installation and charge		
Check the status/ service indicator light		
Note absence of visual/ audible service alarm		
Inspect exterior components and sockets for cracks		
<b>Supplies</b>		
Two sets of AED pads in sealed packages		
Check expiration date on pad packages		
Pocket mask with one-way valve		
Examination gloves		
Razors		
Absorbent gauze or hand towels		

*Please refer to manufacturer's User Manual for more information and proper annual maintenance procedures*

## **Attachment 2 AED Use Protocol**

---

# 1. Indications for AED Use:

The AED units are intended to be used by personnel who have been trained in their operation. The user should be qualified by training in AED use and CPR. The AED is indicated for emergency treatment of patients exhibiting symptoms of SCA who are **unresponsive and not breathing**. Post-resuscitation, if the victim is breathing, the AED should be left attached to allow for acquisition and detection of the ECG rhythm. If a shockable ventricular tachyarrhythmia recurs, the device will charge automatically and deliver therapy.

## 2. Procedure

**Have someone call 911**

**Retrieve unit from storage location**

A. Assess the scene safety prior to assisting victim with possible SCA – the rescuer should ensure there are no hazards to themselves such as:

- Harmful people (someone that could harm the rescuer)
- Fire or flammable gases
- Chemical hazards (smoke from fire or other condition, liquids or solids, or hazardous gases)
- Electrical dangers (victim in contact with electrical source, electrical cords, downed power lines, etc.)
- Traffic (make sure you are not in the path of traffic)

B. **Determine** if patient is **unresponsive and not breathing**. Apply the AED if **unresponsive and not breathing**.

C. **Open lid**, this ‘turns on’ the AED.

D. **Follow Voice Prompts.**

**1. Place pads.** AED will prompt: “Tear open package and remove pads” followed by “Peel one pad from plastic liner.”

**2. Once pad is peeled.** AED will prompt: “Place once pad on bare upper chest” two times. Rescuer should place pad as shown on pad diagram. AED will prompt: “Place second pad on bare lower chest as shown”. Rescuer should place the second pad as shown on pad diagram.

**3. Analyze Rhythm.** AED will prompt: “Do not touch patient, analyzing rhythm.”

**4. Charges.** AED will prompt: “Shock advised, charging...”

**5. Delivers Defibrillation Pulse.** AED will prompt: “Stand clear. Shock will be delivered in 5 seconds, 4, 3, 2, 1”. Once the AED begins the “Stand clear...” prompt, the rescuer will state “clear” and make a visual head-to-toe check of the patient making sure that he/she and any other rescuers are “clear” of contact with the patient prior to the completion of the countdown.

**6. Analyze/Charge/Pulse.** After the first defibrillation shock, the AED will re-analyze the patient's heart rhythm. AED will prompt: "Do not touch patient, analyzing rhythm."

If a shockable rhythm is detected, the AED will charge and deliver another defibrillation pulse.

Continue this cycle until delivery of 3 defibrillation pulses.

\*If at any time during this cycle the AED detects a heart rhythm that does not require defibrillation, the voice prompt will say "Check for breathing. If not breathing, give patient two breaths." The next voice prompt issued will be "Check for signs of circulation, if no signs of circulation start CPR."

\*\*Remember that the AED will not advise to defibrillate all pulse less patients. Some cardiac rhythms do not respond to defibrillation.

\*\*\***Call 911 is someone has not already done this**

**7. Rescuer Gives CPR for One Minute.** After the 3<sup>rd</sup> defibrillation shock, AED will prompt: "Check for breathing. If not breathing give patient two breaths. Check for signs of circulation. If no circulation, start CPR".

**8. Repeat Analyze/Charge/Defibrillation Pulse.** If the cardiac rhythm is shockable, the AED will guide the rescuer through another 3-defibrillation pulse sequence, followed by one minute of CPR. This sequence should continue until:

- No shockable rhythm is detected or
- The pads are disconnected or
- Until ambulance personnel arrive on the scene.

**9. Patient Converts to a Non-Shockable Rhythm.** If at some point during the rescue the patient converts to a heart rhythm that does not require defibrillation, the AED will prompt: "Check for breathing. If not breathing give patient two breaths" followed by "Check for signs of circulation, if no signs of circulation, start CPR."

**At this point, call "911" if someone has not already done so.**

If a pulse is found on the patient and the patient is not breathing, continue rescue breathing. Leave pads in place and follow voice prompts. If the patient regains consciousness, leave AED pads in place and make patient as comfortable as possible until ambulance personnel arrive on scene.

### 3. Post Incident Procedure

These steps should be completed as soon after the incident as possible:

- Replace pads
- Check expiration date on the pad package
- Replace pocket mask and other supplies used
- Check the battery fuel gauge to assure sufficient battery life

- Close lid of AED and ensure the status indicator is **GREEN**
- Retrieve rescue data and forward to AED Program Medical Director for physician oversight. The oversight will include a review of the response documentation and rescue data for all uses of the AED. Technical support is available to download the rescue data.

## 4. Response Documentation

A response documentation form should be completed for each use of the AED. The RISM and the Medical Director should review this form.

## 5. Basic Maintenance

### Daily Maintenance

Check the **STATUS INDICATOR** to ensure that it is **GREEN**. When the indicator is **GREEN**, the AED is ready for a rescue. If the indicator is **RED**, refer to the Troubleshooting Table in the manual.

### Monthly Maintenance

1. Open the AED lid.
2. Wait for the AED to indicate status. Observe the change of the **STATUS INDICATOR** to **RED**. After less than 5 seconds, verify that the **STATUS INDICATOR** returns to **GREEN**.
3. Observe the expiration date on the pads.
4. Listen for the voice prompts.
5. Close the lid and confirm that **STATUS INDICATOR** remains **GREEN**.

### Annual Maintenance

Perform the following tests annually to confirm that the diagnostics are functioning properly and to verify the integrity of the case.

#### **Check the Integrity of the Pads and Circuitry**

1. Open the AED lid.
2. Remove the pads.
3. Close the lid.
4. Confirm that the **STATUS INDICATOR** turns **RED**.
5. Open the lid and confirm that the Pad indicator is lit.
6. Disconnect the pads and close the lid.
7. Make sure the expiration date is visible through the clear window of the lid. Check to make sure that the **STATUS INDICATOR** is **GREEN**.
8. Open the lid and confirm that no diagnostic indicators are lit.
9. Check the expiration date of the pads; if expired, replace them.

10. Check the pad's packaging integrity.

11. Close the lid.

## 6. AED Use Reporting

The following form should be completed each time the AED is used in a rescue:

Date: \_\_\_\_\_

### Patient Information:

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Age: \_\_\_\_\_

Gender: Male \_\_\_\_\_ Female \_\_\_\_\_

Site of Incident: \_\_\_\_\_

Witnessed arrest: Yes \_\_\_\_\_ No \_\_\_\_\_

Breathing upon arrive of designated responders: Yes \_\_\_\_\_ No \_\_\_\_\_

Pulse upon arrival of designated responders: Yes \_\_\_\_\_ No \_\_\_\_\_

Bystander CPR: Yes \_\_\_\_\_ No \_\_\_\_\_

Cardiac arrest after arrival: Yes \_\_\_\_\_ No \_\_\_\_\_

Number of defibrillation shocks: \_\_\_\_\_

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Rescuer's Name: \_\_\_\_\_

Rescuer's Signature: \_\_\_\_\_

---

# **CH2M HILL HEALTH AND SAFETY PLAN**

## **Attachment 13**

### **Material Safety Data Sheets**

**Appendix B**  
**Uniform Federal Policy/Quality Assurance Project**  
**Plan**

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Draft

**Site-Specific Quality Assurance Project Plan**  
**Expanded Site Inspection**  
**Off-Base Surface Danger Zones**

**Marine Corps Installations East - Marine Corps Base Camp Lejeune**  
**Jacksonville, North Carolina**

**Contract Task Order WE26**

**September 2012**

Prepared for

**Department of the Navy**  
**Naval Facilities Engineering Command**  
**Mid-Atlantic**

Under the

**NAVFAC CLEAN 8012 Program**  
**Contract N62470-11-D-8012**

Prepared by



**Knoxville, Tennessee**



# Contents

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Acronyms and Abbreviations.....	iii
QAPP Identifying Information.....	1
Crosswalk to Related Information.....	3
<b>1 Introduction and Project Organization .....</b>	<b>1-1</b>
1.1 Introduction .....	1-1
1.2 Project Organization Roles and Responsibilities .....	1-1
1.2.1 Project Communication .....	1-1
1.2.2 Laboratory Work Group.....	1-2
1.3 Problem Definition and Background .....	1-2
1.4 Project Description .....	1-2
1.5 Quality Objectives and Criteria for Measurement Data .....	1-2
1.5.1 Levels of Data Quality .....	1-3
1.5.2 Data Quality Objective Development.....	1-3
1.5.3 Quality of Data.....	1-3
1.5.4 Project Quality/Systematic Planning Process Statements and Data Quality Objectives.....	1-4
1.6 Special Training, Requirements, and Certifications.....	1-5
1.7 Documentation and Records .....	1-5
1.7.1 Field Documentation .....	1-5
1.7.2 Laboratory Documentation .....	1-5
<b>2 Measurement and Data Acquisition.....</b>	<b>2-1</b>
2.1 Sampling Process Design .....	2-1
2.2 Sampling Method Requirements.....	2-1
2.3 Sample Handling and Custody Requirements .....	2-1
2.4 Analytical Methods Requirements .....	2-1
2.4.1 Analytical Methods.....	2-1
2.4.2 Detection, Quantitation, and Reporting Limits .....	2-1
2.4.3 Target Analytes and Reporting Limits.....	2-2
2.5 Quality Control Requirements.....	2-2
2.6 Field and Laboratory Corrective Action .....	2-2
2.7 Instrument/Equipment Testing, Inspection, and Maintenance Requirements .....	2-2
2.7.1 Field Instruments.....	2-2
2.7.2 Analytical Laboratory Instruments .....	2-2
2.8 Instrument Calibration and Frequency.....	2-2
2.9 Inspection and Acceptance Requirements for Supplies and Consumables .....	2-2
2.10 Data Acquisition Requirements.....	2-3
<b>3 Assessment and Oversight.....</b>	<b>3-1</b>
3.1 Assessments and Response Actions .....	3-1
3.1.1 Laboratory Performance and System Audits.....	3-1
3.1.2 Field Team Performance and System Audits.....	3-1
3.2 Reports to Management.....	3-2
<b>4 Data Review, Validation, and Verification Requirements.....</b>	<b>4-1</b>
4.1 Data Review, Validation, and Verification Requirements .....	4-1
4.2 Verification and Validation Methods.....	4-1
4.2.1 Data Verification.....	4-1

4.2.2 Data Validation ..... 4-1

4.3 Usability Assessment ..... 4-1

4.3.1 Data Quality Evaluation ..... 4-2

4.3.2 Reconciliation with Data Quality Objectives ..... 4-2

**5 References.....5-1**

**Attachment 1 Tables**

1 Communication Pathway and Procedures, Distribution List, and Project Personnel Sign-off Sheet

2 Sample Analysis Summary Table

3 Analytical SOP References Table

4 Analytical SOP Requirements Table

5 Analytical Services Table

6 A – Analytical Services Table – Surface Soil – Explosive Residues  
 A-1 – QC Acceptance Limits – Surface Soil – Explosive Residues  
 B - Analytical Services Table – Surface Soil – Metals  
 B-1 - QC Acceptance Limits – Surface Soil – Metals

7 Data Package Deliverables

8 A – Laboratory QC Samples – Explosive Residues  
 B - Laboratory QC Samples – Perchlorate  
 C - Laboratory QC Samples – Metals (excluding mercury)  
 D - Laboratory QC Samples – Mercury

9 A - Field QC Samples – Explosive Residues  
 B - Field QC Samples – Target Analyte List Metals (including Mercury)

10 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

11 Analytical Instrument Calibration Table

12 Field Performance Audit Checklist

13 Project Document and Records

14 Field Sampling SOPs

15 Post-Detonation Sampling Data Sheet

# Acronyms and Abbreviations

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BIP	blow-in-place
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action—Navy
CompQAP	Comprehensive Quality Assurance Plan
DL	detection limit
DoD	Department of Defense
DQE	data quality evaluation
DQO	data quality objective
EDD	electronic data deliverable
ENCO	Environmental Conservation Laboratories
ESI	Expanded Site Investigation
LOD	limit of detection
LOQ	limit of quantitation
MCIEAST-MCB CAMLEJ	Marine Corp Base Camp Lejeune
MEC	munitions and explosives of concern
MPPEH	material potentially presenting an explosive hazard
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NCDENR	North Carolina Department of Environment and Natural Resources
PC	Project Chemist
PM	Project Manager
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
SAP	Sampling and Analysis Plan
SDZ	Surface Danger Zone
SOP	standard operating procedure
USEPA	U.S. Environmental Protection Agency
WP	Work Plan



# QAPP Identifying Information

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**Site Name/Number:** Marine Corps Installations East - Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ)

**Operable Unit:** Not Applicable

**Contractor Name:** CH2M HILL

**Contract Number:** N62470-11-D-8012

**Contract Title:** Naval Facilities Engineering Command (NAVFAC) Comprehensive Long-term Environmental Action—Navy (CLEAN) 8012 Program

**Work Assignment Number (optional):** Contract Task Order WE26

1. This Quality Assurance Project Plan (QAPP) was prepared in accordance with the requirements of:
  - *Uniform Federal Policy for Quality Assurance Project Plans* (USEPA, 2005)
  - *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5 QAMS* (USEPA, 2002)
  - Identify any additional guidance used to prepare SAP: None
2. Identify regulatory program:
  - Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
3. This Quality Assurance Project Plan (QAPP) is a project-specific QAPP.
4. List dates of scoping sessions that were held:
  - Formal scoping sessions were not used. This QAPP is for CERCLA, and the criteria for the Expanded Site Inspection (ESI) had previously been agreed upon by the MCIEAST-MCB CAMLEJ Partnering Team.
5. List dates and titles of any SAP documents written for previous site work that are relevant to the current investigation.
  - *Quality Assurance Project Plan for Preliminary Assessment/Site Inspection Off-Base Surface Danger Zones* (CH2M HILL, 2009)
6. List organizational partners (stakeholders) and connection with lead organization:
  - MCIEAST-MCB CAMLEJ
  - U.S. Environmental Protection Agency (USEPA) Region IV
  - North Carolina Department of the Environment and Natural Resources (NCDENR)
7. Lead organization
  - NAVFAC Mid-Atlantic
8. If any required SAP elements or required information are not applicable to the project or are provided elsewhere, then note the omitted SAP elements and provide an explanation for their exclusion below:
  - Worksheet #9 – Not applicable. Scope was issued by NAVFAC.
  - Worksheet #13 – Not applicable. No secondary data were used in developing this QAPP.
  - The crosswalk table below references the location of all 37 required elements of the Uniform Federal Policy SAP. They are either provided in this QAPP or in accompanying documents.



# Crosswalk to Related Information

Uniform Federal Policy-QAPP Worksheet #	Required Information	Crosswalk to Related Information
<b>1.0 Introduction and Project Organization</b>		
<b>Documentation</b>		
1	Title and Approval Page	Page 1
2	Table of Contents QAPP Identifying Information	Page 5
3	Distribution List	Table 1 of Attachment 1
4	Project Personnel Sign-off Sheet	Table 1 of Attachment 1
<b>Project Organization</b>		
5	Project Organizational Chart	Section 2.4 of Work Plan (WP) Addendum (CH2M HILL, 2012)
6	Communication Pathways	Table 1 of Attachment 1
7	Personnel Responsibilities and Qualifications Table	Table 1 of Attachment 1, and Table 2-1 of WP Addendum (CH2M HILL, 2012)
8	Special Personnel Training Requirements Table	Section 1.6
<b>Project Planning/Problem Definition</b>		
9	Project Planning Session Documentation (including Data Needs tables) Project Scoping Session Participants Sheet	Not applicable
10	Problem Definition, Site History, and Background Site Maps (historical and present)	Section 1 of WP Addendum (CH2M HILL, 2012)
11	Site-Specific Project Quality Objectives	Section 1.5.4
12	Measurement Performance Criteria Table	Tables 9A and 9B of Attachment 1
13	Sources of Secondary Data and Information Secondary Data Criteria and Limitations Table	Not Applicable
14	Summary of Project Tasks	Figure 2-1 of WP Addendum (CH2M HILL, 2012)
15	Reference Limits and Evaluation Table	Tables 6A and 6B of Attachment 1
16	Project Schedule / Timeline Table	Figure 2-1 of WP Addendum (CH2M HILL, 2012)
<b>B. Measurement Data Acquisition</b>		
<b>Sampling Tasks</b>		
17	Sampling Design and Rationale	Section 5 of WP Addendum (CH2M HILL, 2012)
18	Sampling Locations and Methods / Standard Operating Procedure (SOP) Requirements Table Sample Location Map(s)	Figures 3-3 and 3-4 of WP Addendum (CH2M HILL, 2012) Table 2 of Attachment 1
19	Analytical Methods/Standard Operating Procedure (SOP) Requirements Table	Table 4 of Attachment 1
20	Field Quality Control Sample Summary Table	Table 2 of Attachment 1
21	Project Sampling SOP References Table Sampling SOPs	Table 14 of Attachment 1
22	Field Equipment Calibration, Maintenance, Testing, and Inspection Table	Section 2.7.1 Section 7 of Master Project Plans (CH2M HILL, 2008)
<b>Analytical Tasks</b>		
23	Analytical SOPs Analytical SOP References Table	Table 3 of Attachment 1
24	Analytical Instrument Calibration Table	Table 11 of Attachment 1
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	Table 10 of Attachment 1

Uniform Federal Policy-QAPP Worksheet #	Required Information	Crosswalk to Related Information
<b>Sample Collection</b>		
26	Sample Handling System, Documentation Collection, Tracking, Archiving and Disposal Sample Handling Flow Diagram	Section 2.3 of Master QAPP (CH2M HILL, 2008)
27	Sample Custody Requirements, Procedures/SOPs Example Chain-of-Custody Form and Seal	Section 5.3.4 of WP Addendum (CH2M HILL, 2012) Section 6 of Master QAPP (CH2M HILL, 2008) Attachment III
<b>Quality Control Samples</b>		
28	Laboratory Quality Control (QC) Samples Table Screening/Confirmatory Analysis Decision Tree	Tables 8A and 8B of Attachment 1
<b>Data Management Tasks</b>		
29	Project Documents and Records Table	Section 6.7 of Master QAPP (CH2M HILL, 2008)
30	Analytical Services Table Analytical and Data Management SOPs	Table 5 of Attachment 1 Attachment III
<b>C. Assessment Oversight</b>		
31	Planned Project Assessments Table Audit Checklists	Section 3.1 Table 12 of Attachment 1
32	Assessment Findings and Corrective Action Responses	Section 3.1
33	Quality Assurance (QA) Management Reports Table	Section 3.2
<b>D. Data Review</b>		
34	Verification (Step I) Process Table	Section 4.2.1
35	Validation (Steps IIa and IIb) Process Table	Section 4.2.2
36	Validation (Steps IIa and IIb) Summary Table	Section 4.2.2
37	Usability Assessment	Section 4.3

# Introduction and Project Organization

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## 1.1 Introduction

This site-specific QAPP is meant to serve in conjunction with the MCIEAST-MCB CAMLEJ Master Project QAPP (CH2M HILL, 2008) and the MCIEAST-MCB CAMLEJ Military Munitions Response Program Master Project Plans (CH2M HILL, 2010). The information contained in this site-specific QAPP supplements the general information contained in the Master QAPP. This document applies to the ESI intrusive investigation at the Off-Base Surface Danger Zones (SDZs). The ESI will further evaluate the potential presence or absence of munitions and explosives of concern (MEC) and material potentially presenting an explosive hazard (MPPEH) within the Off-Base SDZs. ESI activities are defined in the *Site-Specific Work Plan Addendum for the Off-Base Surface Danger Zones Expanded Site Inspection* (CH2M HILL, 2012).

This QAPP is a component of the ESI WP Addendum (CH2M HILL, 2012) and has been prepared in accordance with the *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations* (USEPA, 2001). This QAPP describes the data quality objectives (DQOs), specific QA and quality control (QC) activities, and laboratory activities necessary to achieve the DQOs of the project. It also provides QA/QC requirements for sampling activities, sample analysis, and other tests that will generate data as part of the activities performed for the intrusive investigation. Subcontractors will be required to review both the Master QAPP and this site-specific QAPP. Subcontractors will be expected to adhere to the procedures specified in these documents. All field activities will be conducted by CH2M HILL.

The requirements of this document apply to contractors and subcontractors. Deviations from these procedures will be documented.

**Section 1** provides an overview of project management and addresses the following topics:

- Project organization and roles and responsibilities
- Project definition and background
- Project description
- Quality objectives and criteria for measurement data
- Special training, requirements, and certifications
- Documentation and records management

## 1.2 Project Organization Roles and Responsibilities

Please refer to *Table 1 of Attachment 1* for the list of key team members for the project, the QA/QC responsibilities associated with each position, and a description of the communication procedures that will be followed throughout the specific project. The organizational structure and responsibilities are designed to provide project control and QA for the proposed project.

### 1.2.1 Project Communication

Effective communication among all project personnel will be established and maintained throughout the course of the project and is essential for effective implementation of field activities.

**Attachment 1, Table 1, Communication Pathway and Procedures, Distribution List, and Project Personnel Sign-off Sheet**, provides the following information:

- Distribution list and Project Personnel Sign-off Sheet: A list of all recipients of this QAPP. This list is not exclusively for CH2M HILL personnel and may include subcontractor information. Returned signed copies of this table shall be kept in the project files as documentation that project personnel have read this QAPP.
- Communication pathways and procedures for each specific project personnel.

## 1.2.2 Laboratory Work Group

The selected laboratory is responsible for analyzing samples collected during field activities, in accordance with the WP Addendum (CH2M HILL, 2012) and the most current version of the *Department of Defense Quality Systems Manual for Environmental Laboratories* (DoD, 2009). The laboratory Project Manager (PM) or Task Manager will serve as a liaison between laboratory and the Project Chemist (PC) and/or the field team.

## 1.3 Problem Definition and Background

This ESI is being performed to further evaluate the potential presence or absence of MEC/MPPEH within the Off-Base SDZs. Refer to Section 1 of the WP Addendum (CH2M HILL, 2012) for site background information.

## 1.4 Project Description

The objectives of the ESI surface soil sampling effort are detailed in Section 5 of the WP Addendum (CH2M HILL, 2012) and include the following:

- Conduct environmental sampling for munitions constituents at locations where controlled detonations are conducted (if required).
- Prepare an ESI report for the site that summarizes the results from the intrusive investigation, sampling events (if required), ecological and human health risk screenings, and recommendations for future actions.
- Prepare an After Action Report, if needed, summarizing the results from the ESI and requesting cancellation of the explosive safety quantity-distance arcs implemented for the Off-Base SDZs munitions response action.

The environmental sampling project objective was used to develop specific DQOs, described in the next subsection. Additional information regarding the overall objectives and general sampling approach is presented in the WP Addendum (CH2M HILL, 2012).

## 1.5 Quality Objectives and Criteria for Measurement Data

QA involves all those planned and systematic actions necessary to provide adequate confidence that field activities are planned and performed according to accepted standards and practices. This process ensures that the resulting data are valid and retrievable, while continuing to meet minimum safety requirements. QC is an integral part of the overall QA function and comprises all actions necessary to control and verify that project activities and resulting data meet established requirements.

To ensure that a minimum level of certainty about the quality of field data is being met, the following elements will be addressed to meet the requirements specified by the client and regulatory agencies:

- Field operations will be conducted in accordance with written procedures.
- To maintain accuracy within necessary limits, measuring and test equipment used in field investigations will be calibrated against traceable standards at specific intervals, using approved SOPs or manufacturer's instructions.
- When measuring and test equipment is found to be out of specification, the previous inspection or test results will be evaluated for validity and acceptability. This evaluation will be documented.
- Before project field work begins, all project personnel will be trained to become familiar with project WPs and associated documents.
- Internal audits may be performed to assess the quality of project activities and to evaluate compliance with established QA requirements.
- QC samples will be used to monitor the quality of field and laboratory techniques and of the data.

### 1.5.1 Levels of Data Quality

This subsection lists the levels of data. The level of data quality is dependent on the objective use of the results supported by the data.

The data use determines the required levels of data quality. The two categories of data quality established by USEPA, **screening** and **definitive**, are defined as follows:

**Screening data** are generated by rapid methods of analysis with less rigorous sample preparation, calibration and/or QC requirements than the requirements for producing definitive data. Screening data may provide analyte identification and quantitation, although the quantitation may be relatively imprecise, unless USEPA reference methods are used. Depending on the DQOs, screening methods may require confirmation samples that generate definitive data. Confirmation samples will be selected to include both detected and nondetected results from the screening technique.

**Definitive data** are generated using rigorous analytical methods such as approved USEPA reference methods. Data are analyte-specific, and both identification and quantitation are confirmed. These methods have standardized QC and documentation requirements. Definitive data are not restricted in their use unless quality problems require data qualification.

Four levels of data reporting may be performed as part of this field effort, with each level having different supporting QA/QC documentation. The four levels correspond to QC Levels I, II, III, and IV (Level IV data packages will be requested for this project):

- Level I  
Field Surveys (Master QAPP, Section 4.1.1)
- Level II  
Screening Activities, Physical Parameters, and Investigation-derived Waste Analyses (Master QAPP, Section 4.1.2)
- Level III  
Laboratory Analysis – Not applicable
- Level IV  
Laboratory Analysis - Level IV data packages provide the most stringent level of documentation, and allow the data reviewer or data validator to recreate the analytical sequence and evaluate raw data such as quantitation reports generated from the instrumentation used in the analyses.

### 1.5.2 Data Quality Objective Development

DQOs are both qualitative and quantitative statements that define the type, quality, and quantity of data necessary to support decision making during project activities. The intended final use of the data determines the DQOs.

The credibility of the data is strengthened by the level of the supporting QA/QC documentation—the greater the importance of the data or the resulting decision, the more QA/QC information is needed to validate the data. This reasoning must be applied to the data collected for any project. The DQO process used for this project follows the *Guidance for the Data Quality Objectives Process (QA/G-4)* (USEPA, 2000).

### 1.5.3 Quality of Data

Analytical performance requirements are expressed in terms of precision, accuracy, representativeness, comparability, and completeness. Section 4.2 of the Master QAPP (CH2M HILL, 2008) provides a detailed discussion of data quality.

## 1.5.4 Project Quality/Systematic Planning Process Statements and Data Quality Objectives

The data will be used by the Department of the Navy (Navy), CH2M HILL, USEPA, and NCDENR. Within each organization the data will be used by staff scientists/engineers and PMs.

- What are the Project Action Limits?
  - Concentrations of contaminants identified in post-detonation surface soil samples will be compared to the NCDENR Hazardous Waste Section Soil Screening Levels (NCDENR, 2012), USEPA Regional Screening Levels for residential/industrial soils (USEPA, 2012), and MCIEAST-MCB CAMLEJ Background Threshold Values for combined surface soil in undeveloped areas (CH2M HILL, 2011).
- What will the data be used for?
  - Data will be used to evaluate potential surface soil impacts associated with demolition of MEC and MPPEH through controlled detonation, and to evaluate the potential risks to human health and ecological receptors.
- What types of data are needed?
  - The WP Addendum (CH2M HILL, 2012) defines the matrices and analytes for the subject site. Data collected will be used to assess human health and ecological risks associated with exposure to media at each controlled detonation site in the event that analyte concentrations are found to exceed Base background levels and one or more of the regulatory project action limits.
  - Field activities will be recorded in a field notebook or site-specific post-detonation field sampling data sheets to document adherence to the approved WP Addendum. The CH2M HILL SOP entitled *Preparing Field Log Books* describes the necessary documentation required for log book completion. An example *Post-Detonation Field Sampling Data Sheet* is provided in **Attachment 1** (Table 15).
- How “good” must the data be to support the environmental decision?
  - The data need to be of sufficient quality for determining the concentration of constituents in media collected such that the project objectives can be achieved.
  - During the intrusive investigation, QA/QC surface soil samples will be collected as a check on sampling and analytical protocol.
- How much data should be collected (number of samples for each analytical group, matrix, and concentration)? Where, when, and how should the data be collected/ generated?
  - Approximately two post-detonation surface soil samples will be collected from the crater of each controlled detonation/blow-in-place (BIP) event, and from the ejecta surrounding each controlled detonation/BIP crater. Surface soil samples within the crater of each BIP event will be collected following the TR-02-1 sampling method, as discussed in Section 5 of the WP Addendum (CH2M HILL, 2012). Surface soil samples collected from the ejecta surrounding each BIP crater will be collected following the incremental soil sampling approach, as discussed in Section 5 of the WP Addendum (CH2M HILL, 2012). In instances where MEC/MPPEH filler appears to have leaked to the adjacent soil at intrusive investigation locations, composite soil samples will be collected using the TR-02-01 sampling approach. The final number of surface soil samples will depend on the number of BIPs and the discovery of evidence of a release of munitions constituents. Up to six samples have been anticipated.
  - All post-detonation surface soil samples will be analyzed for target analyte list metals, explosive residues including pentaerithrityl tetranitrate, nitroglycerin, and perchlorate.
  - Sample quantities, including QA/QC samples, for each chemical analysis are discussed in **Attachment 1**, Table 2, *Sample Analysis Summary Table*.

- The laboratory will generate data in accordance with the SOPs presented in **Attachment 1**, Table 3, *Analytical SOP References Table*.
- Who will collect and generate the data? How will the data be reported?
  - CH2M HILL field personnel will collect the soil samples for analysis.
  - Chemical analyses for metals are to be performed by Environmental Conservation Laboratories (ENCO), and analyses for explosive residues and perchlorate are to be performed by ENCO’s subcontractor, GEL Laboratories. Both laboratories are certified under the Department of Defense (DoD)-Environmental Laboratory Accreditation Program. ENCO is under subcontract to CH2M HILL for this work.
  - All chemical data will be reported in an ESI report for the site.
- How will the data be archived?
  - Data will be archived according to procedures dictated via the CLEAN program/ contract. All analytical data will be uploaded into a centralized database developed and maintained by CH2M HILL and used for Navy projects. At the end of the project, paper copies of archived laboratory data will be returned to the Navy.
- Project quality objectives listed in the form of if/then qualitative and quantitative statements:
  - If constituents are detected at concentrations exceeding screening levels (i.e., background threshold values and one or more of the North Carolina Soil Screening Levels and regional screening levels), then human health and ecological risk assessments will be conducted.
  - If human health and/or ecological risks are identified, then additional sampling may be required to delineate risks in support of soil mitigation as investigation-derived waste disposal. A separate technical memorandum will be submitted, if needed, to outline the approach for sampling and mitigation.

## 1.6 Special Training, Requirements, and Certifications

The PM works with the project delivery manager to assemble a project team that has the necessary experience and technical skills. Part of the work planning process is to identify special training requirements or certifications necessary to execute the project successfully. Special training or certifications required beyond the normal routine requirements have not been identified for this project.

## 1.7 Documentation and Records

This subsection defines which records are critical to the project and what information needs to be included in reports, as well as the data reporting format and the document control procedures. It is imperative for the defensibility of critical decisions made at the site that proper documents and records be maintained for the field and offsite data gathering activities, so that specific events can be recreated or independently evaluated. The PM will be responsible for organizing, storing, and cataloging all project information. See Section 6.7 of the Master QAPP (CH2M HILL, 2008) for specifics.

### 1.7.1 Field Documentation

See Section 6.7.1 of the Master QAPP (CH2M HILL, 2008) for specific information pertaining to field documentation.

### 1.7.2 Laboratory Documentation

Calculations to be used for data reduction are specified in the referenced analytical methods. Whenever possible, analytical data will be transferred directly from the instrument to a computerized data system. Raw data will be stored electronically, and a hard copy file will be maintained. Laboratory data entered will be sufficient to document information used to arrive at reported values. Electronic data storage will be utilized when possible. All electronic data will be maintained in a manner that prevents inadvertent loss, corruption, and inappropriate

alteration. Raw data will be examined to assess compliance with QC guidelines. Deviations from these guidelines will require corrective action. Deviations found to be caused by factors outside the laboratory's control, such as matrix interference, will be noted with an explanation in the report narrative. Calculations will be checked and the report reviewed for errors and oversights.

Upon completion, a report will be reviewed for discrepancies, errors, or omissions. Data will then be submitted to the laboratory Quality Assurance Officer (QAO) for review and approval. The laboratory QAO will review the package, ensure that any necessary corrections are made, and give the package to the laboratory PM for review. A copy of the data package will be filed in the project file. Mailed data packages, along with applicable electronic data deliverables (EDDs), will be sealed in an appropriate shipping container and logged into a document mailing log.

The requested turn-around time for the majority of the definitive data will be 7 days from the time of sample receipt at the laboratory.

# Measurement and Data Acquisition

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This section describes the measurement and data acquisition procedures and the analytical methods to be performed in support of this ESI. It addresses the following aspects of measurement and data acquisition:

- Sampling process design
- Sampling method requirements
- Sample handling and custody requirements
- Analytical method requirements
- QC requirements
- Instrument and equipment testing, inspection, and maintenance requirements
- Instrument calibration and frequency
- Inspection and acceptance requirements for supplies and consumables
- Data acquisition requirements

## 2.1 Sampling Process Design

Refer to Section 5 of the WP Addendum (CH2M HILL, 2012) for details for sampling design and rationale.

## 2.2 Sampling Method Requirements

Refer to Section 5 of the WP Addendum (CH2M HILL, 2012) and Section 5.3 of the Master Project Plan (CH2M HILL, 2010) for details regarding sampling methods.

## 2.3 Sample Handling and Custody Requirements

See Section 6.0 of the Master Project Plans QAPP (CH2M HILL, 2008) and Section 5 of the WP Addendum (CH2M HILL, 2012).

## 2.4 Analytical Methods Requirements

The list of methods and the corresponding target analytes have been designed to evaluate the potential for contamination at the site. Samples will be analyzed using USEPA-approved methods, and may include methods from

*EPA SW-846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.*

Refer to **Attachment 1**, Table 3, *Analytical SOP References Table*, for the analytical services to be performed during intrusive investigation sampling activities.

Refer to **Attachment 1**, Table 4, *Analytical SOP Requirements Table*, for analytical methods to be used for the analysis of the target compounds, the containers needed for sampling including preservation requirements, and maximum holding times.

### 2.4.1 Analytical Methods

Refer to **Attachment 1**, Table 4, *Analytical SOP Requirements Table*, for the list of analytical methods to be used.

Refer to **Attachment 1**, Table 3, *Analytical SOP References Tables*, for the list of analytical SOPs to be followed during analysis.

### 2.4.2 Detection, Quantitation, and Reporting Limits

#### 2.4.2.1. Detection Limits

The detection limit (DL) is the minimum amount of an analyte that can be routinely identified using a specific method and instrument, and measured and reported with 99 percent confidence that the analyte concentration is greater than zero.

#### 2.4.2.2. Limit of Detection

The limit of detection (LOD) is the smallest amount or concentration of a substance that must be present in a sample in order to be detected at a 99 percent confidence level. All non-detects are to be reported at the LOD. The LOD is determined using the laboratory-established DL.

#### 2.4.2.3. Limit of Quantitation

Quantitative results can only be achieved at or above the limit of quantitation (LOQ). The LOQ is defined as the lowest concentration of a substance that produces a quantitative result within specified limits of precision and bias. For results falling between the DL and the LOQ, a “J” flag will be applied to the results to indicate the variability associated with the result.

### 2.4.3 Target Analytes and Reporting Limits

Refer to **Attachment 1**, Tables 6A and 6B, Reference Limits and Evaluation Tables.

## 2.5 Quality Control Requirements

See Section 10.0 of the Master QAPP (CH2M HILL, 2008) for a discussion of QC requirements.

Refer to **Attachment 1**, Tables 8A through 8D, *Laboratory QC Samples*.

Refer to **Attachment 1**, Tables 9A and 9B, *Field QC Samples*.

## 2.6 Field and Laboratory Corrective Action

See Section 14 of the Master QAPP (CH2M HILL, 2008).

## 2.7 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

### 2.7.1 Field Instruments

All equipment used for field measurements will be maintained in accordance with the manufacturer’s instructions. Routine maintenance and all equipment repairs will be documented in the site logbook. Whenever a piece of equipment fails to operate properly, the instrument either will be repaired in house, if possible, or be sent out for repair, and another instrument equivalent to the original will be substituted, if possible. Other than solutions/standards for calibrating the equipment, the field team keeps only a limited amount of supplies on hand. Parts are ordered on an as-needed basis.

### 2.7.2 Analytical Laboratory Instruments

Preventive maintenance for laboratory instruments is discussed in greater detail in **Attachment 1**, Table 10, *Analytical Instrument and Equipment Maintenance, Testing, and Inspection*.

## 2.8 Instrument Calibration and Frequency

See Section 7 of Master QAPP (CH2M HILL, 2008).

Refer to **Attachment 1**, Table 11, *Analytical Instrument Calibration*.

## 2.9 Inspection and Acceptance Requirements for Supplies and Consumables

All services, including subcontracted services and supplies received from vendors, must meet the project scope, specified levels of quality, and the submittal schedule. Field and laboratory personnel must evaluate the vendor’s ability to provide the services and specify acceptance requirements for supplies and consumables. For example, laboratories rely on suppliers for solvents, gases, consumables, and analytical equipment, including instrument

maintenance. The laboratory should have and maintain adequate contracts with its vendors to receive uninterrupted supplies, parts, and services.

## 2.10 Data Acquisition Requirements

In addition to the electronic data, the laboratory provides hard-copy deliverables of the analytical results. The hard-copy data packages are filed onsite until the project is completed. At that time, the data packages are sent to the PM for inclusion into the project files. Alternatively, the hard-copy data packages can be stored at an offsite warehouse for a period of 10 years after the project closeout.



# Assessment and Oversight

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This section describes the assessment and oversight activities that will be followed to determine whether the QC measures identified in the WP Addendum (CH2M HILL, 2012) and this QAPP are being implemented and documented as required.

Audits and reviews are used to implement this process. For example, during a review, the auditor may check that surface soil has been correctly sampled or that the field QC samples were collected at the appropriate frequency. During an audit or review, the auditor may check for:

- Adherence to the WP Addendum (CH2M HILL, 2012)
- Documentation of the process or system
- Proper identification, resolution, and documentation of nonconformance with the process or system
- Correction of identified deficiencies

## 3.1 Assessments and Response Actions

The need for an audit can be determined independently by the PM. Assessment activities may include surveillance, inspection, peer review, management system review, readiness review, technical systems audit, performance evaluation, and data quality assessment. The PM will be responsible for initiating audits, selecting the audit team, and overseeing audit implementation. For the fieldwork, an audit will be conducted during the sampling activities.

The laboratory will be audited in accordance with the laboratory subcontract. The PC or a designee will perform laboratory audits in compliance with the subcontract. A follow-up meeting will be held to address any deficiencies or issues identified during the audit.

Field audits will be conducted by a review team member designated by the PM. One field audit, if requested, will be performed during the first week of sampling.

### 3.1.1 Laboratory Performance and System Audits

Laboratory systems will be audited in accordance with the project-specific requirements. Contracted laboratories may be required to submit a laboratory Comprehensive Quality Assurance Plan (CompQAP). The CompQAP must reference relevant SOPs and the laboratory's internal procurement policies and corrective action program.

The laboratory audit will address at least the following issues:

- Is the laboratory operation being performed as required by the subcontract?
- Are internal laboratory operations being conducted in accordance with the laboratory CompQAP?
- Are the laboratory analyses being performed in accordance with method requirements?
- Any nonconformance noted during an audit will result in a corrective action.

### 3.1.2 Field Team Performance and System Audits

The PC or other member of the review team, as designated by the PM, will conduct an audit of the field activities in accordance with the program requirements. The audit will address at least the following issues:

- Are sampling operations being performed as stated in the WP Addendum (CH2M HILL, 2012)?
- Are the sample labels being filled out completely and accurately?
- Are the chain-of-custody records complete and accurate?
- Are the field notebooks being filled out completely and accurately?

- Are the sampling activities being conducted in accordance with the WP Addendum (CH2M HILL, 2012) and approved SOPs?
- Are the documents generated in association with the field effort being stored as described in the WP Addendum (CH2M HILL, 2012)?

The generation and documentation of field data also will be audited. Audits will focus on verifying that proper procedures are followed so that subsequent sample data will be valid. Any nonconformance noted during an audit will result in a corrective action.

The results of the assessment and oversight activities will be reported to the PM, who has ultimate responsibility for ensuring that the corrective action response is completed, verified, and documented.

Refer to **Attachment 1**, Table 12, *Field Performance Audit Checklist*.

## 3.2 Reports to Management

Reports to the PM include project status reports, the results of evaluation and system audits, data quality assessments, and significant QA problems and recommended solutions. The status reports, submitted in accordance with the requirements of the WP Addendum (CH2M HILL, 2012), will discuss at least current activities, problems encountered and their resolution, and planned work.

QA reports will be submitted in accordance with the WP Addendum (CH2M HILL, 2012). QA reports document implementation of the QAPP and the results of the site-specific QA/QC audits. A final QA report must be submitted as part of each project's final report. The topics to be covered are outlined in the WP Addendum (CH2M HILL, 2012), but each will include at least the following information:

- Identification of nonconformances that required corrective action and resolution of the nonconformance
- Data quality assessment in terms of precision and accuracy and how this affects the usability of the analytical results
- Limitations of the qualified results and a discussion of rejected results
- Discussion of the field and laboratory QA/QC sample results
- The results of external laboratory audits

The Field Team Leader will provide feedback to the PM regarding all field activities, changes to field procedures, problems encountered, and corrective actions taken.

## SECTION 4

# Data Review, Validation, and Verification Requirements

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This section discusses the QA activities that occur after the data collection has been completed. Implementation of these elements, which include data review, validation, and reconciliation to DQOs, will determine the extent to which the data conform to the specified criteria and satisfy the project objectives.

## 4.1 Data Review, Validation, and Verification Requirements

See Section 9 of the Master QAPP (CH2M HILL, 2008)<sup>1</sup>.

The data are evaluated for precision, accuracy, and completeness against the analytical protocol requirements. Non-conformances or deficiencies that could affect the usability of data are identified as noted.

All analytical data will be supported by a data package. The data package will contain the supporting QC data for the associated field samples. Before the laboratory will release each data package, the laboratory QAO (or the analytical section supervisor) must carefully review the sample and laboratory performance QC data to verify sample identity, the completeness and accuracy of the sample and QC data, and compliance with method specifications.

## 4.2 Verification and Validation Methods

### 4.2.1 Data Verification

Before the analytical results are released by the laboratory, both the sample and QC data will be reviewed carefully to verify sample identity, instrument calibration, DLs, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the QC data will be reduced and spike recoveries will be included in control charts, and the resulting data will be reviewed to ascertain whether they are within the laboratory-defined limits for accuracy and precision. Any non-conforming data will be discussed in the data package cover letter and case narrative. The laboratory will retain all of the analytical and QC documentation associated with each data package.

As discussed previously, the data are also verified to assess whether the EDDs and the hard-copy data deliverables are consistent with one another to ensure an accurate database.

### 4.2.2 Data Validation

The PC will ensure that the laboratory analyzed the samples using the correct methods and that all analytes from each analysis group are reported (as shown in tables 6A, 6A-1, 6B, and 6B-1). The quantitation limits used by the laboratory for the project will be compared to the quantitation limits presented in these tables. If quantitation limits were not met, the reason will be identified and documented. Field QC sample results will be documented, the PC will establish that all required QAPP QC samples were run and met limits.

All non-analytical field data will be reviewed by the Field Team Leader. Non-analytical field data will be compared against QAPP requirements for completeness and accuracy based on the field calibration records.

## 4.3 Usability Assessment

**Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:**

CH2M HILL's PC is responsible for ensuring that the analytical data meet the method detection limits, reporting limits, and laboratory QC limits listed in this QAPP, the laboratory statement of work, and the various methods

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<sup>1</sup> Note that what is considered Level 3 QC in the Master QAPP is required for this project and that data will be reported with a "Level IV" deliverable.

used. During this assessment, non-conformances will be documented, the data will be qualified for use in decision making, and for 10 percent of the results the entire analytical process will be reconstructed and recalculated from the raw data.

Non-detected site contaminants will be evaluated to ensure that project required quantitation limits (**Attachment 1**, Tables 6A and 6B, *Analytical Services Tables*) were achieved. If project quantitation limits were achieved and the verification and validation steps yielded acceptable data, then the data are considered usable. For statistical comparisons, non-detect values will be represented by a concentration equal to one-half the sample reporting limit. For duplicate sample results, the most conservative value will be used for project decisions. Analytical data will be checked to ensure the values and any qualifiers are appropriately transferred to the electronic database. These checks include comparison of hardcopy data and qualifiers to the EDD. Once the data have been uploaded into the electronic database, another check will be performed to ensure all results were loaded accurately. Field and laboratory precision will be compared as the relative percent difference between the two results. Deviations from the QAPP will be reviewed to assess whether corrective action is warranted and to assess impacts to achievement of project objectives.

**Describe the evaluative procedures used to assess overall measurement error associated with the project:**

To assess whether a sufficient quantity of acceptable data are available for decision making, the data will be reconciled with measurement performance criteria following a review of data quality indicator. If significant biases are detected with laboratory QA/QC samples, they will be evaluated to assess impact on decision making. Low biases will be described in greater detail because they represent a possible inability to detect compounds that may be present at the site. If significant deviations are noted between lab and field precision, the cause will be further evaluated to assess impact on decision making.

**Identify the personnel responsible for performing the usability assessment:**

- PC – Bianca Kleist/CH2M HILL
- PM – Keith LaTorre/CH2M HILL

**Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:**

All the results will be assembled and statistically reported for an overall quality assessment provided in the final ESI report. The discussion will cover the data's completeness and representativeness.

Data tables will be produced to reflect detected and non-detected site contaminants and geochemical parameters. Data qualifiers will be reflected in the tables and discussed in the data quality evaluation (DQE). Figures will be produced representing concentrations of contamination.

### 4.3.1 Data Quality Evaluation

The PC or designee will perform the DQE. The DQE process is used to assess the effect of the overall analytical process on the usability of the data. The two major categories of data evaluation are laboratory performance and matrix interferences. Evaluation of laboratory performance is a check for compliance with the method requirements. It is a straight-forward examination—either the laboratory did, or did not, analyze the samples within the limits of the analytical method. Evaluation of the matrix interferences is more subtle and involves analysis of several results, including surrogate spike recoveries, matrix spike recoveries, and duplicate sample results.

The entire data set will be evaluated for overall trends in data quality and usability. Information summarized as part of the DQE may include chemical compound frequencies of detection, dilution factors that might affect data usability, and patterns of target compound distribution. The data set also will be evaluated to identify potential data limitations or uncertainties in the laboratory.

### 4.3.2 Reconciliation with Data Quality Objectives

The final activity of the data evaluation process is to assess whether the data meet the planned DQOs for the project. The final results, as adjusted for the findings of any data evaluation, will be checked against the DQOs,

and an assessment will be made as to whether the data are of sufficient quality to support the DQOs. The decision as to data sufficiency may be affected by the overall precision, accuracy, and completeness of the data. The main project objective should be met, assuming the 90 percent completeness goal is obtained after all of the data have undergone sufficient validation. If the data, after evaluation, are sufficient to achieve project objectives, the data quality manager and PM will release the data and work may proceed.



## SECTION 5

# References

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- CH2M HILL. 2008. *Master Project Plans, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina*.
- CH2M HILL. 2009. *Quality Assurance Project Plan for Preliminary Assessment/Site Inspection Off-Base Surface Danger Zones*.
- CH2M HILL. 2010. *Final Munitions Response Program Master Project Plan*. September.
- CH2M HILL. 2011. *Final Expanded Soil Background Study Report. Marine Corps Base Camp Lejeune Jacksonville, North Carolina*. August.
- CH2M HILL. 2012. *Site-Specific Work Plan Addendum for the Off-Base Surface Danger Zones Expanded Site Inspection*. August. Draft.
- Department of Defense (DoD). 2009. *Department of Defense Quality Systems Manual for Environmental Laboratories; Version 4.2*. April.
- North Carolina Department of Environment and Natural Resources (NCDENR). 2012. *Federal Remediation Branch Target Screening Values*. February. <http://portal.ncdenr.org/web/wm/sf>.
- Pennington, Judith C., Hayes, C. A., Yost, S., Crutcher, T. A., Berry, T. E., Clarke, J. U. and Bishop, M. J. 2008. 'Explosive Residues from Blow-in-Place Detonations of Artillery Munitions', *Soil and Sediment Contamination: An International Journal*,17:2,163 — 180
- Thiboutot, S., G. Ampleman, and A.D. Hewitt. 2002. *Technical Report ERDC/CRREL TR-02-1, Guide for Characterization of Sites Contaminated with Energetic Materials*. U.S. Army Corps of Engineers, Engineer Research and Development Center.
- United States Environmental Protection Agency (USEPA). 1983. *Methods for Chemical Analysis of Water and Wastes*.
- U.S. Environmental Protection Agency (USEPA). 1998. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. SW-846. Third Edition and its updates.
- USEPA. 2000. *Guidance for the Data Quality Objectives Process (QA/G-4)*.
- USEPA. 2001. *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations*.
- USEPA. 2002. *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5 QAMS*.
- USEPA. 2004. *CLP National Functional Guidelines for Inorganic Data Review*. October.
- USEPA. 2005. *Uniform Federal Policy for Quality Assurance Plans*.
- USEPA Regions 3, 6, and 9. 2012. *Regional Screening Levels for Chemical Contaminants at Superfund Sites*. [http://www.epa.gov/reg3hwmd/risk/human/rb-concentration\\_table/index.htm](http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm). Accessed July 11, 2012.



**Attachment 1**  
**Tables**

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**TABLE 1**

Communication Pathway and Procedures, Distribution List, and Project Personnel Sign-off Sheet

Name of SAP Recipients	Title/Role	Organization	Telephone Number (Optional)	E-mail Address or Mailing Address	Communication Drivers	Procedure, Pathway, etc	SAP Section Reviewed	Date SAP Read
Dave Cleland	Navy Technical Representative	Naval Facilities Engineering Command Mid-Atlantic	(757) 322-4851	david.t.cleland@navy.mil	Communication with Marine Corps Installations East - Marine Corps Base Camp Lejeune (MCIEAST-MCB CAMLEJ)	Primary point of contact (POC) for Camp Lejeune; can delegate communication to other internal or external POCs. Remedial Project Manager (RPM) will notify U.S. Environmental Protection Agency (USEPA) and North Carolina Department of Environment and Natural Resources (NCDENR) via email or telephone call within 24 hours for field changes effecting the scope or implementation of the design. Navy will have 30 days for Work Plan review. All sampling data will be presented and discussed during partnering meetings.		
Charity Rychak	MCIEAST-MCB CamLej- Environmental Management Division	MCIEAST-MCB CAMLEJ	(910) 451-9385	charity.rychak@usmc.mil	Communication with MCIEAST-MCB CAMLEJ	POC for MCIEAST-MCB CAMLEJ		
Randy McElveen	RPM	NCDENR	(919) 508-8467	randy.mcelveen@ncmail.net	Communication with NCDENR	Primary POC for NCDENR; can delegate communication to other internal or external POCs. Upon notification of field changes, NCDENR will have 24 hours to approve or comment on the field changes.		
Gena Townsend	USEPA Region 4 RPM	USEPA	(404) 562-8538	townsend.gena@epa.gov	Communication with EPA Region 4	Primary POC for USEPA; can delegate communication to other internal or external POCs. Upon notification of field changes, USEPA will have 24 hours to approve or comment on the field changes. All data results will be presented and discussed during partnering meetings.		
Tom Roth	Senior Technical Consultant (STC)	CH2M HILL	(404) 474-7640	tom.roth@ch2m.com	Technical communications for project implementation, and data interpretation	Contact STC regarding questions/issues encountered in the field, input on data interpretation, as needed. STCs will have 24 hours to respond to technical field questions as necessary. Additionally, STCs will review the data as necessary prior to partnering team discussion and reporting review.		
Tim Garretson	Senior Munitions Response (MR) Technical Consultant	CH2M HILL	(904) 374-5633	timothy.garretson@ch2m.com	Technical communications for project implementation, and data interpretation pertaining to MR	Contact STC regarding questions/issues encountered in the field, input on data interpretation, as needed pertaining to MR. STCs will have 24 hours to respond to technical field questions as necessary. Additionally, STCs will review of the data as necessary prior to partnering team discussion and reporting review.		
Keith LaTorre	Project Manager (PM)	CH2M HILL	(865) 769-3204	keith.latorre@ch2m.com	Communications regarding project management and implementation/ Field corrective actions (CAs)	All information and materials about the project will be forwarded to the Navy, Project Manager , and Senior Consultants as soon as possible, as necessary. POC for field sampling team. Field and analytical issues requiring CA will be determined by the Field Team Leader (FTL) and/or PM on an as needed basis; the PM will ensure Quality Assurance Project Plan (QAPP) requirements are met by field staff for duration of project.		

**TABLE 1**

Communication Pathway and Procedures, Distribution List, and Project Personnel Sign-off Sheet

Name of SAP Recipients	Title/Role	Organization	Telephone Number (Optional)	E-mail Address or Mailing Address	Communication Drivers	Procedure, Pathway, etc	SAP Section Reviewed	Date SAP Read
Greg Schaefer	Task Manager	CH2M HILL	(865) 560-2984	greg.schaefer@ch2m.com	Communications regarding project execution and implementation	Responsible for project execution and report production; will work daily with PM to manage field schedule		
Keith Dobson	Site Manager	CH2M HILL	(865) 560-2983	keith.dobson@ch2m.com	QAPP Field Changes/ Field Progress Reports	Will provide documentation of field activities and work plan deviations (made only with the approval of AM and/or Quality Assurance Officer) in field logbooks; will provide daily progress reports to PM.		
Carl Woods	CH2M HILL Health and Safety (H&S) Manager	CH2M HILL	(513) 319-5771	carl.woods@ch2m.com	H&S	Responsible for generation of the Health and Safety Plan (HSP) and approval of the activity hazard analyses before the start of field work. The PM will contact the H&S Manager as needed regarding questions/issues encountered in the field.		
George DeMetropolis	CH2M HILL Safety and Quality Control (QC) Officer	CH2M HILL	(619) 687-0120	george.demetropolis@ch2m.com	H&S	Will oversee the FTL's implementation of the HSP and QC Plan to ensure that they meet the specific needs of the project and that appropriate H&S and QC requirements are defined and properly executed.		
TBD	Site Safety Coordinator	CH2M HILL	TBD	TBD	H&S	Responsible for the adherence of team members to the site safety requirements described in the HSP. Will report H&S incidents and near losses to PM as soon as possible.		
TBD	FTL	CH2M HILL	TBD	TBD	Work Plan changes in field/ QAPP Field Changes/ Field Progress Reports/ Field CAs	Documentation of deviations from the Work Plan will be made in the field logbook and the PM will be notified immediately. Deviations will be made only with approval from the PM. Documentation of field activities and work plan deviations (made with the approval of AM and/or QAO) in field logbooks; provide daily progress reports to PM. Field and analytical issues requiring CA will be determined by the FTL and/or PM on an as-needed basis; the PM will ensure QAPP requirements are met by field staff for duration of project.		
Troy Horn	Project Data Manager	CH2M HILL	(757) 671-6288	troy.horn@ch2m.com	Data tracking from field collection to database upload	On a daily basis, tracks data from sample collection through database upload.		
Mary Beth Artese	Geographic Information System	Critigen	(757) 671-6228	marybeth.artese@critigen.com	Presentation of data	Provides support as needed for field activities and evaluation of data by generating figures using geographic information system.		
Bianca Kleist	Project Chemist (PC)	CH2M HILL	(704) 543-3274	bianca.kleist@ch2m.com	Field and analytical CAs/ Release of Analytical Data	Any CAs for field and analytical issues will be determined by the FTL and/or the PC and reported to the PM within 4 hours/ No analytical data can be released until validation of the data is completed and has been approved by the PC. The PC will review analytical results within 7 days of receipt for release to the project team.		
Jennifer Obrin	Laboratory PM	Katahdin Analytical Services	207.874.2400	jobrin@katahdinlab.com	Reporting Lab Data Quality Issues	All quality assurance/quality control (QA/QC) issues with project field samples will be reported within 2 days to the PC by the laboratory.		
Laura Maschhoff	Data Validator	DataQual Environmental Services	314.330.1327	dataqual@charter.net	Reporting Data Validation Issues	All data validation issues (missing lab data worksheets / calculations, etc) will be relayed to PC in the event of inadequate lab response within 2 days of initial inquiry		

**TABLE 2**

Sample Analysis Summary Table

<b>Post-Detonation Soil Samples</b>				
<b>Station ID</b>	<b>Sample ID</b>	<b>Explosive Residues (including Nitroglycerin and PETN) (SW846 8330B)</b>	<b>Perchlorate (SW846 6850)</b>	<b>TAL Metals (SW846 6010C/7471B)</b>
SDZ-SS01	SDZ-SS01-IC-YYQ	X	X	X
SDZ-SS01	SDZ-SS01-OC-YYQ	X	X	X
SDZ-SS02	SDZ-SS02-IC-YYQ	X	X	X
SDZ-SS02	SDZ-SS02-OC-YYQ	X	X	X
SDZ-SS03	SDZ-SS63-IC-YYQ	X	X	X
SDZ-SS03	SDZ-SS03-OC-YYQ	X	X	X
SDZ-SS04	SDZ-SS04-IC-YYQ	X	X	X
SDZ-SS04	SDZ-SS04-OC-YYQ	X	X	X
SDZ-SS05	SDZ-SS05-IC-YYQ	X	X	X
SDZ-SS05	SDZ-SS05-OC-YYQ	X	X	X
<b>QA/QC Samples</b>				
SDZ-SS01	SDZ-SS01D-IC-YYQ	X	X	X
SDZ-SS01	SDZ-SS01EB-IC-YYQ	X	X	X
SDZ-SS01	SDZ-SS01MS-IC-YYQ	X	X	X
SDZ-SS01	SDZ-SS01SD-IC-YYQ	X	X	X

YY – Year

Q – Quarter (A, B, C, D)

QA/QC sample IDs include additional identifiers; D = Duplicate; EB = Equipment Blank; MS = Matrix Spike; SD = Matrix Spike Duplicate.

PETN = pentaerithrityl tetranitrate

TAL = target analyte list

**TABLE 3**

Analytical SOP References Table

Lab SOP Number	Title, Revision Date and/or Number	Last Reviewed	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Variance to QSM	Modified for Project Work (Y/N)
CA-402	Determination of Nitroaromatics, Nitramines, and Nitrate Esters by High Performance Liquid Chromatography (HPLC) Method 8330B, Mod., 01/12, Revision 6.	01/12	Definitive	Surface Soil/ Explosives	HPLC	Katahdin Analytical Services	None	N
CA-548	Preparation of Aqueous and Solid Samples for Explosive Analysis by Method 8330, 01/12, Revision 0.	01/12	Definitive	Surface Soil/ Extractions	Mechanical Shaker	Katahdin Analytical Services	None	N
CA-605	Acid Digestion Of Solid Samples By USEPA Method 3050 For Metals Analysis By ICP-AES And GFAA, 09/10, Revision 5.	02/12	Definitive	Surface Soil/ METAL	Block Digester	Katahdin Analytical Services	None	N
CA-608	Trace Metals Analysis By ICP-AES Using EPA Method 6010, 4/12, Revision 13.	09/11	Definitive	Surface Soil/ METAL	Inductively Coupled Plasma	Katahdin Analytical Services	None	N
CA-611	Digestion And Analysis Of Solid Samples For Mercury By USEPA Method 7471, 4/12, Revision 9.	4/12	Definitive	Surface Soil/ METAL	Mercury Analyzer	Katahdin Analytical Services	None	N
SD-902	Sample Receipt and Internal Control, 09/10, Revision 9		NA	NA	NA	Katahdin Analytical Services	NA	N
SD-903	Sample Disposal, 05/09, Revision 4.	12/11	NA	NA	NA	Katahdin Analytical Services	NA	N
HPLC06	Standard Operating Procedure Perchlorate Method 6850/331.0 Issue/Implementation Date: 15 April 2011	4/11	Definitive	Surface Soil/ Perchlorate	LC/MS	Microbac	None	N
LOGIN01	Standard Operating Procedure Sample Receiving and Login Issue/Implementation Date: 15 September 2011	12/11	NA	NA	NA	Microbac	NA	N

**TABLE 4**

Analytical SOP Requirements Table

Matrix	Analytical Group	Analytical and Preparation Method / SOP Reference	Containers	Sample Volume	Preservation Requirements	Maximum Holding Time
Surface Soil	Explosive Residues (including Nitroglycerin and PETN)	SW846 8330B / CA-402	One 4oz CWM soil jar	10g	(4±2) °C	14 days
	Perchlorate	SW846 6850 / HPLC06	One 250 poly bottle	40 mL	(4±2) °C	28 days
	Metals	SW846 6010C / CA-608	One 4oz CWM soil jar	2g	(4±2) °C	6 months
		SW846 7471B / CA-611		0.5g		28 days

SOP = standard operating procedure

CWM = clear wide mouth

g = grams

mL = milliliters

NA = not applicable

QSM = Department of Defense (DoD). 2009. *Department of Defense Quality Systems Manual for Environmental Laboratories; Version 4.1*. April.

**TABLE 5**

Analytical Services Table

<b>Matrix</b>	<b>Analytical Group</b>	<b>Analytical Method</b>	<b>Data Package Turnaround Time</b>	<b>Laboratory / Organization</b>	<b>Backup Laboratory / Organization</b>
Surface Soil	Explosive Residues (including Nitroglycerin and PETN)	SW846 8330B	28 calendar days	Katahdin Analytical Services Technology Way Scarborough, ME 04074 Contact: Jennifer Obrin (207) 874-2400	TBD
	Metals	SW846 6010C/7471B			
	Perchlorate	SW846 6850			

TBD = to be determined

**TABLE 6A**  
Analytical Services Table

**Matrix:** Surface Soil

**Analytical Group:** Explosive Residues

Analyte	CAS Number	MCIEAST-MCB CAMLEJ BTV (mg/kg) <sup>1</sup>	North Carolina Soil Screening Level (NCSSL) (Feb. 2012) (mg/kg) <sup>1</sup>	Regional Screening Levels (RSLs) Industrial for soil (May 2012) (mg/kg) <sup>1</sup>	RSLs Residential for soil (May 2012) (mg/kg) <sup>1</sup>	PLOQ Goal <sup>2</sup> (mg/kg)	Project Action Limit Reference	Laboratory-specific		
								Limit of Quantitation (LOQ)	Limit of Detection (LOD)	Detection Limit (DL)
								(mg/kg)	(mg/kg)	(mg/kg)
1,3,5-Trinitrobenzene	99-35-4	NC	NC	2700	220	110	RSL Residential for Soil	0.1	0.05	0.0067
1,3-Dinitrobenzene	99-65-0	NC	NC	6.2	0.61	0.305	RSL Residential for Soil	0.1	0.05	0.0062
2,4,6-Trinitrotoluene	118-96-7	NC	NC	42	3.6	1.8	RSL Residential for Soil	0.1	0.05	0.0067
2,4-Dinitrotoluene	121-14-2	NC	0.0016	5.5	1.6	0.0008	NCSSL	0.1	0.05	0.015
2,6-Dinitrotoluene	606-20-2	NC	NC	62	6.1	3.05	RSL Residential for Soil	0.1	0.05	0.027
2-Amino-4,6-dinitrotoluene	35572-78-2	NC	NC	200	15	7.5	RSL Residential for Soil	0.1	0.05	0.021
2-Nitrotoluene	88-72-2	NC	NC	13	2.9	1.45	RSL Residential for Soil	0.1	0.05	0.012
3-Nitrotoluene	99-08-1	NC	NC	6.2	0.61	0.305	RSL Residential for Soil	0.1	0.05	0.0079
4-Amino-2,6-dinitrotoluene	19406-51-0	NC	NC	190	15	7.5	RSL Residential for Soil	0.1	0.05	0.017
4-Nitrotoluene	99-99-0	NC	NC	110	24	12	RSL Residential for Soil	0.1	0.05	0.027
HMX	2691-41-0	NC	NC	4900	380	190	RSL Residential for Soil	0.1	0.05	0.0086
Nitrobenzene	98-95-3	NC	NC	24	4.8	2.4	RSL Residential for Soil	0.1	0.05	0.022
Nitroglycerin	55-63-0	NC	NC	6.2	0.61	0.305	RSL Residential for Soil	0.8	0.4	0.124
Perchlorate	14797-73-0	NC	NC	72	5.5	2.75	RSL Residential for Soil	0.004	0.002	0.001
PETN	78-11-5	NC	NC	120	12	6	RSL Residential for Soil	0.8	0.4	0.108
RDX	121-82-4	NC	NC	24	5.6	2.8	RSL Residential for Soil	0.1	0.05	0.0068
Tetryl	479-45-8	NC	NC	250	24	12	RSL Residential for Soil	0.1	0.05	0.0054

<sup>1</sup> Project Action Limits (PALs) were developed to be protective of human health and the environment.

<sup>2</sup> Project Quantitation Limit (PLOQ) Goals are half of the minimum PAL.

Background Threshold Value (BTV) concentration for combined surface soils in undeveloped areas as applicable to MCIEAST-MCB CAMLEJ (CH2M HILL, 2011).

Residential Soil RSL values were adjusted from the USEPA RSLs Table (May 2012).

NCSSLs are from NCDENR (February 2012).

Shading represents cases where the PAL goal is lower than the laboratory limit of detection (LOD).

Shading represents instances where the PAL goal is lower than the LOD. Non-detects will not be treated as exceedances though they will be reported at a value greater than the PLOQ goal.

mg/kg = milligrams per kilogram

**TABLE 6A-1**

QC Acceptance Limits

**Matrix:** Surface Soil**Analytical Group:** Explosive Residues

Analyte	CAS Number	LCS, MS, and MSD %R Limits		
		LCL	UCL	%RPD
1,3,5-Trinitrobenzene	99-35-4	75	125	20
1,3-Dinitrobenzene	99-65-0	80	125	20
2,4,6-Trinitrotoluene	118-96-7	55	140	20
2,4-Dinitrotoluene	121-14-2	80	125	20
2,6-Dinitrotoluene	606-20-2	80	120	20
2-Amino-4,6-dinitrotoluene	35572-78-2	80	125	20
2-Nitrotoluene	88-72-2	80	125	20
3-Nitrotoluene	99-08-1	75	120	20
4-Amino-2,6-dinitrotoluene	19406-51-0	80	125	20
4-Nitrotoluene	99-99-0	75	125	20
HMX	2691-41-0	75	125	20
Nitrobenzene	98-95-3	75	125	20
Nitroglycerin	55-63-0	<b>30</b>	<b>150</b>	<b>20</b>
Perchlorate	14797-73-0	---	---	20
PETN	78-11-5	<b>30</b>	<b>150</b>	<b>20</b>
RDX	121-82-4	70	135	20
Tetryl	479-45-8	10	150	20

LCS – Laboratory Control Sample

MS – Matrix Spike

MSD – Matrix Spike Duplicate

LCL – Lower Control Limit

UCL – Upper Control Limit

% RPD = relative percent difference

Values in bold are laboratory limits.

**TABLE 6B**

Analytical Services Table

**Matrix:** Surface Soil**Analytical Group:** Metals

Analyte	CAS Number	MCIEAST- MCB CAMLEJ BTV, (mg/kg) <sup>1</sup>	NCSSL (Feb. 2012) (mg/kg) <sup>1</sup>	RSLs Industrial for soil (May 2012) (mg/kg) <sup>1</sup>	RSLs Residential for soil (May 2012) (mg/kg) <sup>1</sup>	Project Quantitation Limit Goal <sup>2</sup> (mg/kg)	Project Action Limit Reference	Laboratory-specific		
								LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Aluminum	7429-90-5	12800	0.9	99000	7700	0.45	NCSSL	30	10	0.71
Antimony	7440-36-0	1.87	5.8	41	3.1	0.935	BTV	0.8	0.5	0.07
Arsenic	7440-38-2	1.17	580	1.6	0.39	0.195	RSL Residential for Soil	0.8	0.5	0.068
Barium	7440-39-3	36.7	63	19000	1500	18.35	BTV	0.5	0.3	0.026
Beryllium	7440-41-7	0.195	3	200	16	0.0975	BTV	0.5	0.05	0.0068
Cadmium	7440-43-9	0.2	NC	80	7	0.1	BTV	1	0.3	0.01
Calcium	7440-70-2	8470	3.8	NC	NC	1.9	NCSSL	10	8	1.8
Chromium	7440-47-3	17.4	0.9	5.6	0.29	0.145	RSL Residential for Soil	1.5	0.4	0.03
Cobalt	7440-48-4	0.414	700	30	2.3	0.207	BTV	3	0.4	0.03
Copper	7440-50-8	17.1	150	4100	310	8.55	BTV	2.5	1	0.16
Iron	7439-89-6	7210	270	72000	5500	135	NCSSL	10	8	1.4
Lead	7439-92-1	27.5	NC	800	400	13.75	BTV	0.5	0.4	0.09
Magnesium	7439-95-4	904	65	NC	NC	32.5	NCSSL	10	8	0.68
Manganese	7439-96-5	37	1	2300	180	0.5	NCSSL	0.5	0.4	0.16

**TABLE 6B**

Analytical Services Table

**Matrix:** Surface Soil**Analytical Group:** Metals

Analyte	CAS Number	MCIEAST-MCB CAMLEJ BTV, (mg/kg) <sup>1</sup>	NCSSL (Feb. 2012) (mg/kg) <sup>1</sup>	RSLs Industrial for soil (May 2012) (mg/kg) <sup>1</sup>	RSLs Residential for soil (May 2012) (mg/kg) <sup>1</sup>	Project Quantitation Limit Goal <sup>2</sup> (mg/kg)	Project Action Limit Reference	Laboratory-specific		
								LOQ (mg/kg)	LOD (mg/kg)	DL (mg/kg)
Mercury	7439-97-6	0.161	130	31	2.3	0.0805	BTV	0.033	0.017	0.0052
Nickel	7440-02-0	3.11	NC	2000	150	1.555	BTV	4	0.4	0.04
Potassium	9/7/7440	359	2.1	NC	NC	1.05	NCSSL	100	50	2.9
Selenium	7782-49-2	1.59	3.4	510	39	0.795	BTV	1	0.7	0.17
Silver	7440-22-4	0.354	NC	510	39	0.177	BTV	1.5	0.4	0.03
Sodium	7440-23-5	250	0.28	NC	NC	0.14	NCSSL	100	50	1.5
Thallium	7440-28-0	NC	6	1	0.078	0.039	RSL Residential for Soil	1.5	0.5	0.09
Vanadium	7440-62-2	17.6	1200	520	39	8.8	BTV	2.5	0.4	0.04
Zinc	7440-66-6	28.6	NC	31000	2300	14.3	BTV	2.5	1	0.17

<sup>1</sup> PALs were developed to be protective of human health and the environment.<sup>2</sup> Project Quantitation Limit (PLOQ) Goals are half of the minimum PAL..

BTV concentration for combined surface soils in undeveloped areas as applicable to MCIEAST-MCB CAMLEJ (CH2M HILL, 2011).

Residential Soil RSL values were adjusted from the USEPA RSLs Table (May 2012).

NC SSLs are from NCDENR (February 2012).

Shading represents cases where the PAL goal is lower than the laboratory LOD.

Shading represents instances where the PAL Goal is lower than the LOD. Non-detects will not be treated as exceedances though they will be reported at a value greater than the PLOQ Goal.

**TABLE 6B-1**  
QC Acceptance Limits

**Matrix:** Surface Soil

**Analytical Group:** Metals

Analyte	CAS Number	LCS, MS, and MSD %R and %RPD Limits		
		LCL	UCL	%RPD
Aluminum	7429-90-5	80	120	20
Antimony	7440-36-0	80	120	20
Arsenic	7440-38-2	80	120	20
Barium	7440-39-3	80	120	20
Beryllium	7440-41-7	80	120	20
Cadmium	7440-43-9	80	120	20
Calcium	7440-70-2	80	120	20
Chromium	7440-47-3	80	120	20
Cobalt	7440-48-4	80	120	20
Copper	7440-50-8	80	120	20
Iron	7439-89-6	80	120	20
Lead	7439-92-1	80	120	20
Magnesium	7439-95-4	80	120	20
Manganese	7439-96-5	80	120	20
Mercury	7439-97-6	80	120	20
Nickel	7440-02-0	80	120	20

**TABLE 6B-1**  
QC Acceptance Limits

**Matrix:** Surface Soil

**Analytical Group:** Metals

Analyte	CAS Number	LCS, MS, and MSD %R and %RPD Limits		
		LCL	UCL	%RPD
Potassium	7440-09-7	80	120	20
Selenium	7782-49-2	80	120	20
Silver	7440-22-4	80	120	20
Sodium	7440-23-5	80	120	20
Thallium	7440-28-0	80	120	20
Vanadium	7440-62-2	80	120	20
Zinc	7440-66-6	80	120	20

**TABLE 7**

Data Package Deliverables

<b>All Analytical Fractions</b>			
Case Narrative – A detailed case narrative per analytical fraction is required and will include explanation of any non-compliance and/or exceptions and CA. Exceptions will be noted for receipt, holding times, methods, preparation, calibration, blanks, spikes, surrogates (if applicable), and sample exceptions.			•
Sample Identification (ID) Cross Reference Sheet (Lab IDs and Client IDs)			•
Completed chain of custody and any sample receipt information			•
Sample preparation (extraction/digestion) logs			•
Copies of non-conformance memos and CAs			•
<b>Form *</b>	<b>Gas Chromatograph/Mass Spectrometer Organic Fractions</b>	<b>Level II</b>	<b>Level IV</b>
1	Sample results	•	• + raw
2	Surrogate Recovery Summary (w/ applicable control limits)	•	•
3	MS/MSD Accuracy & Precision Summary **	•	• + raw
3	LCS Accuracy Summary	•	• + raw
4	Method Blank Summary	•	• + raw
5	Instrument Tuning Summary (including tuning summary for applicable initial calibrations [ICALs])		•
6	ICAL Summary (including concentration levels of standards)		• + raw
7	Continuing Calibration Summary		• + raw
8	Internal Standard (IS) Summary (including applicable ICALs)		•
<b>Form *</b>	<b>Gas Chromatograph/High-Performance Liquid Chromatograph Organic Fractions</b>	<b>Level II</b>	<b>Level IV</b>
1	Sample results	•	• + raw
2	Surrogate Recovery Summary (with applicable control limits)	•	•
3	MS/MSD Accuracy and Precision Summary **	•	• + raw
3	LCS Accuracy Summary	•	• + raw
4	Method Blank Summary	•	• + raw
6	ICAL Summary (including concentration levels of standards) ***		• + raw
7	Continuing Calibration Summary ***		• + raw
7	Degradation Summary (Organochlorine Pesticides only) ***		• + raw
8	Analytical Sequence (including internal standard area performance where applicable) ***		•
10	Compound Identification Summary (where confirmation required) ***		•

**TABLE 7**

Data Package Deliverables

Form *	Metals Inorganic Fractions	Level II	Level IV
1	Sample Results	•	• + raw
2A	Initial and Continuing Calibration Summary		• + raw
3	Initial and Continuing Calibration Blanks and Method Blanks Summary	•	• + raw
4	Interference Check Standard Summary		• + raw
5A	Pre-digestion Matrix Spike Recoveries Summary	•	• + raw
5B	Post-digestion Spike Recoveries Summary		• + raw
6	Native Duplicate or MS/MSD Precision Summary **	•	• + raw
7	LCS Recovery Summary	•	• + raw
8	Method of Standard Addition (if necessary)		• + raw
9	Serial Dilution		• + raw
10	Instrument or Method Detection Limit Summary		•
11	ICP Interelement Correction Factors		•
12	Linear Range Summary		•
13	Preparation Log Summary		• + raw
14	Analytical Run Sequence and Graphite Furnace Atomic Absorption F Post-spike Recovery Summary		• + raw
Form *	General Chemistry Fractions: (Includes potentiometric, gravimetric, colorimetric, and titrimetric analytical techniques (e.g., total petroleum hydrocarbon [418.1], total organic compound )	Level II	Level IV
1	Sample Results	•	• + raw
2A	Initial and Continuing Calibration Summary		• + raw
3	Initial and Continuing Calibration Blanks and Method Blanks Summary	•	• + raw
5A	Pre-digestion Matrix Spike Recoveries Summary	•	• + raw
6	Native Duplicate or MS/MSD Precision Summary **	•	• + raw
7	LCS Recovery Summary	•	• + raw
10	Instrument or Method Detection Limit Summary		•

**TABLE 8A**  
Laboratory QC Samples

**Matrix:** Surface Soil  
**Analytical Group:** Explosive Residues (including Nitroglycerin and PETN)  
**Analytical Method/SOP Reference:** SW846 8330B/CA-402

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per batch of 20 or less	No target compounds > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the PQL (Project Quantitation Limit), whichever is greater.	Investigate source of contamination Evaluate the samples and associated QC: i.e. the blank results are above the PQL, report sample results which are <PQL or > 10X the blank concentration. Otherwise, re-prep a blank and the remaining samples.	Analyst, Laboratory Supervisor, and Data Validator	Bias/Contamination	No target compounds > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the PQL (Project Quantitation Limit), whichever is greater.
Surrogate	1per sample	Soil: 1,2-dinitrobenzene	If surrogate is outside high and sample is <LOQ no CA taken.		Accuracy/Bias	Soil: 1,2-dinitrobenzene
LCS	One per batch of 20 or less	Percent recovery (%R) must be within DoD QSM limits, if available; otherwise, within laboratory's statistically-derived QC limits. Allow for the number of marginal exceedances presented in DoD QSM Table 6A-1.	If an MS/MSD was performed and acceptable, narrate. If surrogate is outside low the affected samples are re-extracted and reanalyzed. If an LCS/LCSD was performed and only one of the set was unacceptable, narrate. If the LCS recovery is high but the sample results are < PQL, narrate. Otherwise, re-prep a blank and the remaining samples.		Precision/Accuracy/Bias	%R must be within DoD QSM limits, if available; otherwise, within laboratory's statistically-derived QC limits. Allow for the number of marginal exceedances presented in DoD QSM Table 6A-1.
MS/MSD	One per sample data group(SDG) or every 20 samples.	%R should be within the same limits as for the LCS. RPD should be ≤ 30%.	Evaluate the samples and associated QC: i.e. If the LCS results are acceptable, narrate. If both the LCS and MS/MSD are unacceptable, re-prep the samples and QC.		Precision/Accuracy/Bias	%R should be within the same limits as for the LCS. RPD should be ≤ 30%.
Second Column Confirmation	All positive results must be confirmed.	Results between primary and second column must be RPD ≤ 40%.	None. Apply qualifier if RPD >40% and discuss in the case narrative. The higher of the two results will be reported unless matrix interference is apparent.		Precision	Results between primary and second column must be RPD ≤ 40%.
Results between detection limit (DL) and limit of quantitation (LOQ)	NA	Apply "J" qualifier to results between DL and LOQ.	NA		Accuracy	Apply "J" qualifier to results between DL and LOQ.

DoD QSM v. 4.2 is the basis for specifications on this table; NA = not applicable.

**TABLE 8B**  
Laboratory QC Samples

**Matrix:** Surface Soil  
**Analytical Group:** Perchlorate  
**Analytical Method/SOP Reference:** SW846 6850/HPLC06

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	Measurement Performance Criteria
Method Blank	One per batch of 20 samples	No perchlorate detected > 1/2 LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). For common laboratory contaminants, no analytes detected > LOQ.	If all samples below 1/2 LOQ, no CA. Otherwise, re-prepare and reanalyze all samples processed with contaminated blank.	Analyst, Laboratory Supervisor, and Data Validator	Bias/ Contamination	No perchlorate detected > 1/2 LOQ and > 1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). For common laboratory contaminants, no analytes detected > LOQ.
LCS	One per batch of 20 samples	See limits on Table 6A-1	No CA if recovery is high and perchlorate is not detected above the LOQ in the samples. Otherwise, reanalyze all samples.		Accuracy/bias	See limits on Table 6A-1
MS/MSD	1 per batch of 20 samples if client designated	See limits on Table 6A-1	No action required.		Accuracy/bias	See limits on Table 6A-1
Internal Standard (IS)	Every sample	Measured <sup>18</sup> O IS area within ±50% of the value from the average of the IS area counts of the ICAL. RRT of perchlorate ion must be 1.0±2% (0.98-1.02)	Reanalyze sample at increasing dilutions until ±50% acceptance criteria met. If not met, re-prepare samples.		Accuracy/bias	Measured <sup>18</sup> O IS area within ±50% of the value from the avg of the IS area counts of the ICAL. RRT of perchlorate ion must be 1.0±2% (0.98-1.02)
Isotope Ratio <sup>35</sup> Cl / <sup>37</sup> Cl	Every sample	Monitor for either parent ion at masses 99/101 or daughter ion at masses 83/85 depending on which ions are quantitated. Theoretical ratio ~ 3.06. Must fall within 2.3 to 2.8.	Sample must be reanalyzed.		Accuracy/bias	Monitor for either parent ion at masses 99/101 or daughter ion at masses 83/85 depending on which ions are quantitated. Theoretical ratio ~ 3.06. Must fall within 2.3 to 2.8.
Limit of detection verification (LODV)	One per batch of 20 samples	Within + 30% of true value.	Correct problem. Rerun LODV and all samples since last successful LODV.		Accuracy/bias	Within + 30% of true value.

DoD QSM v. 4.2 is the basis for specifications on this table.

**TABLE 8C**  
Laboratory QC Samples

**Matrix:** Surface Soil  
**Analytical Group:** Metals (excluding Mercury)  
**Analytical Method/SOP Reference:** SW846 6010C/CA-608

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	CA	Person(s) Responsible for CA	DQI	Measurement Performance Criteria
Method Blank	One per digestion batch of 20 or fewer samples of similar matrix.	No target metals > ½ LOQ (> LOQ for common laboratory contaminants) and > 1/10 the amount measured in any sample or 1/10 the PAL, whichever is greater. For negative blanks, absolute value must be < LOD. Blank result must not otherwise affect sample results.	Correct the problem. Report sample results that are <LOD or >10x the blank concentration. Re-prepare and reanalyze the method blank and all associated samples with results > LOD and < 10x the contaminated blank result.	Analyst, Laboratory Department Manager, and Data Validator	Bias/contamination	No target metals > ½ LOQ (> LOQ for common laboratory contaminants) and > 1/10 the amount measured in any sample or 1/10 the PAL, whichever is greater. For negative blanks, absolute value must be < LOD. Blank result must not otherwise affect sample results.
LCS	One per digestion batch of 20 or fewer samples of similar matrix (varies by lot).	%R must be within DoD QSM limits, allowing for the marginal exceedances presented in Table 6B-1.	Re-digest and reanalyze all associated samples for affected analyte.		Accuracy/Bias/Contamination	%R must be within DoD QSM limits, allowing for the marginal exceedances presented in Table 6B-1.
MS	One per digestion batch or SDG or every 20 samples.	%R should be within the DoD QSM limits for LCS, if sample < 4x spike added.	Flag results for affected analytes for all associated samples with "N."		Accuracy/Bias	%R should be within the DoD QSM limits for LCS, if sample < 4x spike added.
Post-digestion Spike	When dilution test fails or analyte concentration in all samples < 50x LOD	%R should be within 75-125%.	Run associated samples by method of standard addition or flag results.		Accuracy/Bias	%R should be within 75-125%.
Laboratory Duplicate	One per digestion batch or SDG or every 20 samples.	Project-specific criteria: If values are ≥ 5x LOQ, RPD should be ≤ 20%. If values are < 5x LOQ, Absolute Difference should be ≤ LOQ.	Flag results for affected analytes for all associated samples.		Precision	Project-specific criteria: If values are ≥ 5x LOQ, RPD should be ≤ 20%. If values are < 5x LOQ, Absolute Difference should be ≤ LOQ.
ICP Serial Dilution	One per preparation batch of 20 or fewer samples of similar matrix.	If original sample result is at least 50x LOQ, 5-fold dilution must agree within ± 10% of the original result.	Flag results for affected analytes for all associated samples with "E."		Accuracy/Bias	If original sample result is at least 50x LOQ, 5-fold dilution must agree within ± 10% of the original result.
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ.	NA	Accuracy	Apply "J" qualifier to results between DL and LOQ.	

DoD QSM v. 4.2 is the basis for specifications on this table.

**TABLE 8D**  
Laboratory QC Samples

**Matrix:** Surface Soil

**Analytical Group:** Mercury

**Analytical Method/SOP Reference:** SW846 7471B/CA-611

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per digestion batch of 20 or fewer samples of similar matrix.	No mercury > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the PAL, whichever is greater. For negative blanks, absolute value < LOD. Blank result must not otherwise affect sample results.	Correct the problem. Report sample results that are <LOD or >10x the blank concentration. Re-prepare and reanalyze the method blank and all associated samples with results > LOD and < 10x the contaminated blank result.	Analyst, Laboratory Department Manager and Data Validator	Bias/contamination	No mercury > ½ LOQ and > 1/10 the amount measured in any sample or 1/10 the PAL, whichever is greater. For negative blanks, absolute value < LOD. Blank result must not otherwise affect sample results.
LCS	One per digestion batch of 20 or fewer samples of similar matrix.	Water and Sediment:%R must be within 80-120%.	Re-digest and reanalyze all associated samples for affected analyte.	Analyst, Laboratory Department Manager, and Data Validator	Accuracy/Bias/Contamination	Water and Sediment:%R must be within 80-120%.
MS	One per digestion batch or SDG or every 20 samples.	%R should be within 80-120% if sample < 4x spike added.	Flag results for affected analytes for all associated samples with "N."	Analyst, Laboratory Department Manager, and Data Validator	Accuracy/Bias	%R should be within 80-120% if sample < 4x spike added.
Laboratory Duplicate	One per digestion batch or SDG or every 20 samples.	Project-specific criteria: If values are ≥ 5x LOQ, RPD should be ≤ 20%. If values are < 5x LOQ, Absolute Difference should be ≤ LOQ.	Flag results for affected analytes for all associated samples.	Analyst, Laboratory Department Manager, and Data Validator	Precision	Project-specific criteria: If values are ≥ 5x LOQ, RPD should be ≤ 20%. If values are < 5x LOQ, Absolute Difference should be ≤ LOQ.
Results between DL and LOQ	NA	Apply "J" qualifier to results between DL and LOQ	NA	Analyst, Supervisor	Accuracy	Apply "J" qualifier to results between DL and LOQ

DoD QSM v. 4.2 is the basis for specifications on this table.

**TABLE 9A**

Field QC Samples

**Matrix:** Surface Soil**Analytical Group:** Explosive Residues (including Nitroglycerin, PETN, and Perchlorate)

QC Sample	Analytical Group	Frequency	DQIs	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A), or both (S&A)
Field Duplicate	Explosive Residues (including Nitroglycerin, PETN, and Perchlorate)	One per 10 field samples	Precision	RPD $\leq$ 30%	S & A
Equipment Rinsate Blank		One per day	Bias / Contamination	Same as Field Blank	S & A
Temperature Blank		One per cooler	Accuracy / Representativeness	2-6 degrees Celsius (°C)	S

**TABLE 9B**  
Field QC Samples

**Matrix:** Surface Soil

**Analytical Group:** Target Analyte List Metals (including Mercury)

QC Sample	Analytical Group	Frequency	DQIs	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A), or both (S&A)
Field Duplicate	TAL Metals	One per 10 field samples	Precision	RPD $\leq$ 30%	S & A
Equipment Rinsate Blank		One per day	Bias / Contamination	Same as Field Blank	S & A
Temperature Blank		One per cooler	Accuracy / Representativeness	2-6 °C	S

**TABLE 10**

Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

<b>Instrument/ Equipment</b>	<b>Maintenance Activity</b>	<b>Testing Activity</b>	<b>Inspection Activity</b>	<b>Frequency</b>	<b>Acceptance Criteria</b>	<b>Corrective Action</b>	<b>Responsible Person</b>	<b>SOP Reference</b>
HPLC (Explosive Residues)	Check and sonicate pump valves as needed. Back flush column as needed. Replace analytical column or guard column as needed. Sonicate and replace solvent with every use. Replace the UV lamp as needed. Check and replace seal-pak as needed	Explosives	Column flow, pressure	Prior to ICAL and/or as necessary.	Acceptable calibration or calibration verification (CV)	Correct the problem and repeat calibration or CV	Analyst, Department Manager	CA-402
LC/MS (Perchlorate)	Change analytical column as needed, change mobile phase when insufficient for run or contamination, change inlet filters as needed for contamination	Perchlorate	Check pump pressure, check for leaks, check for adequate mobile phase	Instrument receipt, instrument change (new column, etc.), when continuing calibration verification (CCV) does not meet criteria Prior to calibration check and/or as necessary	Acceptable ICAL or CCV	Correct problem and repeat ICAL or CCV	Analyst, Lab Section Supervisor	HPLC06

**TABLE 10**

Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

<b>Instrument/ Equipment</b>	<b>Maintenance Activity</b>	<b>Testing Activity</b>	<b>Inspection Activity</b>	<b>Frequency</b>	<b>Acceptance Criteria</b>	<b>Corrective Action</b>	<b>Responsible Person</b>	<b>SOP Reference</b>
ICP-AES (Metals)	Clean torch assembly and spray chamber when discolored or when degradation in data quality is observed. Clean nebulizer, check argon, and replace peristaltic pump tubing as needed. Other maintenance specified in lab Equipment Maintenance SOP.	TAL Metals	Torch, nebulizer chamber, pump, pump tubing.	Prior to ICAL and as necessary.	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	CA-608
Mercury Analyzer (Mercury)	Replace peristaltic pump tubing, replace mercury lamp, replace drying tube, clean optical cell and/or clean liquid/gas separator as needed. Other maintenance specified in lab Equipment Maintenance SOP.	Mercury	Tubing, sample probe, optical cell.	Prior to ICAL and as necessary	Acceptable calibration or CCV	Correct the problem and repeat calibration or CCV	Analyst, Department Manager	CA-611

LC/MS = liquid chromatography/mass spectrometry

ICP-AES = inductively coupled plasma atomic emission spectroscopy

**TABLE 11**  
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
HPLC (Explosive Residues)	ICAL - 7-point calibration of all explosives	Instrument receipt, major instrument change, when CV does not meet criteria.	7 point calibration – correlation coefficient (r) <sup>3</sup> 0.995 or (r) <sup>2</sup> <sup>3</sup> 0.990	Repeat ICAL and/or perform necessary equipment maintenance. Check calibration standards. Reanalyze affected data.	Analyst, Department Manager	CA-402
	Independent Calibration Check, ICV	Once after initial calibration.	%R must within 80%-120% for all project compounds.	Identify source of problem, correct, repeat calibration, rerun samples.		
	CCV	After every 10 samples; If calibration curve previously analyzed, analyze daily before samples.	%D must be ≤ 20% for all project compounds.	Correct problem, rerun calibration verification. If that fails, then repeat ICAL. Reanalyze all samples since the last successful calibration verification.		
LC/MS (Perchlorate)	Mass Calibration	Upon instrument set-up and as needed	±0.3 m/z of mass 83, 85, and 89	Correct the problem and recalibrate	Analyst, Lab Section Supervisor	HPLC06
	ICAL	Prior to sample analysis	RSD for each analyte ≤ 20% or r > 0.995. The concentration corresponding with the y-intercept must be ≤ LOD.	Correct problem then repeat ICAL		
	ICV	After each ICAL; analysis of second source standard at midpoint of calibration	85-115% Recovery	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.		
LC/MS (Perchlorate)	CCV	At the beginning of the analytical sequence; after each 10 field samples; at the end of the analytical sequence	85-115% Recovery	If %D is high and sample result is ND, qualify/narrate with project approval. If %D is low or project approval not received, correct problem, rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since the last acceptable CCV.	Analyst, Lab Section Supervisor	HPLC06
	Interference Check Sample (ICS)	One per batch of 20 samples; at least one daily	Within 30% of true value	Correct problem and then reanalyze all samples in that batch. If poor recovery from the cleanup filters is suspected, a different lot of filters must be used to re-extract all samples in the batch. If column degradation is suspected, a new column must be calibrated before the samples can be reanalyzed.		
	Tuning	Prior to ICAL and after any mass calibration or maintenance is performed	Tuning standards must contain the analytes of interest and meet acceptance criteria in SOP	Retune instrument and perform instrument mass calibration if retune doesn't meet criteria.		
	LODV	Before and after each analytical batch	Within 30% of the true value.	Correct problem and rerun LODV and all samples with concentrations less than RL analyzed since the last successful LODV.		

**TABLE 11**  
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	CA	Person Responsible for CA	SOP Reference
ICP-AES (Metals)	ICAL	At the beginning of each day or if QC is out of criteria.	One point calibration plus a blank per manufacturer's guidelines.	Recalibrate and/or perform necessary equipment maintenance. Check calibration standards.	Analyst, Department Manager	CA-608
	ICV	Once after each ICAL, prior to beginning a sample run.	%R must be within 90-110% for all project compounds.	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.		
ICP-AES (Metals)	Calibration Blank (CB)	Before beginning a sample sequence, after every 10 samples and at end of the analysis sequence.	No analytes detected > LOD. For negative blanks, absolute value < LOD.	Correct problem. Re-prepare and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed.	Analyst, Department Manager	CA-608
	CCV	After every 10 samples and at the end of each run sequence.	%R must be within 90-110% for all project compounds.	Correct problem, rerun calibration verification. If that fails, then repeat ICAL. Reanalyze all samples since the last successful calibration verification.		
	Low-level Calibration Check Standard (if using one-point ICAL)	Daily after one-point ICAL.	%R must within 80%-120% for all project compounds.	Correct problem, then reanalyze.		
	ICS - ICSA & ICSB	Daily, before sample injections	ICSA recoveries must be less than the absolute value of the LOD and ICSB %Rs must be within 80-120%.	Correct the problem, then re-prepare checks and reanalyze all affected samples.		
Mercury Analyzer (Mercury)	ICAL - 5 points plus a calibration blank	Upon instrument receipt, major instrument change, at the start of each day.	Correlation coefficient (r) must be $\geq 0.995$ .	Recalibrate and/or perform necessary equipment maintenance. Check calibration standards.	Analyst, Department Manager	CA-611
	ICV	Once after each ICAL, prior to beginning a sample run.	%R must be within 90-110%	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.	Analyst, Department Manager	
	Continuing Calibration Blank (CCB)	Before beginning a sample sequence, after every 10 samples and at end of the analysis sequence. For negative blanks, absolute value < LOD.	No analytes detected > LOD.	Correct problem. Re-prepare and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed.	Analyst, Department Manager	
Mercury Analyzer (Mercury)	CCV	Beginning and end of each run sequence and every 10 samples.	%R must be within 80-120%	Correct problem, rerun calibration verification. If that fails, then repeat ICAL. Reanalyze all samples since the last successful calibration verification.	Analyst, Department Manager	CA-611

**TABLE 12**

Field Performance Audit Checklist

<b>Project Responsibilities</b>			
Project No.:		Date:	
Project Location: <u>MCB Camp Lejeune</u>		Signature: _____	
Team Members: _____			
Yes	No	1)	Is the approved work plan being followed? Comments _____ _____
Yes	No	2)	Was a briefing held for project participants? Comments _____ _____
Yes	No	3)	Were additional instructions given to project participants? Comments _____ _____
<b>Sample Collection</b>			
Yes	No	1)	Is there a written list of sampling locations and descriptions? Comments _____ _____
Yes	No	2)	Are samples collected as stated in the Master SOPs? Comments _____ _____

Field Performance Audit Checklist (continued)

Yes      No      3)      Are samples collected in the type of containers specified in the work plan?  
Comments \_\_\_\_\_  
\_\_\_\_\_

Yes      No      4)      Are samples preserved as specified in the work plan?  
Comments \_\_\_\_\_  
\_\_\_\_\_

Yes      No      5)      Are the number, frequency, and type of samples collected as specified in  
the work plan?  
Comments \_\_\_\_\_  
\_\_\_\_\_

Yes      No      6)      Are quality assurance checks performed as specified in the work plan?  
Comments \_\_\_\_\_  
\_\_\_\_\_

Yes      No      7)      Are photographs taken and documented?  
Comments \_\_\_\_\_  
\_\_\_\_\_

**Document Control**

Yes      No      1)      Have any accountable documents been lost?  
Comments \_\_\_\_\_  
\_\_\_\_\_

Yes      No      2)      Have any accountable documents been voided?  
Comments \_\_\_\_\_  
\_\_\_\_\_

Field Performance Audit Checklist (continued)

Yes      No      3)      Have any accountable documents been disposed of?

Comments \_\_\_\_\_

Yes      No      4)      Are the samples identified with sample tags?

Comments \_\_\_\_\_

Yes      No      5)      Are blank and duplicate samples properly identified?

Comments \_\_\_\_\_

Yes      No      6)      Are samples listed on a chain-of-custody record?

Comments \_\_\_\_\_

Yes      No      7)      Is chain-of-custody documented and maintained?

Comments \_\_\_\_\_

**TABLE 13**

## Project Documents and Records

Document	Where Maintained
Field Notebooks	Electronic .pdf copies in the project file. Hardcopy (bound notebook) in the project file. Archived at project closeout.
Chain-of-Custody Records	Electronic .pdf copies in the project file. Hardcopy in the project file. Archived at project closeout.
Airbills	Hardcopy in the project file. Archived at project closeout.
Telephone Logs	Hardcopy in the project file. Archived at project closeout.
CA Forms	Electronic .pdf copies in the project file. Hardcopy in the project file. Archived at project closeout.
Photoionization Detector/Flame Ionization Detector readings	Recorded in Field Notebook. Stored in EnDat (encoder data).
Water quality parameters collected during sediment sampling	Recorded in Field Notebook. Stored in EnDat.
Various field measurements	Recorded in Field Notebook.
All equipment calibration information	Recorded in Field Notebook.
Pertinent telephone conversations	Recorded in Field Notebook.
Equipment maintenance records	Inspected by FTL. Not maintained.
Sample Receipt, Custody, and Tracking Records	Electronic .pdf copies in the project file. Hardcopy in the full data package.
Standard Traceability Logs	Hardcopy in the full data package. Archived at project closeout.
Equipment Calibration Logs	Hardcopy in the full data package. Archived at project closeout.
Sample Prep Logs	Hardcopy in the full data package. Archived at project closeout.
Run Logs	Hardcopy in the full data package. Archived at project closeout.
Equipment Maintenance, Testing, and Inspection Logs	Hardcopy in the full data package. Archived at project closeout.
Reported Field Sample Results	Electronic .pdf copies in the project file. Hardcopy in the data package. Archived at project closeout.
Reported Results for Standards, QC Checks, and QC Samples	Hardcopy in the full data package. Archived at project closeout.
Instrument Printouts (raw data) for Field Samples, Standards, QC Checks, and QC Samples	Hardcopy in the full data package. Archived at project closeout.
Data Package Completeness Checklists	Hardcopy in the data validation report. Archived at project closeout.
Sample Disposal Records	Maintained by the laboratory.
Extraction/Clean-up Records	Maintained by the laboratory.
Raw Data	Hardcopy in the full data package. Archived at project closeout.

**TABLE 13**

## Project Documents and Records

<b>Document</b>	<b>Where Maintained</b>
Field Sampling Audit Checklists	Hardcopy in the project file. Archived at project closeout.
Fixed Laboratory Audit Checklists	If completed, hardcopy in the project file. Archived at project closeout.
Data Validation Reports	Electronic .pdf copies in the project file. Hardcopy stored with the data package. Archived at project closeout.

**TABLE 14**

Field Sampling SOPs

**Field Sample Requirements and Collection Methods**

Composite surface soil samples will be collected using the TR-02-1 sampling approach inside the crater resulting from controlled detonation activities and the incremental sampling method will be utilized to collect a sample from outside of the crater.

**Surface Soil TR-02-1 Sampling**

Surface soil samples from inside the crater shall be collected using the TR-02-1 approach described in the USACE Technical Report ERDC/CRREL TR-02-1, *Guide for Characterization of Sites Contaminated with Energetic Materials* (Thiboutot, et al., 2002). Coordinates of the sampling locations will be based on the center of the sampling area. Soil samples will be collected by compositing a minimum of 30 sample increments from random locations within each crater. The 30 sample increments will be approximately equal in the amount of collected soil and the sample depth interval will be from 0 to 2 inches below ground surface. The sample increments at each location will be homogenized.

**Incremental Soil Sampling**

Surface soil samples shall be collected outside the crater utilizing the incremental sampling method. The decision unit for the post-blow-in-place sample collected outside the crater (outside the 1- by 1-meter (m) TR-02-01 sampling area) will be roughly circular and centered upon the crater, with a radius of up to 15 m to encompass the visible ejecta pattern. The maximum radius of 15 m is based on work conducted by the US Army Engineer Research and Development Center entitled "Explosive Residues from Blow-in-Place Detonations of Artillery Munitions"(Pennington, et al., 2008). This paper concluded that the majority of the explosives residue mass falls within 15 m of the detonation center. The soil samples will be collected in accordance with the incremental sampling SOP in Appendix C of the Master Project Plan (CH2M HILL, 2010). At least 30 aliquots of soil will be collected from 0 to 2 inches below ground surface and homogenized.

**Soil Sample Homogenization Procedure**

Soil samples to be analyzed for explosives residues, perchlorate, and metals shall be homogenized in the field. After a sample is taken, a stainless steel spatula shall be used to remove the sample from the split sampling device. The sampler should not use fingers to do this because gloves may introduce organic interferences into the sample.

The sample should be placed in a decontaminated stainless steel pan and thoroughly mixed using a stainless steel spoon. The soil in the pan should be scraped from the sides, corners, and bottom, rolled into the middle of the pan, and initially mixed. The sample should then be quartered and moved to the four corners of the pan. Each quarter of the sample should be mixed individually, and then rolled to the center of the pan and mixed with the entire sample again.

All stainless steel spoons, spatulas, and pans must be decontaminated following procedures specified in the appropriate SOP prior to homogenizing the sample. A composite equipment rinse blank of homogenization equipment should be taken each day it is used.

**TABLE 15**  
Post-Detonation Sampling Data Sheet



POST-DETONATION SOIL SAMPLING DATA SHEET	
<b>Client:</b>	<b>Project Number:</b>
<b>Location:</b>	<b>Inside Crater Sample ID:</b>
<b>Event:</b>	<b>Outside Crater Sample ID:</b>
<b>Date:</b>	<b>Field Duplicate Sample ID:</b>
<b>Weather:</b>	<b>MS/MSD Sample ID:</b>
<b>Sampling Team:</b>	<b>EB Sample ID:</b>
<b>Easting Coordinate UTM Zone 18 (Meters)</b>	
<b>Northing Coordinate UTM Zone 18 (Meters)</b>	

Sample information: method, container number, size, and type, preservative used.			
Soil Samples			
Analytical Method	Preservative	Container requirements <sup>1</sup>	Total No. of Containers <sup>2</sup>
SW846 8330B Explosive Residues, including PETN and Nitroglycerin	Cool to 0-6°C	Two 4oz. glass jars per sample	
SW846 6850 Perchlorate	Cool to 0-6°C	Two 4oz. glass jars per sample	
SW846 6010C and 7470A/7471B Metals	Cool to 0-6°C	Two 4oz. glass jars per sample	
Equipment Blank (Aqueous)			
SW846 8330B Explosive Residues, including PETN and Nitroglycerin	Cool to 0-6°C	Two 250mL Amber per sample	
SW846 6850 Perchlorate	Cool to 0-6°C	Two 250mL plastic per sample	
SW846 6010C and 7470A/7471B Metals	pH < 2 with HNO <sub>3</sub> & Cool to 0-6°C	Two 250mL plastic per sample	
<b>Notes:</b> <sup>1</sup> Container types and quantities per sample vary among laboratories. Confirm container information with the project chemist. <sup>2</sup> Including field and QA/QC Samples			
<b>Observations:</b>			

**Appendix C**  
**Standard Operating Procedures**

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# Field Log Books

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## I. Purpose

To provide general guidelines for entering field data into log books during site 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 performed 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), if required - 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/or 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.
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)
  - Parameters to be analyzed for, if appropriate
  - Descriptions of soil 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.
2. Use tables to record sampling information and field data from multiple samples.
3. Sketch sampling locations and other pertinent information.

## Post-Detonation Sampling Activities MCIEAST-MCB CamLej, North Carolina

PREPARED FOR: Keith LaTorre/KNV

COPIES TO: Bianca Kleist/CLT

DATE: July 30, 2012

### Introduction

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The use of explosives during controlled detonation/ blow-in-place (BIP) operations could potentially impact the surrounding soils. Soil samples will be collected at locations where controlled detonations/ BIP operations are conducted. These field instructions describe the planning, field, and information management activities to be conducted for surface soil sampling at Unexploded Ordnance (UXO) Sites at Marine Corps Installations East – Marine Corps Base Camp Lejeune. For more detailed instructions and procedures, please refer to the Work Plan Addendum Section 5.0.

The following essential elements for post-detonation steps are described in these field instructions:

- Activity Coordination
- Field Sampling
- Information Management

### Activity Coordination

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The field team leader shall coordinate and plan the post detonation sampling activities with the following personnel:

Project Manager:	Keith LaTorre/KNV 865-769-3204 Cell: 865-323-3300
Project Chemist:	Bianca Kleist/CLT Office: 704-543-3274
EMS (GPS Units):	Colin Sullivan/Critigen Office: 720-872-4436
Field Team Lead (FTL):	TBD

<b>Table 1. Summary of Coordination Activities and Contacts</b>			
<b>Activity/Material</b>	<b>Responsible Party</b>	<b>Resource Contact</b>	<b>Recipient</b>
Schedule UXO Escort	Keith LaTorre	TBD	UXO Technician
Order GPS Unit	TBD	TBD	TBD
Purchase/Rent Sampling Equipment	TBD	Various	TBD
Order Sample Bottles	TBD	Bianca Kleist	Contracted Laboratory
Collect and Ship Samples	TBD	Bianca Kleist	FedEX and Contracted Laboratory
Complete Field Sampling Data Sheet	TBD	Keith LaTorre	TBD
Data Validation	Bianca Kleist	Contracted Third Party	TBD
Data Screening Tables	Bianca Kleist	TBD	Keith LaTorre

## Field Sample Requirements and Collection Methods

Composite surface soil samples will be collected using the TR-02-1 sampling approach inside the crater resulting from controlled detonation activities and the incremental sampling method will be utilized to collect a sample from outside of the crater (refer to Section 5.0 in this Work Plan Addendum). A summary of sampling activities will be recorded in a field book and on the Post-Detonation Soil Sampling Data Sheet (see template attached to these field instructions).

### Surface Soil TR-02-1 Sampling – Inside the Crater

Surface soil samples from inside the crater will be collected using the TR-02-1 approach described in the USACE Technical Report ERDC/CRREL TR-02-1, *Guide for Characterization of Sites Contaminated with Energetic Materials* (Thiboutot, et al., 2002). Each sampling location will be defined as an area measuring approximately 1 meter × 1 meter. Coordinates of the sampling locations will be based on the center of the sampling area. Soil samples will be collected by compositing a minimum of 30 sample aliquots from random locations within each 1 meter x 1 meter sampling area. The 30 sample increments will be approximately equal in the amount of collected soil and the sample depth interval will be from 0 to 2 inches bgs. The sample increments at each location will be homogenized using the procedure described in Section 14.3 of these SOPs.

### Incremental Soil Sampling – Outside the Crater

Surface soil samples will be collected outside the crater utilizing the incremental sampling method. The decision unit for the post-BIP sample collected outside the crater (outside the 1 m × 1 m TR-02-01 sampling area) will be roughly circular and centered upon the crater, with a radius of up to 15 m (approximately 50-ft) to encompass the majority of the explosives residue mass ejection pattern. The maximum radius of 15 m is based on work conducted by the US Army Engineer Research and Development Center entitled “Explosive Residues from Blow-in-Place Detonations of Artillery Munitions”(Pennington, et al., 2008). This paper concluded that the majority of the explosives residue mass falls within 15 m of the detonation center. The soil samples will be collected in accordance with the incremental sampling SOP in Appendix C MRP MPP (CH2M HILL, 2008). At least 30 aliquots of soil will be collected from 0 to 2 inches bgs inside the circular area and homogenized using the procedure described in Section 14.3 of these SOPs.

## Soil Sample Homogenization Procedure

Soil samples will be homogenized in the field. After a sample is taken, a stainless steel spatula shall be used to remove the sample from the split sampling device. The sampler should not use fingers to do this, as gloves may introduce organic interferences into the sample. The sample should be placed in a decontaminated stainless steel pan and thoroughly mixed using a stainless steel spoon. The soil in the pan should be scraped from the sides, corners, and bottom, rolled into the middle of the pan, and initially mixed. The sample should then be quartered and moved to the four corners of the pan. Each quarter of the sample should be mixed individually, and then rolled to the center of the pan and mixed with the entire sample again. The sample should then be obtained from the homogenized soil within the center of the pan. The sample jars should be filled using a stainless steel spoon or spatula. Samples will be stored on ice in clean plastic bags or clean large mouth glass bottles and shipped to the laboratory for analysis via FedEx.

All stainless steel spoons, spatulas, and pans must be decontaminated following procedures specified in the appropriate SOP prior to homogenizing the sample. The sampling tools will not need to be cleaned between aliquots since each individual aliquot will be part of the same sample, but tools will be cleaned between each sample. A composite equipment rinse blank of homogenization equipment should be taken each day it is used.

## Sample Preservation and Handling

Sample preservation must occur in the field immediately after compositing. The containers supplied by the laboratory will contain the applicable preservative. This will protect field personnel from transporting, handling, and measuring concentrated acids and bases.

## Quality Assurance and Quality Control

Field QC samples (including field blanks, equipment blanks, duplicate samples, and matrix spike/matrix spike duplicate [MS/MSD] samples) will be collected during the post-detonation sampling event and submitted for laboratory analysis. Required QA/QC samples are detailed in **Table 3**.

## Sample Identification System

An electronic sample-tracking program will be used to manage the flow of information from the field sampling team to the laboratory and to internal and external data users. The tracking program is used to manage the entry of sampling-related data, such as station locations and field measurements.

While in the custody of the sampling team, the sample analysis data will be recorded in the field logbooks and on the Post-Detonation Soil Sampling Data Sheet. Labels for samples to be shipped to a fixed-base laboratory will be produced electronically. If they cannot be produced electronically, they must be written legibly in indelible ink.

The following information typically is included on the sample label:

- Site or project name or identifier
- BIP location identifier (refer to Section 4.2.1)
- Unique sample identification number
- Date and time of sample collection
- Sampler's initials
- Sample matrix or matrix identifier
- Type of analyses to be conducted

Each analytical sample for soil will be assigned a unique sample identification number using the following format:

*Site#-Media/Station# or QA/QC-Year/Quarter or Depth Interval*

Refer to Section 5.3.3 of this Work Plan Addendum for more information regarding the sample identification system for this project.

## Sample Location

The coordinates of the actual soil sample location will be determined in the field using a handheld GPS unit. All coordinates will be recorded on the Post-Detonation Soil Sampling Data Sheet.

## Sample Packaging and Shipping

Samples will be packed in a cooler with bubble wrap packaging material and double-bagged ice. The samples will be shipped to the primary contracted or subcontracted laboratories via overnight courier. The Field Team Leader (FTL) is responsible for the following activities related to shipment of the samples:

- Verifying that all sample bottles are correctly labeled, sealed, and packaged
- Checking to ensure that sample bottles in each cooler correspond to the accompanying chain-of-custody (COC) form
- Making sure that the turnaround time (TAT) is specified on the COC and that all the analyses to be performed are marked off on the COC
- Affixing a custody seal to each cooler
- Using the appropriate labels and forms required for shipment

Custody of the samples will be maintained and documented at all times. Chain-of-custody will begin with the collection of the samples in the field and will continue through the analysis of the sample at the analytical laboratory (samplers must transfer custody to the person responsible for shipping the samples).

## Laboratory Analysis

Samples from both inside and outside the detonation crater and associated QA/QC samples will be analyzed by a fixed base laboratory for the following parameters (**Table 2**):

- Explosives residues including PETN and nitroglycerin (SW-846 USEPA Method 8330)
- Perchlorate (SW-846 USEPA Method 6850)
- Target Analyte List (TAL) metals including mercury (SW-846 USEPA Methods 6010C and 7471B)

TABLE 2  
**Summary of Post Detonation Sampling and Analysis Program**

Sample Media	Sample Depth/Location and Rationale	Analysis			
		TAL Metals	PETN and Nitroglycerin	Nitroaromatics and Nitroamines	Perchlorate
Surface Soil Inside Crater	TR-02-01 methodology will be used to collect soil inside the crater from 0 – 2 inches bgs.	X	X	X	X
Surface Soil Outside Crater	Incremental sampling methodology will be used to collect soil outside of the crater from 0 – 2 inches bgs.	X	X	X	X

Notes and Abbreviations:

TAL = target analyte list

PETN = pentaerythritol tetranitrate

TABLE 3  
**Post-Detonation Field and Quality Control Sample Summary**

<b>Matrix</b>	<b>Analytical Group</b>	<b>No. of Sampling Locations</b>	<b>No. of Field Duplicates</b>	<b>No. of MS/MSDs</b>	<b>No. of Field Blanks*</b>	<b>No. of Equip. Blanks</b>	<b>Total No. of Samples to Lab</b>
<b>Post Detonation Samples</b>							
Surface Soil	Explosives Residues including PETN and Nitroglycerin	2	1	1/1	1	1	7
	Perchlorate	2	1	1/1	1	1	7
	TAL Metals including mercury	2	1	1/1	1	1	7

\* Field Blanks may only be required if ambient contamination in the atmosphere is suspected at the time of sample collection. Confirm QAPP requirements with project chemist.



**POST-DETONATION SOIL SAMPLING DATA SHEET**

Client:	Project Number:
Location:	Inside Crater Sample ID:
Event:	Outside Crater Sample ID:
Date:	Field Duplicate Sample ID:
Weather:	MS/MSD Sample ID:
Sampling Team:	EB Sample ID:
Easting Coordinate UTM Zone 18 (Meters)	
Northing Coordinate UTM Zone 18 (Meters)	

**Sample information: method, container number, size, and type, preservative used.**

Soil Samples			
Analytical Method	Preservative	Container requirements <sup>1</sup>	Total No. of Containers <sup>2</sup>
SW-846 8330 Explosive Residues, including PETN and Nitroglycerin	Cool to 0-6°C	Two 4oz. glass jars per sample	
SW-846 6850 Perchlorate	Cool to 0-6°C	Two 4oz. glass jars per sample	
SW-846 6010C and 7470A/7471B Metals	Cool to 0-6°C	Two 4oz. glass jars per sample	
Equipment Blank (Aqueous)			
SW-846 8330 Explosive Residues, including PETN and Nitroglycerin	Cool to 0-6°C	Two 250mL Amber per sample	
SW-846 6850 Perchlorate	Cool to 0-6°C	Two 250mL plastic per sample	
SW-846 6010C and 7470A/7471B Metals	pH < 2 with HNO <sub>3</sub> & Cool to 0-6°C	Two 250mL plastic per sample	

**Notes:**  
<sup>1</sup> Container types and quantities per sample vary among laboratories. Confirm container information with the project chemist.  
<sup>2</sup> Including field and QA/QC Samples

**Observations:**

## References

CH2M HILL. 2008. *MCB Camp Lejeune Munitions Response Program Master Project Plans, Marine Corps Base Camp Lejeune, North Carolina*. May.

Pennington, Judith C. et al. 2008. *Explosive Residues from Blow-in-Place Detonations of Artillery Munitions. Soil & Sediment Contamination* 17:163-180. 01 March 2008.

Thiboutot, S., G. Ampleman, and A.D. Hewitt. 2002. *Technical Report ERDC/CRREL TR-02-1, Guide for Characterization of Sites Contaminated with Energetic Materials*. U.S. Army Corps of Engineers, Engineer Research and Development Center.