

M67001.AR.006345
MCB CAMP LEJUENE
5090.3a

FINAL SITE-SPECIFIC WORK PLAN ADDENDUM FOR FOCUSED PRELIMINARY
ASSESSMENT/SITE INSPECTION D-9 SKEET RANGE PROPOSED MILCON AREA MCB
CAMP LEJEUNE NC
9/1/2008
CH2M HILL

Final

**Site-Specific Work Plan Addendum for Focused
Preliminary Assessment/Site Inspection
D-9 Skeet Range
Proposed MILCON Area**

**Marine Corps Base Camp Lejeune
Jacksonville, North Carolina**

Task Order 09

September 2008

Prepared for

**Department of the Navy
Naval Facilities Engineering Command
Atlantic Division
Norfolk, Virginia**

Under the

**Multi-Media
Contract N62470-07-D-0501**

Prepared by



CH2MHILL

Charlotte, North Carolina



QC Review Page

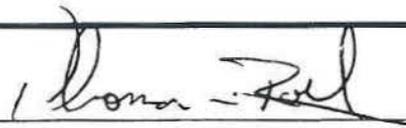
Site-Specific Work Plan Addendum for Focused Preliminary Assessment/Site Inspection D-9 Skeet Range Proposed MILCON Area

Marine Corps Base Camp Lejeune
Jacksonville, North Carolina

Multi-Media
Contract Number N62470-07-D-0501
Task Order 009

Prepared by
CH2M HILL
September 2008

Approved by:

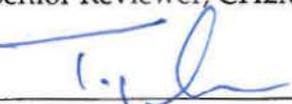


Thomas M. Roth, P.E.
Senior Reviewer, CH2M HILL

Date:

9/22/08

Approved by:

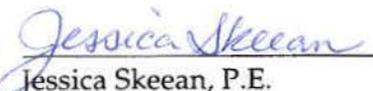


Teg Williams, L.G.
Senior Reviewer, CH2M HILL

Date:

9/22/08

Approved by:



Jessica Skeean, P.E.
Project Manager, CH2M HILL

Date:

9/22/08

Contents

Contents.....	i
1 Introduction	1-1
1.1 Background and Project Objectives.....	1-1
1.2 Work Plan Scope and Organization	1-1
1.3 Site Location and Description	1-2
1.4 Site History	1-3
1.5 Previous Investigations	1-4
1.6 Climate	1-4
1.7 Geology and Hydrogeology	1-5
2 Technical Management Plan	2-1
2.1 Project Personnel, Organization, and Schedule.....	2-1
2.1.1 Project Organization.....	2-1
2.1.2 Project Personnel.....	2-1
2.2 Technical Approach.....	2-1
2.2.1 Task 1 – Project Planning	2-1
2.2.2 Task 2 – Data Evaluation	2-2
2.2.3 Task 3 – Site Investigation	2-2
2.2.4 Task 4 – Sample Management, Analysis, and Validation	2-2
2.2.5 Task 5 – Geographical Information System	2-2
2.2.6 Task 6 – Reporting	2-2
3 Field Investigation Plan.....	3-1
3.1 Overall Approach	3-1
3.2 Site Preparation and Restoration	3-1
3.2.1 Mobilization.....	3-2
3.2.2 Transect and Sample Location Survey.....	3-2
3.2.3 Vegetation Clearing.....	3-2
3.2.4 Buried Utility Clearance.....	3-3
3.2.5 Site Restoration and Demobilization.....	3-3
3.3 Geospatial Information and Electronic Submittals	3-3
3.4 Field Sampling Plan.....	3-3
3.4.1 Field Operations.....	3-3
3.4.2 Analytical Requirements and Sample Handling.....	3-6
3.4.3 Investigation-derived Waste Management	3-8
3.5 Health and Safety Plan.....	3-8
3.6 Data Documentation and Processing Procedures	3-8
3.7 Project File Requirements	3-8
4 Quality Control Plan	4-1
5 Environmental Protection Plan	5-1
5.1 Regional Ecological Summary	5-1
5.2 Endangered/Threatened Species within the Project Site.....	5-1

5.3	Wetlands within the Project Site	5-2
5.4	Cultural and Archaeological Resources within the Project Site	5-2
5.5	Water Resources within the Project Site.....	5-2
5.6	Coastal Zones within the Project Site	5-3
5.7	Vegetation to be removed within the Project Site.....	5-3
5.8	Existing Waste Disposal Sites within the Project Site.....	5-3
5.9	Compliance with Applicable or Relevant and Appropriate Requirements.....	5-3
5.10	Detailed Procedures and Methods to Protect and/or Mitigate the Resources/Sites Identified	5-4
6	References.....	6-1

Appendices

A Health and Safety Plan

Tables

1-1	Previous Investigatory Skeet Range XRF Soil Screening Results
1-2	Previous Investigatory Surface Soil Detections
1-3	Previous Investigatory Subsurface Soil Detections
1-4	Previous Investigatory Groundwater Detections
2-1	Project Personnel Contact Information
3-1	Summary of Sampling Program
3-2	Analyses, Bottleneck, Preservation, and Holding Time Requirements
3-3	Required QA/QC Samples
3-4	Sample Collection Frequencies
4-1	Definable Features of Work Auditing Procedures
5-1	Species Potentially Occurring on or Adjacent to Camp Lejeune Listed as Threatened, Endangered, or of Special Concern by the USFWS

Figures

1-1	D-9 Skeet Range Site Map
1-2	D-9 Skeet Range Theoretical Shotfall Area
1-3	D-9 Skeet Range June/July 2007 XRF Screening and Soil Sampling Results
2-1	Project Schedule
3-1	D-9 Skeet Range Sampling Grid and New Sample Locations

Acronyms and Abbreviations

AEC	area of environmental concern
AHA	Activity Hazard Analysis
AOC	area of concern
ASR	archives search report
bgs	below ground surface
BMP	Best Management Practice
CAMA	Coastal Area Management Act
CLEAN	Comprehensive Long-term Environmental Action Navy
COC	chain-of-custody
CTO	contract task order
DFOW	definable feature of work
DGPS	Differential Global Positioning System
DPT	direct-push technology
EOD	explosive ordnance disposal
ESV	ecological screening value
FTL	Field Team Leader
GIS	Geographical Information System
GPS	global positioning system
HSP	Health and Safety Plan
HTW	hazardous and toxic waste
ID	inner diameter
IDW	investigation-derived waste
INRMP	Integrated Natural Resource Management Plan
IRP	Installation Restoration Program
kg	kilogram
m	meter
MC	munitions constituents
MCB	Marine Corps Base
MCCS	Marine Corps Community Services
MEC	munitions and explosives of concern
mg	milligram
MILCON	military construction
MRP	Munitions Response Program
MS/MSD	matrix spike/matrix spike duplicate
NAVFAC	Naval Facilities Engineering Command
NC	North Carolina

NCAC	NC Administrative Code
NCGQS	NC groundwater quality standards
NCSSL	NC soil screening level
NC2L	NCAC Chapter 15 Subsection 2L
NCDENR	North Carolina Department of Environment and Natural Resources
PAH	polynuclear aromatic hydrocarbon
PA/SI	Preliminary Assessment/Site Inspection
ppm	part per million (same as mg/kg)
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
QCP	Quality Control Plan
RCRA	Resource Conservation and Recovery Act
RSL	Regional Screening Level
RTK	real-time kinematics
Skeet Range	D-9 Skeet Range Site
SLERA	Screening-level Ecological Risk Assessment
SOP	standard operating procedure
SSL	soil screening level
TO	task order
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOC	volatile organic compound
WP	Work Plan
XRF	x-ray fluorescence

Introduction

1.1 Background and Project Objectives

Marine Corps Base (MCB) Camp Lejeune is planning a military construction (MILCON) project in an area that encompasses an existing range area known as the D-9 Skeet Range (Skeet Range) site, located north of the Hadnot Point area of the Base (**Figure 1-1**). Due to historical activities at the Skeet Range Site, a Focused Preliminary Assessment/Site Inspection (PA/SI) is being conducted to follow up on previously-conducted investigative work that was performed under Naval Facilities Engineering Command (NAVFAC) Comprehensive Long-Term Environmental Action Navy (CLEAN) III Program, contract number N62470-02-D-3052, Contract Task Order (CTO)-169. This PA/SI is being conducted under the Navy Multi-Media Contract N62470-07-D-0501, Task Order (TO) 09, for the NAVFAC, Mid-Atlantic Division. The PA/SI will focus on the impacted areas found during the previous investigation (south of Bearhead Creek) and the uninvestigated area of the D-9 Skeet Range located north of Bearhead Creek. This Focused PA/SI is being conducted to accomplish the following objectives:

- Evaluate the presence and nature of select hazardous and toxic waste (HTW) constituents and munitions constituents (MC) contamination that may exist at the Skeet Range by conducting an investigation of groundwater, soil, sediment, and surface water
- Conduct ecological and human health risk screenings using analytical data collected at the Skeet Range

1.2 Work Plan Scope and Organization

The following PA/SI activities will be performed in accordance with methods and procedures detailed in the MCB Camp Lejeune Munitions Response Program (MRP) Master Project Plans (CH2M HILL, 2007b) (referred to herein as the MRP Master Project Plans) to accomplish the objectives described in Section 1.1:

- Clear vegetation (up to 5 acres) in order to access sampling locations.
- Conduct a field investigation that includes screening soil using a portable X-ray fluorescence (XRF) meter, and sampling and analyzing groundwater, soil, surface water, and sediment.
- Prepare a Focused PA/SI Report.

This Work Plan (WP) is divided into sections providing information on the detailed approach, including procedures to be employed during the execution of the project. Appendices to the WP provide supporting documentation that details specific procedures for the execution of the project.

This WP is organized as follows:

- **Section 1, Introduction**, provides general information about this WP, describes the Skeet Range, summarizes the history of the site, previous investigations, and presents the project scope and objectives.
- **Section 2, Technical Management Plan**, identifies the technical approach, methods, and operational procedures that will be used to execute the Focused PA/SI project.
- **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, land surveying, vegetation clearing, temporary well installation, and sampling of environmental media.
- **Section 4, Quality Control Plan (QCP)**, provides details of the approach, methods, and operational procedures to be employed for quality control (QC) of the Focused PA/SI at the Skeet Range.
- **Section 5, Environmental Protection Plan**, describes the approach, methods, and operational procedures to be employed to protect the natural environment during the performance of all tasks at the Skeet Range.
- **Section 6, References**, lists the references cited in the preceding sections.
- **Appendix A, Health and Safety Plan (HSP)**, provides an interface with CH2M HILL's overall health and safety program and with the MCB Camp Lejeune Master Health and Safety Plan (CH2M HILL, 2005).

1.3 Site Location and Description

The Skeet Range, also referred to as Archives Search Report (ASR) site number 2.82 in the Range Identification and Preliminary Range Assessment (USACE, 2001), is located north of the Hadnot Point area of Base, and bounded by Holcomb Boulevard to the east, Birch Street to the south, McHugh Boulevard to the west, and Wallace Creek to the north. The 149-acre Site encompasses the furthest extent of all historic skeet range boundaries and includes portions of Parachute Tower Road to the south and Bearhead Creek within the northern portion of the Site (**Figure 1-1**). The site topography generally slopes toward Bearhead Creek from both the north and the south, with a change in elevation of approximately 20 feet and 15 feet respectively between the north and south boundaries and the creek.

Several structures are located within the boundary of the Skeet Range, including a contractor's field trailer and a waste holding/characterization facility to the east; parachute towers and skeet disc firing structures to the south; and a K9 unit facility, graveyard, former research lab, and a dump site to the west.

Based on a review of the aerial photographs and site reconnaissance, the majority of the Skeet Range is wooded with undergrowth, with wetlands present on either bank of Bearhead Creek. Aside from Parachute Tower Road, access to the site is limited to a few paths within the northern portion of the site and a right-of-way for above-ground utility lines that bisects the site.

1.4 Site History

The Skeet Range began operation in 1953 (USACE, 2001). The oldest known historic figure of the Hadnot Point Area that includes the Skeet Range is a 1979 map (CH2M HILL, 2007a), which depicts the location of the Skeet Range within the same area as more recent Skeet Range fans (**Figure 1-1**).

The Skeet Range is one of four live-fire ranges within a training area known as Area D. The range is used for recreational shooting and is operated by the Marine Corp Community Services (MCCS). The weapons accommodated include 12, 16, 20, 28, and 410-gauge shot guns. The sizes of lead shot used on the range include 7.5, 8, 8.5 and 9. Although the total amounts of ammunition used on the skeet ranges are not available, it is estimated that several hundred thousand rounds are fired each year (Singhas, 2007).

There are ten firing points and eight skeet houses on the current range. The types of clay pigeons used on the Skeet Range include “White Flyer” clays and biodegradable targets. The fields are raked every six months to clear the clay pieces, which are disposed of off site. Camp Lejeune prisoners also rake the inner fields throughout the year and dispose of the clay pieces in the nearby dumpsters. According to the manufacturer, the biodegradable clays will almost completely degrade in roughly two years, depending on rainfall or contact with moisture (White flyer, 2007). However, accumulation of the nutrients resulting from the decomposition of the biodegradable clays in one specific area may have an effect upon the local soil and vegetation growth (White flyer, 2007).

The positions of the shooters and the angles at which targets are thrown at skeet ranges result in a fan-shaped theoretical shot fall zone. Lead skeet loads can reach about 680 feet from the shooter, depending on the load, the angle at which the shot was fired, wind, and other factors. However, most shot typically tends to fall roughly 375 to 600 feet from the shooter (ITRC, 2005). The theoretical shot fall zone and the area of maximum shot fall at the Skeet Range are illustrated by **Figure 1-2**. The theoretical shot fall zone of a single skeet field is approximately 14 acres, and about 2 acres is added with each additional overlapping field, thereby creating a composite shot fall zone that encompasses all of the adjacent skeet fields (**Figure 1-2**). The areas of maximum shot fall overlap, which leads to an anticipated area of maximum lead deposition in the center of the fan (ITRC, 2005).

The materials that are potentially present in the surface soils at the site include small-arms ammunition such as buckshot. Limited soil sampling in the vicinity of the Skeet Range was conducted during an Area of Concern (AOC) Background Study in 2001, which reported lead concentrations in the surface soil up to 20.6 mg/kg (Baker, 2001a).

1.5 Previous Investigations

In 2007, CH2M HILL conducted environmental investigations at the Skeet Range as part of a Focused SI supporting various MILCON activities. These previous investigations at the Skeet Range encompassed approximately 100 acres of land south and west of Bearhead Creek.

An initial investigation to determine lead concentrations within surface soils at the Skeet Range took place in June 2007. The area south of Bearhead Creek was divided into a total of 224 50-meter by 50-meter grids. For each grid, a surface soil sample was collected from a centralized point and screened using an x-ray fluorescence (XRF) meter. The XRF screening data (**Table 1-1**) were used to generate a generalized surface soil lead concentration map of the site (**Figure 1-3**). 25 of the 224 screened samples were sent to Compuchem Laboratory of Cary, North Carolina, for confirmatory lead analyses. Based on the results of the initial investigation, the highest concentrations of lead, generally in excess of 1,000 milligrams per kilogram (mg/kg), are located within the area extending approximately 700 ft north and northwest of the Skeet Range firing positions (**Figure 1-3**).

Using the preliminary screening data from the initially investigated area, a more focused grid network was developed around the Skeet Range firing positions. Surface soils in this area were initially found to have higher concentrations of lead than at other sampling locations further from the firing positions. Thus, additional XRF screening was performed in June 2007 on surface soil samples in this area to better characterize the locations of higher lead concentrations.

Based upon results of the initial investigations, an additional investigation was conducted by CH2M HILL in July 2007 to better define the concentrations of lead in soils and to evaluate if lead is leaching into groundwater. The additional investigation consisted of four surface soil samples, four subsurface soil samples collected using DPT, and four groundwater samples from temporary wells (**Figure 1-3**). Temporary wells were constructed within the DPT soil boring installed for the subsurface soil sampling. All samples were sent to Compuchem Laboratory and were analyzed for lead by USEPA SW-846 Method 6010B/7000. The results from this additional investigation showed screening level exceedances for surface soil and groundwater but not for subsurface soil (**Tables 1-2 through 1-4**).

1.6 Climate

The climate in the MCB Camp Lejeune area is discussed in Section 1.4 of the MRP Master Project Plans.

1.7 Geology and Hydrogeology

The regional geology and hydrogeology at MCB Camp Lejeune is discussed in Section 1.6 and 1.7 of the MRP Master Project Plans. Site-specific geologic and hydrogeologic data is not currently available for the portion of the Skeet Range north of Bearhead Creek, however, it is anticipated that it will be similar to that observed to the south during the 2007 site investigation. The shallow soils to the south of the creek consist of sands and sandy clays. Soil boring logs completed during DPT sampling activities (DPT locations shown on **Figure 1-3**) note poorly graded sands encountered generally at depths ranging up to approximately 5 ft bgs, whereupon sandy clays were typically observed at depths of approximately 4 to 12 ft bgs. Sands and silty sands were generally present below the sandy clays, extending depths of approximately 16 to 19 ft bgs.

The depth to groundwater was measured within several temporary wells and ranged from approximately 16 to 19 ft bgs.

Technical Management Plan

2.1 Project Personnel, Organization, and Schedule

2.1.1 Project Organization

The key organizations involved in this project are Naval Facilities Engineering Command (NAVFAC), MCB Camp Lejeune, the North Carolina Department of Environment and Natural Resources (NCDENR), the USEPA and CH2M HILL. Project execution will be conducted by CH2M HILL and its subcontractors; specific duties for CH2M HILL and its subcontractors are described in Section 2.4 of the MRP Master Project Plans. CH2M HILL will issue subcontracts as necessary for buried utility locating, land surveying, vegetation clearing, direct push technology (DPT) sampling and well installation, laboratory analysis, data validation, and investigation-derived waste management.

2.1.2 Project Personnel

The reporting relationship between key project personnel and the roles and responsibilities of the key personnel are discussed in Section 2.4 of the MRP Master Project Plans. Contact information for key project personnel is shown in **Table 2-1**.

2.4.3 Project Schedule

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

2.2 Technical Approach

2.2.1 Task 1—Project Planning

This task includes project management, meetings, WP 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 MCB Camp Lejeune, CH2M HILL's Charlotte office, or at other locations as necessary.

Subcontractor procurement is also included under this task. Anticipated subcontractor services include utility locating, land surveying, brush clearing, DPT soil sampling and well installation, laboratory analysis, data validation, and investigation-derived waste management.

2.2.2 Task 2—Data Evaluation

Previously collected data has been evaluated and considered along with historical site information to determine the best approach for conducting investigatory efforts for the Skeet Range under this WP.

2.2.3 Task 3—Site Investigation

All field investigation activities will be performed under this task. The scope of the field investigation and the technical approach is presented in Section 3. The primary field investigation activities are the following:

- Surveying
- Vegetation clearance
- Field work support
- Temporary well installation and abandonment
- Environmental sampling

2.2.4 Task 4—Sample Management, Analysis, and Validation

This task includes management of environmental sample data from the time the samples are collected until the validated data is received and incorporated into the project reports. Details for this task are provided in Section 8.1 of the MRP Master Plans.

2.2.5 Task 5—Geographical Information System

All field data will be collected in preparation for the creation of a geographical information system (GIS) tailored for the investigative needs of the Skeet Range. All digital data will be created using a software platform that will allow it to be loaded directly into the GIS system. The main purpose of the GIS is to facilitate review and analysis of the spatially related environmental investigative data.

CH2M HILL will also provide the Skeet Range GIS data for upload into the existing MCB Camp Lejeune GIS. This 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.

2.2.6 Task 6—Reporting

A draft Focused PA/SI Report will be prepared to document the findings of the field investigation. Prior to submittal of the draft report, a preliminary draft will be provided in electronic format to NAVFAC and MCB Camp Lejeune for review. The report will summarize all field activities, provide an evaluation of the environmental data, provide a summary of site history and results of previous investigations, and present the results of the human health and ecological risk screening.

The preliminary ecological risk screening will include a brief description of the ecosystems potentially at risk, a figure depicting the ecosystems, the results of the comparison of maximum detected concentrations (of composite samples) to ecological screening values (ESVs) in tabular form and recommendations for further evaluation. This preliminary

ecological screening will not constitute a full Screening Level Ecological Risk Assessment (SLERA).

The human health risk screening will be conducted using data collected during the investigation. The data will be screened using the following criteria:

- Soil data will be compared to USEPA industrial soil Regional Screening Levels (RSLs) (USEPA, 2008) and NCDENR Soil Screening Levels (SSLs; NCDENR, 2005).
- Groundwater data will be compared to USEPA tap water RSLs (USEPA, 2008) and NC Groundwater Quality Standards (NCAC, 2005).
- Surface water data will be compared to both North Carolina surface water standards and USEPA national recommended water quality criteria (NC DENR, 2007; USEPA, 2006).
- Sediment data will be compared to USEPA industrial soil RSLs (USEPA, 2008).

The soil and groundwater data will also be compared to the MCB Camp Lejeune background soil and groundwater data from the *Final Base Background Soil Study Report* (Baker, 2001b). The background values used will be two times the average site background soil concentration.

Field Investigation Plan

3.1 Overall Approach

This field investigation will be completed for portions of the Skeet Range that were not previously addressed by the 2007 Focused PA/SI. The objective for this field investigation is to assess the presence and nature of HTW and MC constituents, including selected Resource Conservation and Recovery Act (RCRA) metals, polynuclear aromatic hydrocarbons (PAHs), and perchlorate.

In order to reduce the bias introduced by the collection and analysis of actual lead shot or bullet fragments, visible shot and fragments will be removed from the soil samples prior to shipment for analysis. Given that the historical use of the Skeet Range was limited to small arms fire only, MEC avoidance procedures will not be practiced unless MEC is identified during the investigation. All field activities will be conducted in accordance with CH2M HILL Standard Operating Procedures (SOPs) and the MRP Master Project Plans (CH2M HILL, 2007b).

The field investigation will accomplish the stated objectives by means of the following activities:

- Establish a sampling grid within the uninvestigated area of the site north of Bearhead Creek and conduct XRF screening for lead;
- Collection of 20 surface soil samples and 10 subsurface soil samples. Sample locations South of Bearhead Creek will be based on the findings of the previous investigation. Sample locations north of Bearhead Creek will be based on the results of XRF screening;
- Collection of five shallow depth groundwater samples from temporary wells installed using DPT; and
- Collection of surface water and sediment samples from five locations including one sample upstream and one downstream of the Skeet Range.

The field investigation activities are detailed below and reference the MRP Master Project Plans (CH2M HILL, 2007b).

3.2 Site Preparation and Restoration

The following subsections describe the procedures associated with site preparation, including mobilization of personnel and equipment and preparation for environmental investigation activities.

3.2.1 Mobilization

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

General Activities

- Identify/procure, package, ship, and inventory project equipment, including tools, supplies, and vegetation clearance equipment
- Coordinate with local agencies, including the MCB Camp Lejeune, Base Range Control, police, hospital, and fire department, as appropriate
- Coordinate communications and other logistical support
- Test and inspect equipment
- Conduct site-specific training on the WP and HSP
- Review subcontractor Activity Hazard Analysis (AHA) forms.
- Verify that all forms and project documentation are in order and project team members understand their responsibilities regarding completing project-reporting requirements

Kickoff/Safety Meeting

During mobilization, a kickoff and site safety meeting will be conducted. This meeting will include a review of this WP and a review and acknowledgment of the HSP by all site personnel. Additional meetings will occur as needed, as new personnel, visitors, and/or subcontractors arrive at the site.

3.2.2 Transect and Sample Location Survey

Land surveying services will be conducted in accordance with Section 7.4 of the MRP Master Project Plans (CH2M HILL, 2007b). The surveying at the Skeet Range will consist of two phases.

- **Phase 1** will be a survey of the transect locations. The survey will identify the area that will be subject to vegetation clearing for sampling efforts.
- **Phase 2** of the land surveying services will occur after environmental sampling activities have concluded at the site and will entail surveying of the coordinates and elevations of temporary monitoring wells and soil sampling locations.

The surveying at the Skeet Range will occur after environmental sampling activities have concluded at the site and will entail surveying of the coordinates and elevations of temporary monitoring wells and soil sampling locations.

3.2.3 Vegetation Clearing

Vegetation less than three inches in diameter will be removed from up to 5 acres of the 149-acre investigation area. Vegetation will be cleared to allow site access for sampling teams and DPT equipment. Vegetation clearing will be accomplished using a combination of

mechanical and manual methods. The brush and trees will be mulched and left in place. Trees greater than three inches in diameter will not be removed unless absolutely necessary.

The Base will coordinate with Camp Lejeune's Environmental Management Division office to identify federally protected species or archaeological sites that may be encountered during vegetation clearing activities. Federally listed plant species will be identified and left in place in accordance with the Environmental Protection Plan (refer to Section 5). Wetland areas will not be cleared.

3.2.4 Buried Utility Clearance

Prior to initiation of subsurface sampling activities, all buried utilities will be located and clearly marked within the vicinity of each proposed sampling location.

3.2.5 Site Restoration and Demobilization

Site Restoration

Damage caused by equipment or other site activities (e.g., deep ruts) will be repaired and revegetated as necessary to prevent erosion.

Demobilization

Full demobilization will occur when the project is completed and appropriate quality assurance and quality control (QA/QC) checks have been performed. The following will occur prior to demobilization:

- Chain-of-custody (COC) records will be reviewed to ensure that all samples were collected as planned and were submitted for appropriate analyses
- Verification of adequate site restoration
- All field equipment will be inspected, packaged, and shipped to the appropriate location

3.3 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 Master Project Plans (CH2M HILL, 2007b).

3.4 Field Sampling Plan

3.4.1 Field Operations

In order to identify the presence and nature of HTW and MC contamination that may exist in the investigation area, the project team will investigate groundwater, surface water, soil, and sediment in the project area. This will include collecting surface soil samples, groundwater samples from the temporary wells, DPT subsurface soil samples, surface water samples, and sediment samples. QA/QC samples will be collected per Section 3.6.2.

Surface Soil XRF Sample Screening

The area north of Bearhead Creek will be overlain by a grid system, similar to the 2007 investigation, to allow for a systematic approach of sample collection (**Figure 3-1**). Grids approximately 50m x 50m will be developed and central points within each grid square will be located during the sampling event using a handheld global positioning system (GPS) instrument. A surface soil sample will be collected from the centralized point within each grid from zero to one foot below ground surface (bgs). All samples will be screened on-site for lead using an XRF instrument. Prior to screening the sample using the XRF instrument, the field team will remove any metallic objects (e.g., bullet fragments) from the sample so it is representative of the concentration of metals in the soil. The XRF sample screening results will be used as the basis for selection of surface and subsurface soil sample locations north of Bearhead Creek.

Discrete Surface Soil Samples

Twenty discrete surface soil samples (designated as ASR2.82-SS26 through ASR2.82-SS45) will be collected from zero to one ft bgs. Proposed surface soil sample locations can be found on **Figure 3-1**; actual sample locations for the area north of Bearhead Creek will be based on the results of the XRF sample screening. All sample locations will be identified using GPS.

Surface soil samples will be analyzed by a fixed base laboratory for the following parameters (refer to **Tables 3-1** through **3-3**):

- RCRA Metals (USEPA SW-846 Method 6010B/7000)
- Perchlorate (USEPA Method 6850)
- PAHs (USEPA SW-846 Method 8270C)

Subsurface Soil Sampling

A DPT rig will be used to collect subsurface soil samples in accordance with the *Direct-Push Soil Sample Collection* SOP in Appendix C of the MRP Master Project Plans. Ten subsurface soil samples (ASR2.82-IS05 through ASR2.82-IS14) will be collected from just above the water table (estimated to range from 8 to 14 ft bgs). **Figure 3-1** illustrates the proposed subsurface soil sample locations; actual sample locations for the area north of Bearhead Creek will be based on the results of the XRF sample screening. At the conclusion of sampling activities, all DPT subsurface soil samples locations will be surveyed by a NC-licensed land surveyor.

Subsurface soil samples will be analyzed by a fixed base laboratory for the following parameters (refer to **Tables 3-1** through **3-3**):

- RCRA Metals (USEPA SW-846 Method 6010B/7000)
- Perchlorate (USEPA Method 6850)
- PAHs (USEPA SW-846 Method 8270C)

Temporary Well Installation

Temporary groundwater monitoring wells (designated as ASR2.82-TW05 through ASR2.82-TW09) will be installed in the five boreholes previously installed for subsurface soil sample

collection. Each well will consist of one-inch inner diameter (ID) polyvinyl chloride (PVC) casing and screen, with a pre-packed sand filter attached to the screened interval. The wells will be constructed in accordance with *Temporary Well Installation* SOP in Appendix C of the MRP Master Project Plans.

Following well development, groundwater samples will be collected from each temporary well using low-flow purge rates in accordance with the *Low-Flow Groundwater Sampling from Monitoring Wells* SOP in Appendix C of the MRP Master Project Plans (CH2M HILL, 2007b). Proposed DPT temporary well locations can be found on **Figure 3-1**.

Samples will be analyzed by a fixed base laboratory for the following parameters (refer to **Tables 3-1** through **3-3**):

- Total and dissolved RCRA Metals (USEPA SW-846 Method 6010B/7000)
- Perchlorate (USEPA Method 6850)
- PAHs (USEPA SW-846 Method 8270C)

Following sampling and surveying, all temporary wells will be removed from the boreholes and the boreholes will be abandoned in accordance with NC Well Construction Standards.

Surface Water and Sediment Sampling

A total of five surface water (ASR2.82-SW01 through ASR2.82-SW05) and five sediment samples (ASR2.82-SD01 through ASR2.82-SD05) will be collected from Bearhead Creek. In addition, one surface water and one sediment sample will be collected from any tributaries to Bearhead Creek identified during the field investigation that are within the boundary of the Skeet Range. All surface water and sediment samples will be collected in accordance with the *Surface Water Sampling* and *Sediment Sampling* SOPs in Appendix C of the MRP Master Project Plans (CH2M HILL, 2007b). Proposed surface water and sediment sample locations for Bearhead Creek can be found on **Figure 3-1**.

Surface water samples will be analyzed by a fixed base laboratory for the following parameters (refer to **Tables 3-1** through **3-3**):

- Total and dissolved RCRA Metals (USEPA SW-846 Method 6010B/7000)
- Perchlorate (USEPA Method 6850)
- PAHs (USEPA SW-846 Method 8270C)

Sediment samples will be analyzed by a fixed base laboratory for the following parameters:

- RCRA Metals (USEPA SW-846 Method 6010B/7000)
- Perchlorate (USEPA Method 6850)
- PAHs (USEPA SW-846 Method 8270C)

In order to avoid cross-contamination during sample collection, samples will be collected from downstream to upstream. The surface water and sediment samples will be co-located at the locations shown in **Figure 3-1**, subject to accessibility. Actual sample location coordinates will be determined using a GPS unit in the field.

A summary of the sampling program for MILCON support activities at the Skeet Range is presented in **Table 3-1**.

3.4.2 Analytical Requirements and Sample Handling

Sample Preservation and Handling

Sample preservation will occur in the field immediately after collection. The containers supplied by the laboratory will contain applicable preservative. This will protect field personnel from transporting, handling, and measuring concentrated acids and bases. QA/QC samples, with the exception of trip blanks, will be collected in the same containers with preservatives as the field samples. The preservatives and holding times for analysis are shown in **Table 3-2**.

Quality Assurance and Quality Control

QA/QC requirements for environmental sampling, handling, and management are detailed in Section 4 of the MRP Master Project Plans (CH2M HILL, 2007b). Field QC samples (including trip blanks, field blanks, 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 **Table 3-3**.

Sample Collection Frequencies

Table 3-4 presents the anticipated number of field samples and their associated QA/QC samples.

Sample Identification System

While in the custody of the sampling team, the sample analysis data will be recorded in field logbooks, along with sample identity information.

Labels for samples sent to a laboratory for analysis 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 name or identifier
- 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 of the following format similar to other sample numbers for MCB Camp Lejeune under the Installation Restoration Program (IRP):

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

An explanation of each of these identifiers is given below.

- Site#:** This investigation includes MRP Site Skeet Range (ASR 2.82) under the Munitions Response Program. Therefore, the prefix “ASR2.82” will be used
- Media:** TW = Groundwater from temporary wells
 SW = Surface water
 SS = Surface soil
 IS= Subsurface soil
 SD = Sediment
- Station#:** Samples will be numbered consecutively.
- 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 COC. The total number of sample containers submitted will be entered on the COC and “MS/MSD” will be indicated in the comments section.

- Year/Quarter#:** Year/Quarter indicators will be used for samples collected from monitoring wells. Each round of sampling will have a distinct identification number:

“08” = year 2008

“A” = Sampling during the first quarter at the site

- Depth Interval:** Depth indicators will be used for soil samples collected using direct push technology. The number will reference the depth interval of the sample:

2-3 = 2 to 3 ft bgs

Under this sample designation format, “ASR2.82-TW01-08A” would mean the following:

- ASR2.82-TW01-08A MRP Site D-9 Skeet Range (ASR 2.82)
 ASR2.82-TW01-08A Groundwater sample from temporary well #1
 ASR2.82-TW01-08A Sampled during the first quarter of 2008

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

Sample Packaging and Shipping

Samples will be packed in a cooler with bubble wrap packaging material and double-bagged ice. The samples will be either picked up at the site by the analytical laboratory or shipped to the laboratory via overnight courier. The field team leader (FTL) is responsible for the following activities related to shipment of the samples:

- Verification that all sample bottles are correctly labeled, sealed, and packaged
- Checking to ensure that sample bottles in each cooler correspond to the accompanying COC form
- Affixing a custody seal to each cooler
- Use of 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 (sampler's must transfer custody to the person responsible for shipping the samples).

3.4.3 Investigation-derived Waste Management

All investigation-derived waste (IDW) generated during the investigation will be managed in accordance with Section 10 of the MRP Master Project Plans (CH2M HILL, 2007b). IDW includes soil cuttings from the DPT borings and liquid waste (e.g., purged groundwater, decontamination fluids) generated during temporary well development and sampling.

3.5 Health and Safety Plan

The HSP is provided in Appendix A. MEC is not suspected at the Skeet Range based on historical knowledge of the Site. However, base EOD will be contacted and will respond to any suspected MEC that may be discovered during site activities.

3.6 Data Documentation and Processing Procedures

Documentation and processing of field data, laboratory data, and investigation results will be completed in accordance with the Section 7.2 of the MRP Master Project Plans (CH2M HILL, 2007b).

3.7 Project File Requirements

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 Master Project Plans (CH2M HILL, 2007b).

SECTION 4

Quality Control Plan

All applicable work performed by CH2M HILL and its subcontractors at the Skeet Range will be conducted in accordance with the QCP in Section 8 of the MRP Master Project Plans. The QCP describes the QC approach and procedures to be employed during the investigation of the Skeet Range.

The specific QC audit procedures for the definable features of work (DFOW) to be employed at the Skeet Range, including the phase during which it is performed, the frequency of performance, the pass/fail criteria, and actions to take if failure occurs, are presented in **Table 4-1**.

Environmental Protection Plan

5.1 Regional Ecological Summary

A summary of the regional ecological is provided in Section 9.1 of the MRP Master Project Plans (CH2M HILL, 2007b).

5.2 Endangered/Threatened Species within the Project Site

Many protected species have been sited near and on MCB Camp Lejeune such as the American alligator, the green sea turtle, the loggerhead sea turtle, the piping plover, the red-cockaded woodpecker, bald eagle, seabeach amaranth, and the rough-leaf loosestrife (Marine Corps, 2006). **Table 5-1** lists those species that could occur in or adjacent to MCB Camp Lejeune that 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.

MCB Camp Lejeune has active programs in place to protect the three federally protected avian species (American bald eagle, piping plover, and red cockaded woodpecker) that are known to occur on the base. The Skeet Range is not within the vicinity of any of the red-cockaded woodpecker management areas.

A bald eagle's nest is documented aboard MCB Camp Lejeune, located at the junction of Sneads Creek and the New River, 10.5 miles from the Skeet Range. Three protective buffers that restrict ground and air-use activities have been established at approximately 750 ft; 1,000 ft; and 1,500 ft from the nest site. The Skeet Range is not within any of these buffer zones. Non-nesting eagles may use the Skeet Range area for foraging habitat. However, the proposed work is not expected to impact any special habitat where eagles are concentrating.

Suitable habitat for the piping plover does not exist at the Skeet Range.

The Skeet Range is approximately 8.2 miles from the Atlantic Coast. The federally protected marine species (e.g., green sea turtle, leatherback sea turtle, loggerhead sea turtle, West Indian manatee) listed in **Table 5-1** are unlikely to inhabit the D-9 Skeet Range.

The eastern cougar is the only federally listed mammal species that could occur in Onslow County. The only extant population of eastern cougar is located in south Florida and the species has not been observed in North Carolina in over 50 years. Suitable habitat for the eastern cougar does not exist at the Skeet Range and the level of human activity would tend to make the species avoid the area. Because the eastern cougar has not been verified in the area in more than 50 years and there is substantial human activity in proximity to the Skeet Range, it is very unlikely that the eastern cougar would occur on the site and no impacts are expected.

Two of the four federally listed plant species have been identified on the base: rough-leaved loosestrife and seabeach amaranth. Approximately 22 rough-leaved loosestrife sites are

found on MCB Camp Lejeune with 76 acres buffered and marked to protect this species. Rough-leaved loosestrife sites are visited annually to visually inspect for changes in extent and apparent health. Approximately half of the rough-leaved loosestrife sites occur within protected red-cockaded woodpecker sites, obviating the need for marking each of these sites individually. The other sites, mostly falling within the Greater Sandy Run Area are marked with white paint around a perimeter that extends 100 ft from the outermost individuals. None of these sites are located on or adjacent to the D-9 Skeet Range.

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 and thus is not located on or adjacent to the Skeet Range.

Environmental reviews completed in preparation for the Integrated Natural Resource Management Plan (INRMP) determined that the remaining species listed in **Table 5-1** are not expected to exist at the site. No adverse impacts to listed species are expected to result from the proposed work at the Skeet Range. Project design features have been developed to prevent impacts to listed species.

5.3 Wetlands within the Project Site

Jurisdictional wetland areas are known to be located at the Skeet Range, specifically along Bearhead Creek. In order to install the temporary monitoring wells and to collect samples, some vegetation removal will be necessary. However, no significant soil disturbance is anticipated from planned site work as described in this WP, and no wetlands on or downstream of the Skeet Range are expected to be impacted by the project. None of the proposed sampling points will be located within a wetland area.

5.4 Cultural and Archaeological Resources within the Project Site

The environmental sampling activities proposed to support this WP involve a limited degree of intrusive activity. The probability that any significant cultural or archeological resources will be impacted by the field investigation is low. Consultation with the Base archaeologist confirms no cultural or archaeological resources are known to lie within the project area. If new cultural or archaeological materials or resources are discovered within the project investigation area, the Base archaeologist will be notified to provide guidance on performing further work in the area.

5.5 Water Resources within the Project Site

As shown in **Figures 1-1**, the Skeet Range encompasses a surface water source. No water resources are expected to be impacted by the project. There is adequate vegetation buffer surrounding the site to protect surface water from additional runoff. Should clearing of vegetative be required in areas adjacent to a water body, appropriate silt barriers or other

best management practices (BMP) will be put in place to prevent sediment from migrating to the water body.

5.6 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). The CAMA requires permits for development in Areas of Environmental Concern (AEC) if it meets all of the following conditions:

- It is in one of the 20 counties covered by CAMA
- It is considered "development" under CAMA
- It is in, or it affects, an AEC established by the Coastal Resources Commission
- It doesn't qualify for an exemption

"Development" includes activities such as dredging or filling coastal wetlands or waters, and construction of marinas, piers, docks, bulkheads, oceanfront structures, and roads.

The investigation at the Skeet Range will include surface investigations and the collection of subsurface soil and groundwater samples using direct-push technology. These activities do not fit the definition of "development" under CAMA; therefore, a CAMA permit is not necessary for this project.

5.7 Vegetation to be removed within the Project Site

Vegetation removal is anticipated in association with the field investigations described in this WP. Vegetation will be removed to access sampling locations. It is estimated that 100 percent of vegetation less than three inches in diameter will be cut, on up to five acres of the project site. Only vegetation up to three inches in diameter will be cut as part of this investigation. Consultation with the base wildlife biologist confirms no threatened or endangered species have been located within the project area. Procedures in place will prevent excessive exposure of bare ground.

5.8 Existing Waste Disposal Sites within the Project Site

No known waste disposal sites are present at the Skeet Range.

5.9 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 Master Project Plans (CH2M HILL, 2007b). No permits have been determined to be required for the proposed work.

5.10 Detailed Procedures and Methods to Protect and/or Mitigate the Resources/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 Project Manager (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 plant be identified within the project area, the specimens will be flagged for easy relocation and verification
- Should cultural or archaeological material or resource 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 determine appropriate mitigation measures in the event that the performed work activities impact an environmental resource

References

- Baker Environmental (Baker). 2001a. *Final Area of Concern Background Study, Marine Corps Base Camp Lejeune, North Carolina*. April 25.
- Baker Environmental (Baker). 2001b. *Final Base Background Soil Study Report, Marine Corps Base Camp Lejeune, North Carolina*. April 25.
- CH2M HILL. 2005. *Master Project Plans, Marine Corps Base Camp Lejeune, North Carolina*.
- CH2M HILL. 2007a. *Archival Records Search Report for the Expanded Site Investigation: CTO-168, Marine Corps Base Camp Lejeune, North Carolina*. June.
- CH2M HILL. 2007b. *MCB Camp Lejeune Munitions Response Program Master Project Plans, Marine Corps Base Camp Lejeune, North Carolina*.
- Interstate Technology and Regulatory Council (ITRC). 2005. *Technical Guideline: Environmental Management at Operating Outdoor Small Arms Firing Ranges*. February.
- Lowder, Bob. 2005. *Closed Range List and Maps for Marine Corps Base, Camp Lejeune, NC*. Camp Lejeune Environmental Management Division.
- North Carolina Administrative Code (NCAC), 2001. *Title 15A Environment and Natural Resources, Subchapter 2C – Well Construction Standards*. April 1.
- NCAC, 2005. *Title 15A Environment and Natural Resources, Subchapter 2L – Classifications and Water Quality Standards Applicable to The Groundwaters of North Carolina*. December 1.
- NCDENR - Division of Water Quality. 2007. *"Redbook" Surface Waters and Wetlands Standards*. May 1.
- NCDENR, 2005. *Guidelines for Establishing Remediation Goals at RCRA Hazardous Waste Sites*. Division of Waste Management. Hazardous Waste Section. May.
- Richardson, 2007. Personal Communication with Duane Richardson, Camp Lejeune Range Safety Officer. May 9, 2007.
- Singhas, Michael, Camp Lejeune Skeet Range Manager. Personal Communication, May 11, 2007
- United States Army Corps of Engineers (USACE). 2001. *Final Range Identification and Preliminary Range Assessment*. Huntsville Engineering and Support Center, St. Louis District. December.
- United States Marine Corps (USMC). 2006. *Integrated Natural Resource Management Plan (INRMP) 2007-2011, Marine Corps Base Camp Lejeune, Onslow County, North Carolina*. November.

United States Army Corps of Engineers (USACE), St. Louis District. 2001. *Final Range Identification and Preliminary Range Assessment, Marine Corps Base Camp Lejeune, Onslow, North Carolina*. December.

United States Environmental Protection Agency (USEPA). 2008. *Regional Screening Levels for Chemical Contaminants at Superfund Sites*. May.

United States Environmental Protection Agency (USEPA). 2006. *National Recommended Water Quality Criteria*.

White Flyer, 2007. <<http://www.whiteflyer.com>>

Tables

Table 1-1

XRF and Laboratory Data Comparison for Lead in Surface Soils

Work Plan Addendum, D-9 Skeet Range

MCB Camp Lejeune

Jacksonville, North Carolina

Grid ID	Sample ID	Northing	Easting	Lead Lab (mg/kg)	Lead XRF (ppm)	+/-	%RPD	%Diff
D2C	SS01	3840180	284894	7.7	18	4	80.2	133.8
D3D	SS02	3840160	285025	7.7	13	3	51.2	68.8
D3A	SS03	3840230	285025	4.1	10	LOD	83.7	143.9
E4D	SS04	3840275	285120	5.9	16	4	92.2	171.2
F4D	SS05	3840420	285120	51.7	60	4	14.9	16.1
C5B	SS06	3840120	285185	417	371	9	11.7	11.0
B6A	SS07	3840030	285335	170	224	7	27.4	31.8
D6A	SS08	3840230	285325	15.1	29	4	63.0	92.1
E6B	SS09	3840315	285210	8.8	13	4	38.5	47.7
B7A	SS10	3840030	285415	48,100	558	11	195.4	98.8
C7A	SS11	3840130	285365	38.9	66	5	51.7	69.7
D7B	SS12	3840230	285365	31.1	37	4	17.3	19.0
A7A	SS13	3839930	285430	66,800	9,111	103	152.0	86.4
B8D	SS14	3839975	285640	980	1,327	20	30.1	35.4
C8D	SS15	3840070	285525	59,600	5,698	65	165.1	90.4
B8B	SS16	3840040	285475	49,700	9,455	107	136.1	81.0
B9A	SS17	3840020	285620	52,500	15,281	170	109.8	70.9
B9B	SS18	3840030	285570	2,970	12,797	151	124.7	330.9
C9A	SS19	3840130	285640	12.8	30	3	80.4	134.4
C11C	SS20	3840070	285785	4.4	10	LOD	77.8	127.3
D11D	SS21	3840185	285820	5.2	10	LOD	63.2	92.3
C12D	SS22	3840065	285930	5.2	14	3	91.7	169.2
E13D	SS23	3840280	286020	23.4	36	4	42.4	53.8
C14A	SS24	3840120	286110	39	36	4	8.0	7.7
E15C	SS25	3840275	286175	11.2	14	3	22.2	25.0

Average %RPD

73.2

LOD Limit of Detection for Lead with the XRF is within the range of 10-100 ppm

Average % Difference

88.3

%RPD is <50%

TABLE 2-1
 Project Personnel Contact Information
 Work Plan Addendum, D-9 Skeet Range
 MCB Camp Lejeune
 Jacksonville, North Carolina

Name/Title/Organization	Mailing Address	Telephone/Fax/E-mail
Phil Smith Program Manager	CH2M HILL 5700 Cleveland Street Suite 101 Virginia Beach, VA 23462	757-518-9666 (office) 757-460-4592 (fax) Phillip.Smith@ch2m.com
Jessica Skeeane, P.E. Project Manager	CH2M HILL 4824 Parkway Plaza Blvd Suite 200 Charlotte, NC 28217	704-329-0073 (office) 704-329-0141 (fax) Jessica.Skeeane@ch2m.com
Matt Louth Activity Manager	CH2M HILL 5700 Cleveland Street Suite 101 Virginia Beach, VA 23462	757-518-9666 (office) 757-460-4592 (fax) Matt.Louth@ch2m.com
Thomas M. Roth, P.E. Senior Consultant	CH2M HILL 2607 Lavista Road Decatur, GA 30033-1725	404-474-7640 (office) 404-259-6674 (cell) 770-604-9183 (fax) Tom.Roth@ch2m.com
Michael Goldman, C.I.H. Program H&S Manager	CH2M HILL 1000 Abernathy Road Suite 1600 Atlanta, GA 30328	770-604-9095 (office) 770-604-9183 (fax) Michael.Goldman@ch2m.com
Ben Redmond Munitions Response Market Segment Director	CH2M HILL 2035 Lakeside Centre Way Suite 200 Knoxville, TN 37922	865-560-2801 (office) 865-560-2802 (fax) bredmond@ch2m.com
Tim Garretson MEC Integrator/Senior MEC Technical Consultant	CH2M HILL 5700 Cleveland Street Suite 101 Virginia Beach, VA 23462	757-671-8311 (office) 757-460-4592 (fax) timothy.garretson@ch2m.com
Dan Young, CSP, CSRP Corporate MEC H&S Manager	CH2M HILL 10687 Aloe Lane Lillian, AL 36549	251-962-2963 (home office) 251-752-0148 (cell) Dan.Young@ch2m.com
Kevin Lombardo MR Operations Manager	CH2M HILL 15010 Conference Center Dr. Suite 200 Chantilly, VA 20151	703-376-5175 (office) 703-608-8247 (cell) Kevin.Lombardo@ch2m.com

TABLE 3-1
 Summary of Sampling Program
Work Plan Addendum, D-9 Skeet Range
MCB Camp Lejeune
Jacksonville, North Carolina

Sample Media	Sample ID Number	Sample Depth/Location and Rationale	Analysis			
			RCRA Metals (USEPA SW-846 Method 6010B/7000)	Dissolved RCRA Metals (USEPA SW-846 Method 6010B/7000)	Perchlorate (USEPA Method 6850)	PAHs (USEPA SW-846 Method 8270C)
Discrete Surface Soil	D9SR-SS26 through D9SR-SS45	Collected as proposed in Figure 3-1 from an interval of 0 – 1 ft. bgs.. Will allow for characterization of surface soil across the site.	x		x	x
Direct Push Subsurface Soil	D9SR-IS05-T-B through D9SR-IS14-T-B	Collected as proposed in Figure 3-1 at approximately 10 ft bgs above the water table at each location. Will allow for characterization of soil across site.	x		x	x
Temporary Well Groundwater	D9SR-TW05 through D9SR-TW09	Collected as proposed in Figure 3-1. Will allow for characterization of groundwater across site, including upgradient and downgradient locations.	x	x	x	x
Surface Water	Surface Water: D9SR-SW01 through D9SR-SW05	Collected as proposed in Figure 3-1 and in accordance with the Surface Water Sampling and Sediment Sampling SOPs in Appendix C of the MRP Master Project Plans.	x	x	x	x
Sediment	Sediment: D9SR-SD01 through D9SR-SD05	Will allow for characterization of groundwater across site, including upgradient and downgradient locations.	x		x	x

Notes and Abbreviations:
 For Direct Push Soil Samples: "T-B" refers to the top depth and bottom depth of the sample interval

TABLE 3-2
Analyses, Bottleneck, Preservation, and Holding Time Requirements
Work Plan Addendum, D-9 Skeet Range
MCB Camp Lejeune
Jacksonville, North Carolina

Media	Analysis	Method	Container	Preservation & Storage	Holding Times
Soil and Sediment	RCRA Metals	SW-846 6010B/7000	1x4-oz bottle, Teflon cap	4°C	6 months: Mercury 28 days
	Perchlorate	USEPA 6850	1x8-oz bottle, Teflon cap	4°C	28 days to extraction and analysis
	PAHs	SW-846 8270C	1x4-oz bottle, Teflon cap	4°C	14 days to extraction, 40 days from extraction to analysis
Groundwater and Surface Water	Total RCRA Metals	SW-846 6010B/7000	1x1-L Poly bottle	4°C	6 months: Mercury 28 days
	Dissolved RCRA Metals	SW-846 6010B/7000	1x1 L Poly bottle	HNO ₃ to pH <2 and cool to 4°C	6 months: Mercury 28 days
	Perchlorate	USEPA 6850	1x1-L Poly bottle	4°C	28 days to extraction and analysis
	PAHs	SW-846 8270C	1x1-L Poly bottle	HNO ₃ to pH <2 and cool to 4°C	7 days to extraction, 40 days from extraction to analysis

Notes:

L = Liter; oz = ounce; HNO₃ = nitric acid

TABLE 3-3
 Required QA/QC Samples
Work Plan Addendum,, D-9 Skeet Range
MCB Camp Lejeune
Jacksonville, North Carolina

Sample Type	Description	Frequency	Analytes
Field Blank	Designed to detect contamination in the decontamination water. A field blank is decontamination water collected directly in the sample bottle. It shall be handled like a sample and transported to the laboratory for analysis.	One field blank from each source of decontamination water for each sampling event, where a sampling event is defined as one week	All laboratory analyses requested for the environmental samples collected at the site for that week
Equipment Blank	Designed to detect contamination of environmental samples caused by contamination of sampling equipment. An equipment blank is analyte-free water that is poured into or pumped through the sampling device, transferred to a sample bottle, and transported to the laboratory for analysis.	One per each day of sampling	All laboratory analyses requested for environmental samples collected at the site on that day
Field Duplicate	Designed to check precision of data in the laboratory. A field duplicate is a sample collected in addition to the native sample at the same sampling location during the same sampling event.	10%	Same parameters as native sample
MS/MSD	Designed to evaluate potential matrix interferences, accuracy, and precision. Three aliquots of a single sample—one native and two spiked with the same concentration of matrix spike compounds—are analyzed.	5%	Same parameters as native sample

TABLE 3-4
 Sample Collection Frequencies
Work Plan Addendum, D-9 Skeet Range
MCB Camp Lejeune
Jacksonville, North Carolina

Analysis	Sample Matrix	Field Samples	Field Duplicates	Equipment Blanks	Field Blanks	MS/MSDs
Surface Soil Samples						
RCRA Metals		20	2	4	1	1
Perchlorate	Solid	20	2	4	1	1
PAHs		20	2	4	1	1
Subsurface Soil Samples						
RCRA Metals		5	1	2	1	1
Perchlorate	Solid	5	1	2	1	1
PAHs		5	1	2	1	1
Temporary Well Groundwater Samples						
RCRA Metals		5	1	2	1	1
Dissolved RCRA Metals	Aqueous	5	1	2	1	1
Perchlorate		5	1	2	1	1
PAHs		5	1	2	1	1
Surface Water Samples						
RCRA Metals		5	1	2	1	1
Dissolved RCRA Metals	Aqueous	5	1	2	1	1
Perchlorate		5	1	2	1	1
PAHs		5	1	2	1	1
Sediment Samples						
Lead		5	1	2	1	1
Perchlorate	Solid	5	1	2	1	1
PAHs		5	1	2	1	1

Notes:

MS/MSD = Matrix Spike and Matrix Spike Duplicate pair
 Field duplicates are collected at the rate of 1 for every 10 environmental samples
 Equipment rinsate blanks are typically collected at the rate of 1 per day per media
 Field blanks are typically collected at the rate of 1 per week during sampling
 MS/MSDs are collected at the rate of 1 for every 20 samples

TABLE 4-1
 Definable Features of Work Auditing Procedures
 Work Plan Addendum, D-9 Skeet Range
 MCB Camp Lejeune
 Jacksonville, North Carolina

Definable Feature of Work with Auditable Function	Responsible Person(s) ¹	Audit Procedure ²	QC Phase ³	Freq. of Audit	Pass/Fail Criteria	Action if Failure Occurs
Planning						
Geographical Information System (GIS) Setup (Pre-mobilization Activities)	Project GIS Manager	Verify GIS system has been set up and is ready for site data.	PP	O	GIS system has been set up and is ready for site data.	Do not proceed with field activities until criterion is passed.
Document management and control (Pre-mobilization Activities)	Project Manager	Verify appropriate measures are in place to manage and control project documents.	PP	O	Appropriate measures are in place to manage and control project documents.	Do not proceed with field activities until criterion is passed.
Data Management (Pre-mobilization Activities)	Project Manager, Project Geophysicist	Verify appropriate measures are in place to manage and control project data.	PP	O	Appropriate measures are in place to manage and control project data.	Do not proceed with field activities until criterion is passed.
Subcontracting (Pre-mobilization Activities)	Project Manager, Site Manager	Verify subcontractor qualifications, training, and licenses.	PP/IP	O	Subcontractors' qualifications, training, and licenses are up to date and acceptable.	Ensure subcontractor provides the qualifications, training, and licenses or change subcontractor.
Technical and Operational approach (Technical Project Planning)	Project Manager	Verify technical and operational approaches have been agreed on by the project team.	PP/IP	O	Technical and operational approaches have been agreed on by project team and incorporated into the Work Plans.	Do not proceed with field activities until criterion is passed
Work Plan preparation and approval	Project Manager	Verify Work Plan prepared and approved.	PP/IP	O	Work Plan has been approved	Do not proceed with field activities (excluding site mobilization) until criterion is passed.
Field Operations						
Site preparation (Mobilization)	Project Manager, Site Manager	Verify local agencies are coordinated.	PP/IP	O	Local agencies are coordinated.	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	Project Manager, Site Manager	Verify equipment has been inspected and tested.	PP/IP	E	Equipment passes inspection and testing.	Proceed only with activities for which equipment has passed inspection and testing.
Site preparation (Mobilization)	Project Manager, Site Manager	Verify communications and other logistical support are coordinated.	PP/IP	O	Communications and other logistical support are coordinated.	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	Project Manager, Site Manager	Verify emergency services have been coordinated.	PP/IP	O	Emergency services are coordinated.	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	MEC QCS, Project Manager, Site Manager	Verify site-specific training is performed and acknowledged.	PP/IP	O	Site-specific training is performed and acknowledged	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	MEC QCS, Project Manager, Site Manager	Hold pre-mobilization meeting with the project team.	PP/IP	O	Project plans are reviewed and acknowledged by team members.	Do not proceed with field activities until criterion is passed.
Site Preparation (Site Survey)	Project Manager, Site Manager	Verify benchmarks for survey have been established and documented.	PP/IP	O	Benchmarks for survey have been established and documented.	Ensure benchmarks for survey are established and documented prior to performing survey.
Site Preparation (Site Survey)	Project Manager, Site Manager	Verify site boundaries and grids have been established.	PP/IP	O	Site boundaries and grids have been established.	Do not proceed with dependent field activities until criterion is passed.
Site Preparation (Site Survey)	Project Manager, Site Manager	Verify surveyor notes are legible, accurate, and complete.	IP	O	Surveyor notes are legible, accurate and complete.	Ensure surveyor replaces deficient notes with legible, accurate and complete notes.
Demobilization	Project Manager, Site Manager	Verify facilities-support infrastructures are dismantled and shipped to appropriate location and area is returned to original condition.	FP	O	Facilities-support infrastructures are dismantled and shipped to appropriate location and site is returned to original condition.	Ensure that all support facilities are removed and that the site is returned to original condition

Definable Feature of Work with Auditable Function	Responsible Person(s) ¹	Audit Procedure ²	QC Phase ³	Freq. of Audit	Pass/Fail Criteria	Action if Failure Occurs
Final Project Reports and Closeout						
Site Specific Final Report preparation and approval	Project Manager	Verify all phases of environmental investigation were performed correctly and are complete.	FP	O	All dig sheets where geophysical mapping and investigation performed are accurate and complete.	Ensure all dig sheets where geophysical mapping and investigation performed are accurate and complete
Archiving	GIS Manager	Verify data back-up systems are in place.	IP	O	Data back-up systems are in place	Ensure data back-up systems are in place
Project Closeout	Project Manager	Verify purchase orders have been closed out.	IP	O	Purchase orders have been closed out	Ensure purchase orders are closed out
Project Closeout	Project Manager	Verify invoices completed and approved.	IP	O	Invoices completed and approved	Ensure invoices are completed and approved

Notes:

IAW = in accordance with

QC Phase

PP = Preparatory Phase

IP = Initial Phase

FP = Follow-up Phase

Frequency

O = Once

D = Daily

W = Weekly

E = Each occurrence

¹ The responsible person (if other than the MEC QCS) is the individual with whom the MEC QCS will coordinate with to ensure compliance with requirements and to verify that any necessary follow-up actions are taken.

² Where appropriate, a reference has been included referring the reader to a more detailed description of the procedures being audited.

³ Documentation to be in accordance with the three-phase control process as outlined in the Quality Control Plan.

TABLE 5-1

Species Potentially Occurring on or Adjacent to Camp Lejeune, in Onslow County, Listed as Threatened, Endangered, or of Special Concern by the USFWS

Work Plan Addendum, D-9 Skeet Range

MCB Camp Lejeune

Jacksonville, 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, 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.
<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 U.S.
<i>Haliaeetus leucocephalus</i>	American bald eagle	T	A single bald eagle's nest is found on Camp Lejeune- at the junction of Sneads Creek and the New River near the back gate. Three protective buffers have been established at approximately 750', 1000', and 1500' from the nest site.
<i>Laterallus jamaicensis</i>	Black rail	FSC	Marsh/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.

TABLE 5-1

Species Potentially Occurring on or Adjacent to Camp Lejeune, in Onslow County, Listed as Threatened, Endangered, or of Special Concern by the USFWS

Work Plan Addendum, D-9 Skeet Range

MCB Camp Lejeune

Jacksonville, North Carolina

Scientific Name	Common Name	Federal Status	Habitat
<i>Acipenser brevirostrum</i>	Shortnose sturgeon	E	Sturgeon inhabits the lower sections of larger rivers and coastal waters along the Atlantic coast. It 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, etc.) 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 abound
<i>Ammodramus henslowii</i>	Eastern Henslow's sparrow	FSC	A species of tallgrass prairies, agricultural grasslands, and pine savannas of the eastern U.S.; the species migrates south to spend the non-breeding season in the native pine savanna habitats of the southeastern U.S.
<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/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.
<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.

TABLE 5-1

Species Potentially Occurring on or Adjacent to Camp Lejeune, in Onslow County, Listed as Threatened, Endangered, or of Special Concern by the USFWS

Work Plan Addendum, D-9 Skeet Range

MCB Camp Lejeune

Jacksonville, North Carolina

Scientific Name	Common Name	Federal Status	Habitat
<i>Agrotis buchholzi</i>	Buchholz's dart moth	FSC	Found in Forested wetlands, scrub-shrub wetlands, shrubland/chaparral and coniferous woodlands. This moth is found mostly in recently burned habitats. Populations can persist up to about a decade or rarely two without fire, until litter accumulates sufficiently to cover foodplants. In most cases habitat is probably suboptimal beginning about five years after a fire.
<i>Atrytonopsis sp.</i>	a 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>	A 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>	Awed 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 savannahs
<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 5 populations in three counties in eastern North Carolina. Three of these populations occur on Camp Lejeune. The other sites occur in Pender and Brunswick Counties. Currently the North Carolina Natural Heritage Program is conducting a survey of likely habitat to look for coastal goldenrod.

TABLE 5-1

Species Potentially Occurring on or Adjacent to Camp Lejeune, in Onslow County, Listed as Threatened, Endangered, or of Special Concern by the USFWS

Work Plan Addendum, D-9 Skeet Range

MCB Camp Lejeune

Jacksonville, North Carolina

Scientific Name	Common Name	Federal Status	Habitat
<i>Thalictrum cooleyi</i>	Cooley's meadowrue	E	Cooley's meadowrue occurs in moist to wet bogs and savannahs. 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>Dichanthelium 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 the states of 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 Camp Lejeune.
<i>Myriophyllum laxum</i>	Loose watermilfoil	FSC	Riparian habitats
<i>Calopogon multiflorus</i>	Many-flower grass-pink	FSC	Grasslands, pinelands; typically in wet areas
<i>Plantago sparsiflora</i>	Pineland plantain	FSC	Savannahs, 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 savannahs
<i>Scleria sp.</i>	Smooth-seeded hairy nutrush	FSC	Dry woods, pineland and savannahs (<i>S. triglomerata</i>)

TABLE 5-1

Species Potentially Occurring on or Adjacent to Camp Lejeune, in Onslow County, Listed as Threatened, Endangered, or of Special Concern by the USFWS

Work Plan Addendum, D-9 Skeet Range

MCB Camp Lejeune

Jacksonville, North Carolina

Scientific Name	Common Name	Federal Status	Habitat
<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.

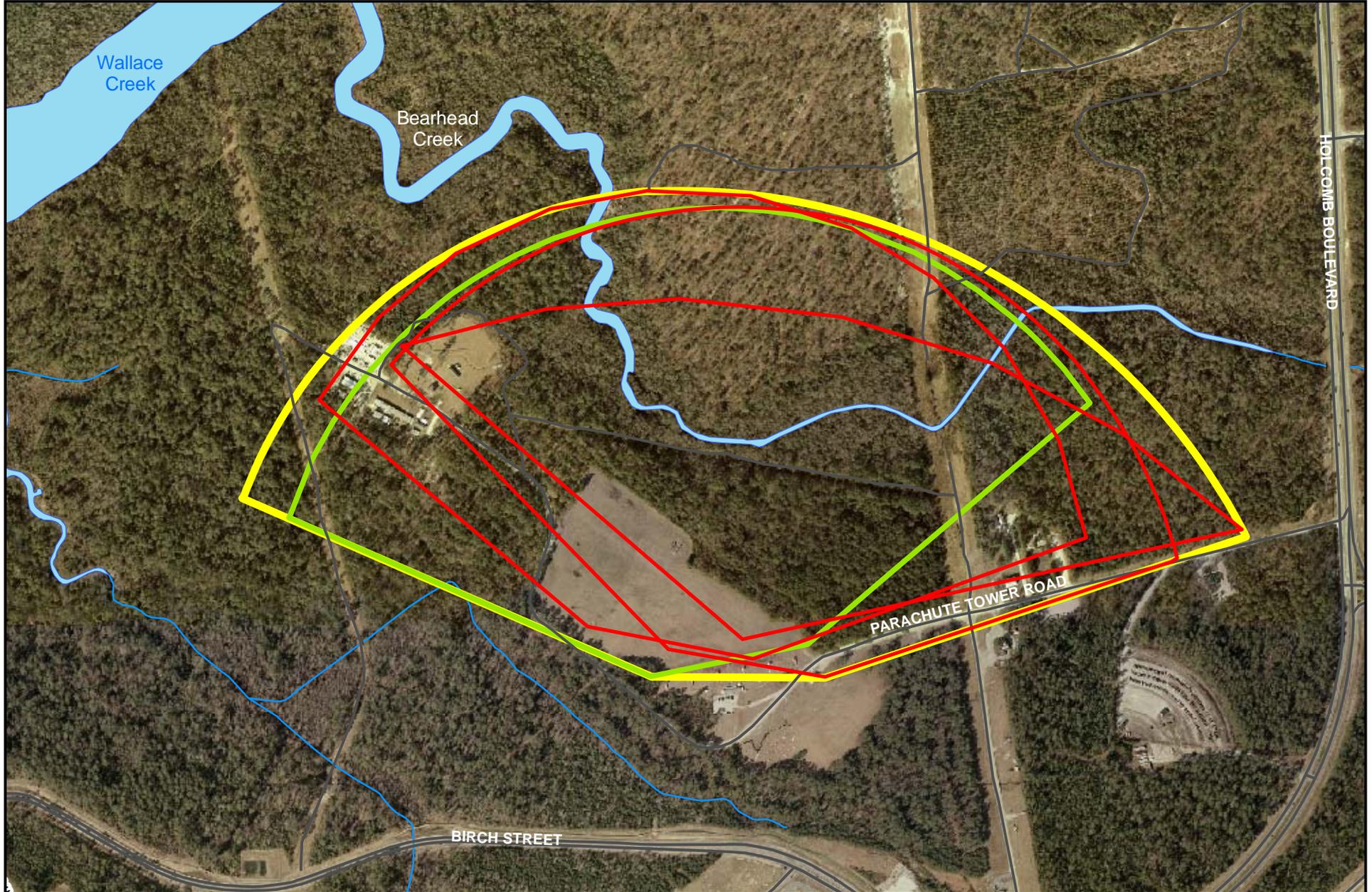
T = Threatened—A taxon likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

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 (e.g., 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.

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

Figures



Legend

- Road
- Surface Water Course Centerline
- Surface Water Body Area
- Former Skeet Range Boundaries
- Current Skeet Range

 Skeet Range- furthest extent

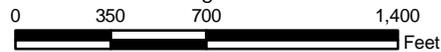
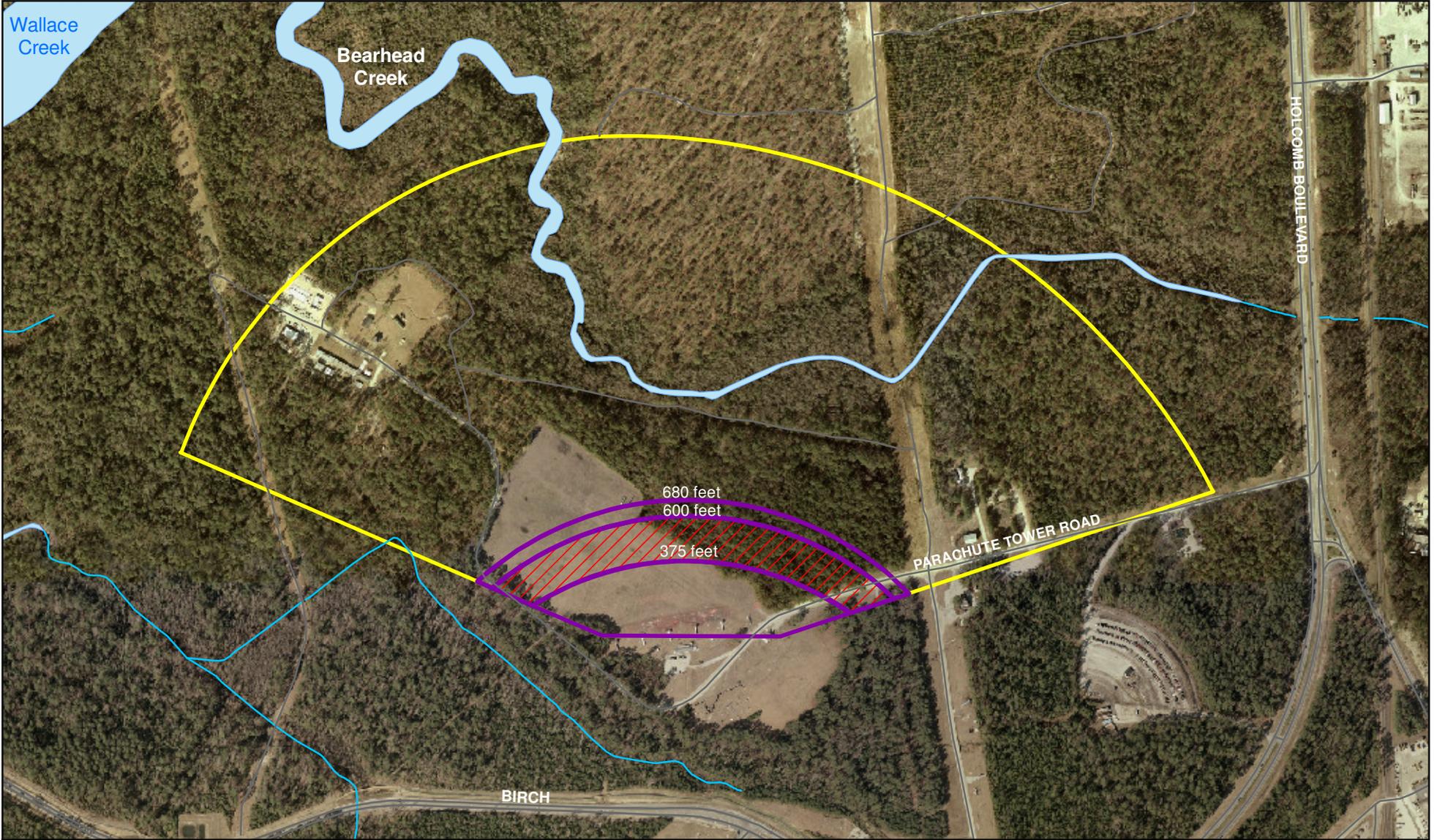


Figure 1-1
Site Map
D-9 Skeet Range
MCB Camp Lejeune, North Carolina



Legend

- Road
- Surface Water Course Centerline
- Theoretical Skeet Shot Fall Zone
- ▨ Area of Maximum Skeet Shot Fall
- Surface Water Body Area
- Skeet Range - furthest extent

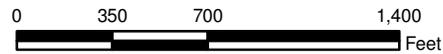
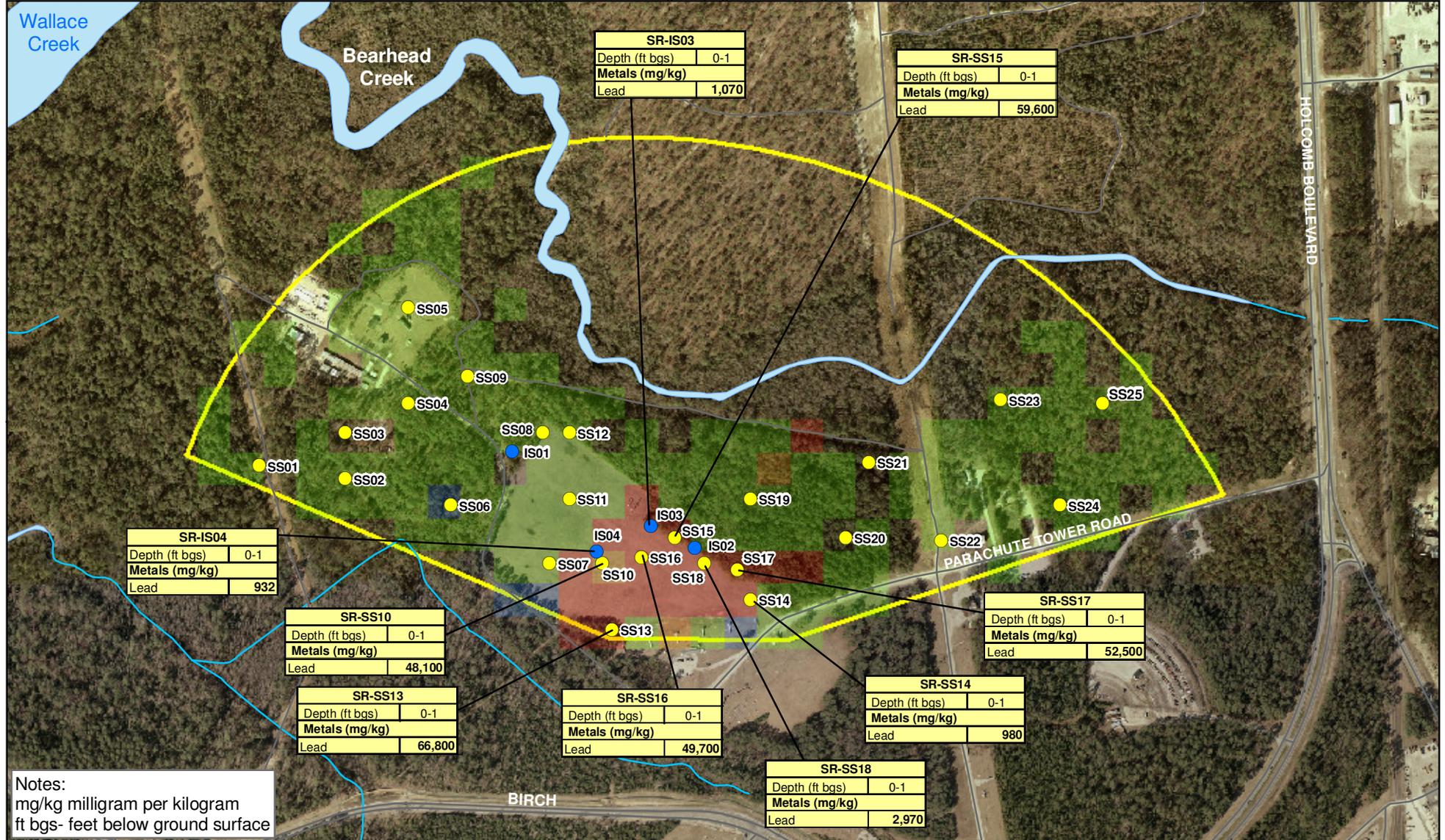


Figure 1-2
Theoretical Shot Fall Zone
D-9 Skeet Range
MCB Camp Lejeune, North Carolina



Notes:
mg/kg milligram per kilogram
ft bgs- feet below ground surface

Legend

- DPT Soil Boring/ Temporary Well
- Surface Soil Sample
- Road
- Surface Water Course Centerline
- Surface Water Body Area
- Skeet Range - furthest extent

Lead Concentration (ppm)

0 - 8
9 - 269
270 - 399
400 - 799
>= 800

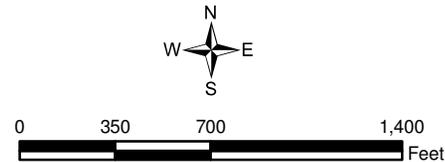
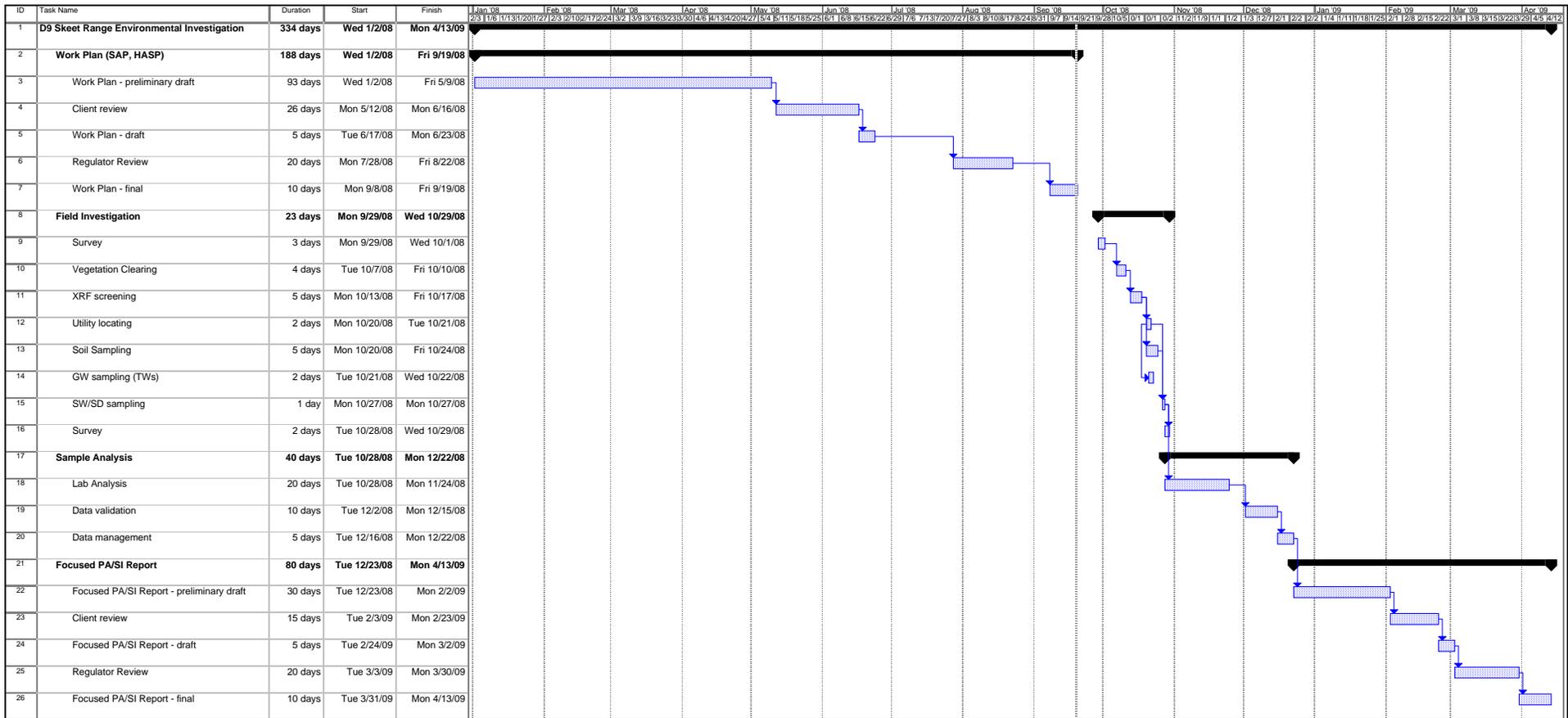
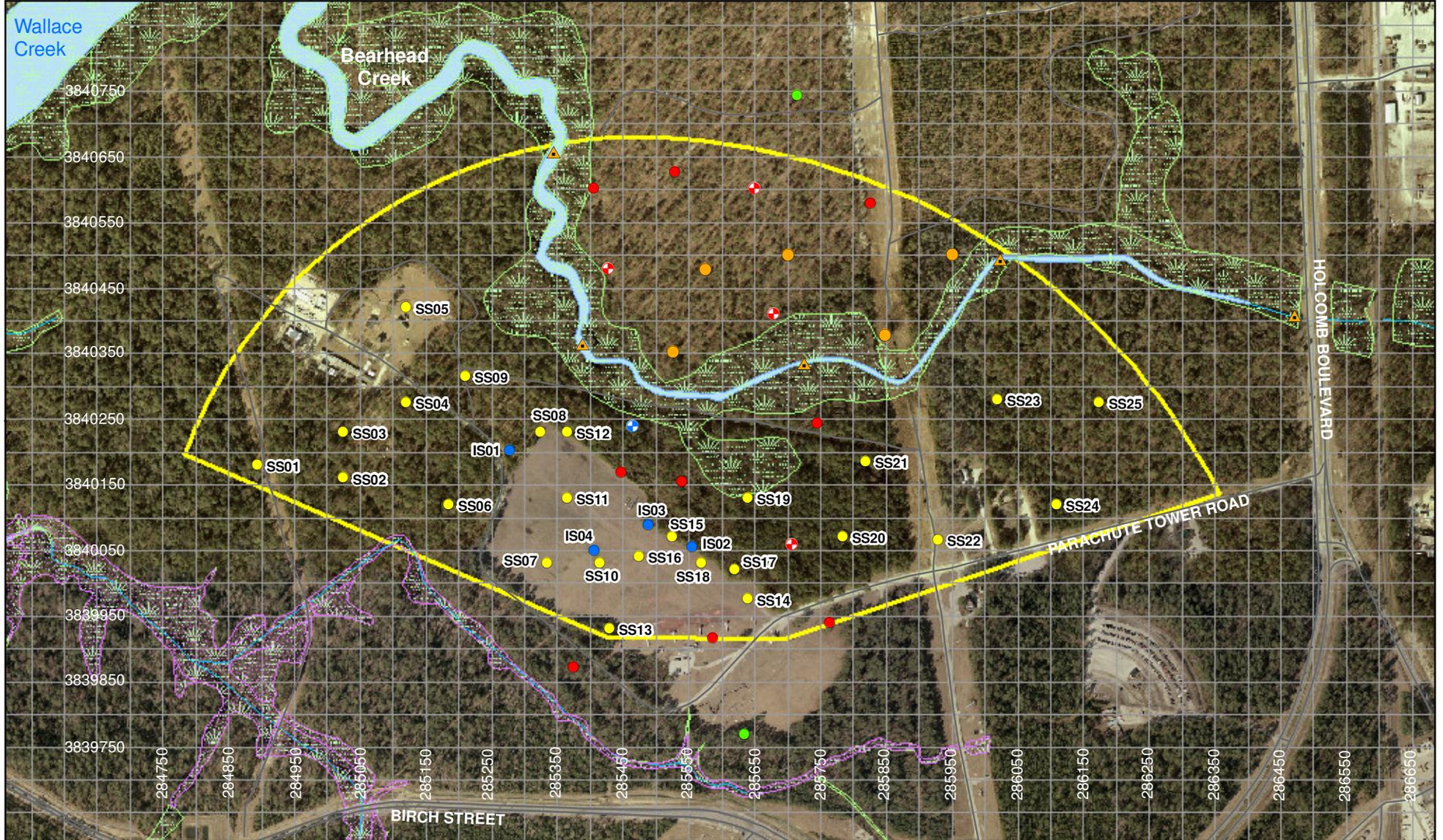


Figure 1-3
June/July 2007
XRF Screening and Sampling Results
Exceedances - Region IX Industrial PRGs
D-9 Skeet Range
MCB Camp Lejeune, North Carolina



Task Split Progress Milestone Summary Project Summary External Tasks External Milestone Deadline

Figure 2-1
Project Schedule - D-9 Skeet Range
MCB Camp Lejeune, North Carolina



Legend

- Proposed Background Sample
- Proposed Surface Soil Sample
- Proposed Surface/Subsurface Soil Sample
- ⊕ Proposed Surface/Subsurface Soil Sample and Temporary Well
- ⊕ Proposed Subsurface Soil and Temporary Well
- ▲ Proposed Surface Water and Sediment Sample
- Previous DPT Soil Boring/ Temporary Well
- Previous Surface Soil Sample
- Road
- Surface Water Course Centerline
- Surface Water Body Area
- Jurisdictional Wetland Area
- Planning Wetland Areas
- Skeet Range - furthest extent

□ 50 Meter Grid



1 inch equals 700 feet

Figure 3-1
Sampling Grid and New Sample Locations
D-9 Skeet Range
MCB Camp Lejeune
North Carolina



Appendix A
Health and Safety Plan

CH2M HILL HEALTH AND SAFETY PLAN

This Health and Safety Plan (HASP) will be kept on the site during field activities and will be reviewed as necessary. The plan will be amended or revised as project activities or conditions change or when supplemental information becomes available. The plan adopts, by reference, the Standards of Practice (SOPs) in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual*, as appropriate. In addition, this plan adopts procedures in the project Work Plan. The Safety Coordinator- Haz Waste (SC-HW) is to be familiar with these SOPs and the contents of this plan. CH2M HILL's personnel and subcontractors must sign Attachment 1.

Project Information and Description

PROJECT NO: 363366

CLIENT: NAVFAC

PROJECT/SITE NAME: Multi-Media TO-009 / MCB Camp Lejeune, MRP Construction Support, MILCON Site D-9 Skeet Range, Active Base Skeet Range

SITE ADDRESS: Jacksonville, North Carolina

CH2M HILL PROJECT MANAGER: Jessica Skeean/CLT

CH2M HILL OFFICE: Charlotte

DATE HEALTH AND SAFETY PLAN PREPARED: December 10, 2007

DATE(S) OF SITE WORK: February through March 2008

SITE ACCESS: Access to all sites is restricted. Base Skeet Range may be accessed through the Stone Bay Gate or the Piney Green Road Gate (contractor's entrance) on the east side of the New River.

SITE SIZE: MCB, Camp Lejeune is approximately 236 square miles. The Base Skeet Range, subject of the construction support activities, is located on approximately 149 acres of land.

SITE TOPOGRAPHY: The topography of MCB Camp Lejeune is relatively flat with ground surface elevations ranging from mean sea level (msl) to 72 feet above msl. Most of the MCB Camp Lejeune lies between 20 and 40 feet msl.

PREVAILING WEATHER: The climate at MCB, Camp Lejeune is characterized by mild winters and hot humid summers. Winters are usually short and mild with occasional and short duration cold periods. Summers are long, hot and humid. Average annual net precipitation is approximately 50 inches. Ambient air temperatures generally range from 33 to 53 degrees Fahrenheit (°F) in the winter months, and 71°F to 88°F during the summer months. Winds are generally south-southwesterly in the summer, and north-northwesterly in the winter (Water and Air Research, 1983). The hurricane season in the immediate area surrounding Camp Lejeune begins on June 1 and continues through November 30. Storms of non-tropical origins such as frontal passages, local thunderstorms, and tornadoes are more frequent and can occur year-round.

BASE HISTORY: Construction of MCB, Camp Lejeune began in 1941 with the objective of developing the "World's Most Complete Amphibious Training Base". Construction of the Base started at Hadnot Point where the major functions of the Base are centered. During World War II, MCB, Camp Lejeune was used as a training area to prepare Marines for combat. MCB, Camp Lejeune was again used for training during the Korean and Vietnam conflicts, and the Gulf War. MCB, Camp Lejeune is host to five Marine Corps commands and one Navy command. In addition, MCB Camp Lejeune provides support and training for the following tenet commands: Headquarters Nucleus; Second Marine Expeditionary Force; Second Marine Division; Second Marine Force Service Support Group; Second Marine Surveillance, Reconnaissance, and Intelligence Group;

Sixth Marine Expeditionary Brigade; the Naval Hospital; and the Naval Dental Clinic. All of the real estate and infrastructure are owned, operated, and maintained by the host command. The mission of Camp Lejeune is to maintain combat ready units for expeditionary deployment.

MCB, Camp Lejeune is bisected by the New River, which flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean. The Atlantic Ocean forms the southeastern boundary of the facility. The western and northwestern boundaries are U.S. Route 17 and State Route 24, respectively. The City of Jacksonville, North Carolina is located immediately northwest of MCB, Camp Lejeune.

A majority of the land surrounding the facility is used for agriculture. Estuaries along the coast support commercial fishing and residential resort areas are located adjacent to MCB, Camp Lejeune along the Atlantic Ocean.

MCB Camp Lejeune is planning the construction of an operations and housing complex, messhall and extended parking area, covering approximately 100 acres, on the northeast corner of McHugh Blvd. and Birch Street.

SITE DESCRIPTION: The Skeet Range Site, also referred to in the Range Identification and Preliminary Assessment (USACE, 2001) as Range D-9, is approximately 149 acres in size and is located north of the Hadnot Point area of Base, within the boundary of Holcomb Boulevard to the east, Birch Street to the south, McHugh Boulevard to the west, and Wallace Creek to the north. The Site encompasses the furthest extent of all historic skeet range boundaries and includes portions of Parachute Tower Road to the south and Bearhead Creek within the northern portion of the Site (**Figure 1-1**). The site topography generally slopes toward Bearhead Creek from both the north and the south, with a change in elevation of approximately 20 feet and 15 feet respectively between the north and south boundaries and the creek.

Several structures are located within the boundary of the Skeet Range Site, including a contractor's field trailer and a waste holding/characterization facility within the east portion of the site, and parachute towers and skeet disc firing structures to the south. The west portion of the fan of the Skeet Range Site also includes a K9 unit facility, K9 graveyard, and a research lab and dump site, operational in the 1950's, since closed and classified as RCRA facilities.

Based on a review of the aerial photograph (**Figure 1-2**) and site reconnaissance, it is assumed that the proposed MILCON area is primarily wooded with undergrowth as well as wetlands on either bank of Bearhead Creek. Access to the site is limited by few paths within the northern portion of the site, as well as a relatively wide right-of-way, containing above-ground utility lines, following a northerly direction that bisects the site. The presence of underground utilities is unknown. Bearhead Creek, however, is wide enough that it cannot be crossed within any portion of the site and there are no bridges or other crossing points along this waterway. Investigative activities have been completed south of the creek under CTO-169; this investigation will focus on the impacted areas identified during the CTO-169 investigation, the uninvestigated wetlands area, and an approximately 50 acre area north of the creek within the construction footprint.

The site has potential to include hazardous or toxic waste (HTW). Limited soil sampling in the vicinity of the Skeet Range was conducted during the AOC Background Study in 2001 and reported Lead concentrations in the surface soil as high as 120 mg/kg. The nearest known monitoring wells in proximity to the proposed MILCON area are at least 2500 feet southwest of Skeet Range, with no wells north, east, or west of the range. Therefore, there is no existing data concerning site lithology, hydrogeology, and groundwater quality in the immediate area of any of the investigations.

DESCRIPTION OF SPECIFIC TASKS TO BE PERFORMED:

Due to historical activities within the project area, potential impacts to soil and groundwater will be assessed within this portion of the proposed MILCON area under the munitions response program (MRP) prior to construction. The following objectives will be accomplished during the construction support activities:

1. Clear vegetation (up to 5 acres) in order to allow environmental field work to proceed.
2. Evaluate the presence and nature of HTW and MC contamination that may exist at the proposed MILCON area by conducting an investigation of the soil, groundwater, surface water, and sediment.
3. Conduct ecological and human health risk screenings using analytical data collected at the D-9 Skeet Range.

Site Map

**This page is reserved for a Site Map.
(Refer to attached Figures 1-1 and 1-2)**

Table of Contents

CH2M HILL HEALTH AND SAFETY PLAN	I
PROJECT INFORMATION AND DESCRIPTION	I
SITE MAP.....	III
1 TASKS TO BE PERFORMED UNDER THIS PLAN.....	1
1.1 DESCRIPTION OF TASKS	1
1.1.1 Hazwoper-Regulated Tasks	1
1.1.2 Non-HAZWOPER-Regulated Tasks	1
1.2 TASK HAZARD ANALYSIS	2
2 HAZARD CONTROLS	3
2.1 GENERAL HAZARDS.....	4
2.1.1 General Practices and Housekeeping.....	4
2.1.2 Hazard Communication	5
2.1.3 Shipping and Transportation of Chemical Products	5
2.1.4 Lifting	5
2.1.5 Slips, Trips and Falls Hazards	5
2.1.6 Excavations Hazards.....	6
2.1.7 Heavy Equipment Operational Hazards	6
2.1.8 Hand and Power Tool Hazards	6
2.1.9 Vehicle Operations Hazards	7
2.1.10 Material Handling Equipment Hazards	7
2.1.11 Fire Prevention	8
2.1.12 Electrical.....	8
2.1.13 Heat Stress	9
2.1.14 Cold Stress	10
2.1.15 Procedures for Locating Buried Utilities	11
2.2 BIOLOGICAL HAZARDS AND CONTROLS.....	12
2.2.1 Snakes.....	12
2.2.2 Poison Ivy and Poison Sumac.....	12
2.2.3 Ticks	12
2.2.4 Tick Analysis Procedure for Lyme disease	13
2.2.5 Bees and Other Stinging Insects	13
2.2.6 Bloodborne Pathogens	13
2.2.7 Mosquito Bites.....	13
2.2.8 Fire Ant Bites.....	14
2.3 MUNITIONS AND EXPLOSIVES OF CONCERN HAZARDS AND CONTROLS.....	14
2.3.1 Possible Munitions and Explosives of Concern	14
2.3.2 Hazard Mitigation.....	14
2.3.3 Types of Explosives to be used on Site	15
2.3.4 Explosives Storage, Transportation and Management.....	15
2.3.5 MEC Avoidance Procedures.....	15
2.4 CONTAMINANTS OF CONCERN	16
3 PROJECT ORGANIZATION AND PERSONNEL	19
3.1 CH2M HILL EMPLOYEE MEDICAL SURVEILLANCE AND TRAINING	19
3.2 FIELD TEAM CHAIN OF COMMAND AND COMMUNICATION PROCEDURES	19
3.2.1 Client	19
3.2.2 CH2M HILL	19
3.2.3 CH2M HILL Subcontractors	20

3.2.4	Contractors.....	20
4	PERSONAL PROTECTIVE EQUIPMENT (PPE)	19
5	AIR MONITORING/SAMPLING	19
5.1	AIR MONITORING SPECIFICATIONS	19
5.2	CALIBRATION SPECIFICATIONS	20
5.3	AIR SAMPLING	20
6	DECONTAMINATION.....	19
6.1	DECONTAMINATION SPECIFICATIONS	19
6.2	DIAGRAM OF PERSONNEL-DECONTAMINATION LINE.....	19
7	SPILL-CONTAINMENT PROCEDURES	20
8	SITE-CONTROL PLAN.....	21
8.1	SITE-CONTROL PROCEDURES.....	21
8.2	HAZWOPER COMPLIANCE PLAN.....	21
9	EMERGENCY RESPONSE PLAN.....	22
9.1	PRE-EMERGENCY PLANNING	22
9.2	EMERGENCY EQUIPMENT AND SUPPLIES.....	22
9.3	INCIDENT RESPONSE	22
9.4	EMERGENCY MEDICAL TREATMENT	23
9.5	EVACUATION	23
9.6	EVACUATION SIGNALS.....	23
9.7	INCIDENT NOTIFICATION AND REPORTING.....	23
9.8	EMERGENCY CONTACTS	24
10	APPROVAL.....	25
10.1	ORIGINAL PLAN	25
10.2	REVISIONS	25
11	ATTACHMENTS.....	26
ATTACHMENT 1:	EMPLOYEE SIGNOFF FORM – FIELD SAFETY INSTRUCTIONS	
ATTACHMENT 2:	PROJECT-SPECIFIC CHEMICAL PRODUCT HAZARD COMMUNICATION FORM	
ATTACHMENT 3:	CHEMICAL-SPECIFIC TRAINING FORM	
ATTACHMENT 4:	EMERGENCY CONTACTS	
ATTACHMENT 5:	PROJECT H&S FORMS/PERMITS	
ATTACHMENT 6:	PROJECT ACTIVITY SELF-ASSESSMENT CHECKLISTS	
ATTACHMENT 7:	APPLICABLE MATERIAL SAFETY DATA SHEETS	
ATTACHMENT 8:	BEHAVIOR BASED LOSS PREVENTION SYSTEMS	

1 Tasks to be performed under this Plan

1.1 Description of Tasks

(Reference Field Project Start-up Form)

Refer to project documents (i.e., Work Plan) for detailed task information. A health and safety risk analysis (Section 1.2) has been performed for each task and is incorporated in this plan through task-specific hazard controls and requirements for monitoring and protection. Tasks other than those listed below require an approved amendment or revision to this plan before tasks begin. Refer to Section 8.2 for procedures related to “clean” tasks that do not involve hazardous waste operations and emergency response (Hazardous Waste Operations).

1.1.1 Hazardous Waste Operations-Regulated Tasks

- Direct-push technology (DPT) soil boring
- Groundwater sampling
- Surface and subsurface soil sampling
- Vegetation Clearing

1.1.2 Non-HAZWOPER-Regulated Tasks

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

1.2 Task Hazard Analysis

(Refer to Section 2 for hazard controls)

POTENTIAL HAZARDS	TASKS					
	DPT Soil Boring	Vegetation Clearing	Surface Water Sampling	Soil Sampling	Groundwater Sampling	Sediment Sampling
Flying debris/objects	X	X				
Noise > 85dBA	X	X				
Electrical	X	X		X	X	
Suspended loads	X					
Buried utilities, drums, tanks	X					
Slip, trip, fall	X	X	X	X	X	X
Back injury	X		X	X	X	X
Confined space entry						
Trenches / excavations						
Visible lightning	X	X	X	X	X	X
Vehicle traffic	X			X	X	
Elevated work areas/falls	X	X				
Fires						
MEC						
Entanglement	X	X				
Drilling	X					
Heavy equipment	X	X				
Working near water			X			X
Working from boat			X			
IDW Drum Sampling	X			X	X	

2 Hazard Controls

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

In addition to the controls specified in this section, Project-Activity Self-Assessment Checklists are contained in Attachment 6. These checklists are to be used to assess the adequacy of CH2M HILL and subcontractor site-specific safety requirements. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. Self-assessment checklists should be completed early in the project, when tasks or conditions change, or when otherwise specified by the HSM. The self-assessment checklists, including documented corrective actions, should be made part of the permanent project records, and be promptly submitted to the HSM.

Principles

Risk management is, and will continue to be, integrated into the planning, preparation, and execution of work on all operational sites during this project. Risk management is a dynamic process that continuously improves as personnel become familiar with site operations, the equipment, the environment, and such. Personnel are urged to continuously identify hazards and assess accident risks. Once identified, these hazards will be brought to the attention of the supervisor and/or the Project Manager (PM). Control measures will be developed and coordinated. All personnel are responsible for continuously assessing variable hazards and implementing risk controls.

Constraints

Risk management does not convey authority to violate the law or deliberately disobey local, state, or national laws. Neither does it justify bypassing risk controls required by the law, such as life safety and fire protection codes, physical security, and transport and disposal of hazardous material and waste.

Risk Management Process

The risk management process will be used by all personnel involved in the operations of the project. Every individual is responsible for the safety of operations and the identification of potential hazards. The SC-HW will cover all aspects of the appropriate AHA prior to that activity being conducted and ensure that all personnel understand the engineering controls being used and the personal protective equipment (PPE) that is issued. During operations, if any new hazards are identified or it is determined that the engineering controls or PPE are not appropriate, operations will cease and the following risk management process will be used to determine the appropriate course of action. The final actions or changes will be coordinated through the HSM and the PM. Prior to the changes being placed into effect, a written and approved change document will be in place.

The AHAs and the pre-task safety plans are key elements to this process. All personnel are required to read and understand each document. This shall be accomplished in the morning safety briefing and again at the daily debriefing to bring out any changes or discrepancies in the process.

Step 1 - Identify hazards.

Tasks, terrain and weather, biological hazards, chemical/explosive hazards, physical hazards, health hazards, lack of resources, physical and emotional health of personnel, long-term project, and lack of planning time.

Step 2 - Assess hazards to determine risks.

Hazard Probability: The possibility of any hazard that may be present having an effect on personnel H&S or the working environment.

Hazard Severity: The severity of the impact on personnel if they were exposed to the hazard without any engineering controls or PPE. The severity can range from negligible to severe, which could cause loss of life.

Step 3 - Develop controls and make risk decisions.

Engineering Controls - Engineering controls are the most effective means to eliminate a hazard. Through engineering controls, the unpredictable human element is removed from the equation. Engineering controls can include such measures as barriers and guards, substitution, distance, or other measures to separate personnel from existing hazards.

Personal Protective Equipment - Where engineering controls cannot eliminate the hazard, PPE will be used in conjunction with engineering controls to prevent the hazardous exposure from impacting personnel.

Administrative Controls - Administrative controls are used to supplement engineering controls and PPE to ensure that the controls in place are working as planned. Administrative controls include training and education of the workforce, monitoring, standard operating procedures, inspection program, and signs to warn individuals that a hazard exists. Oversight personnel responsible for locating specific hazards fall into this category.

Avoidance - Avoidance controls are applied when positive action is required to prevent contact with an identified hazard.

Criteria for controls - To be effective, each control developed must meet the following criteria:

Suitability - It must remove the hazard or mitigate (reduce) the residual risk to an acceptable level.

Feasibility - Personnel must have the capability to implement the control.

Acceptability - The benefit gained by implementing the control must justify the cost in resources and time.

Step 4 - Implement controls.

Controls are converted into clear, simple execution orders understood at all levels.

Personnel are trained to ensure understanding of controls.

Step 5 - Supervise and evaluate.

Supervisors ensure controls are followed.

Project-specific frequency for completing self-assessments: Bi-weekly or at the beginning of each project phase.

2.1 General Hazards

2.1.1 General Practices and Housekeeping

(Reference CH2M HILL SOP HS-209, *General Practices*)

- Site work should be performed during daylight hours whenever possible. Work conducted during hours of darkness requires enough illumination intensity to read a newspaper without difficulty.
- Good housekeeping must be maintained at all times in all project work areas.
- Common paths of travel should be established and kept free from the accumulation of materials.
- Keep access to aisles, exits, ladders, stairways, scaffolding, and emergency equipment free from obstructions.
- Provide slip-resistant surfaces, ropes, and/or other devices to be used.

- Specific areas should be designated for the proper storage of materials.
- Tools, equipment, materials, and supplies shall be stored in an orderly manner.
- As work progresses, scrap and unessential materials must be neatly stored or removed from the work area.
- Containers should be provided for collecting trash and other debris and shall be removed at regular intervals.
- All spills shall be quickly cleaned up. Oil and grease shall be cleaned from walking and working surfaces.

2.1.2 Hazard Communication

(Reference CH2M HILL SOP HS-107, *Hazard Communication*)

The SSC is to perform the following:

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

2.1.3 Shipping and Transportation of Chemical Products

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

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

2.1.4 Lifting

(Reference CH2M HILL SOP HS-112, *Lifting*)

- Proper lifting techniques must be used when lifting any object.
 - Plan storage and staging to minimize lifting or carrying distances.
 - Split heavy loads into smaller loads.
 - Use mechanical lifting aids whenever possible.
 - Have someone assist with the lift -- especially for heavy or awkward loads.
 - Make sure the path of travel is clear prior to the lift.

2.1.5 Slips, Trips and Falls Hazards

Project sites may contain hazards that pose potential slip, trip and fall hazards to workers, such as:

- Holes, pits or ditches
- Slippery surfaces
- Steep grades
- Uneven ground
- Debris and sharp objects

Site personnel will be instructed to look for potential slip, trip and fall hazards. Take measures to correct the hazards, if possible, and notify the UXOSO and other team members if the hazards cannot be corrected.

2.1.6 Excavations Hazards

Excavation operations may be performed in support of intrusive anomaly investigations and MEC mechanical sifting and separation operations. Excavations for the MEC mechanical sifting and separation will be performed in no more than 2-foot increments until no anomalies are detected using the screening methods. Should excavations greater than 4 feet in depth be generated, the following hazard control measures will be implemented:

- 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 (1.5 meters) deep and there is no indication of possible cave-in, as determined by the excavation competent person.
- Trenches greater than 4 feet deep shall have a ladder, stairway, or ramp positioned so that the maximum lateral travel distance is no more than 25 feet.
- Excavations will not be entered unless necessary and only after the competent person has completed the daily inspection and has authorized entry.

2.1.7 Heavy Equipment Operational Hazards

Heavy equipment may be used during mobilization, vegetation removal, excavation of soil for mechanical sifting and separation, site restoration, and demobilization. Heavy equipment on site will be operated in compliance with the following general policies:

- Only authorized, licensed drivers shall be permitted to operate equipment.
- Operators shall wear seatbelts.
- Equipment must be checked at the beginning of each shift to ensure the equipment is in safe operating condition and free of apparent damage. The check should include service brakes, parking brakes, emergency brakes, tires, horn, back-up alarm, steering mechanism, coupling devices, seat belts and operating controls.
- Equipment shall not be used to lift personnel; loads shall not be lifted over the heads of personnel.
- When equipment is unattended, the motor must be shut off, brakes set, blades/buckets landed, and shift lever in neutral position.
- Equipment that is operating in reverse must have a reverse signal alarm distinguishable from the surrounding noise or a signal person when the operator's view is obstructed.
- When not in operation, the blade/bucket must be blocked or grounded; the master clutch must be disengaged when the operator leaves the cab.
- Qualified UXO personnel will survey areas that require the removal of previously undisturbed soil or material before intrusive actions are performed.
- Operators of earth-moving equipment must be observant of MEC when performing operations in or around stockpiled materials from excavations or performing any intrusive operations on previously undisturbed areas. If MEC is suspected, operations will be halted until the items are investigated and the UXO qualified individual declares the area clear.

2.1.8 Hand and Power Tool Hazards

Hand and power tools may be used during tasks on the project. All hand and power tools will be used in compliance with the following basic policies:

- Operate all tools according to the manufacturer's instructions and within design limitations.
- Maintain all hand and power tools in a safe condition.

- Inspect and test tools before use. If a tool is found to be defective, it is to be tagged “Do Not Use” and removed from service until repaired.
- Use PPE, such as gloves, safety glasses, earplugs, and face shields, when exposed to a hazard from the tool.
- Do not carry or lower power tools by the cord or hose.
- Disconnect tools from energy sources when not in use, before servicing and cleaning, and when changing accessories such as blades, bits, and cutters.
- Do not remove safety guards on tools while the tool is in use and promptly replace after repair or maintenance has been performed.
- When using a knife or blade tool, stroke or cut away from the body with a smooth motion, taking care not to use excessive force that could damage tool, material being cut, or unprotected hands.

2.1.9 Vehicle Operations Hazards

All vehicle operators will have a valid driver’s license and will operate the vehicles within the following guidelines:

- Vehicle operators will perform daily operational checks prior to operation.
- The principles of defensive driving shall be practiced at all times.
- Seat belts shall be installed and worn at all times while the vehicle is in operation.
- The operator shall have the vehicle under control at all times and able to bring the vehicle to a complete stop within a safe stopping distance.
- Vehicles may not be driven faster than the posted speed limit or for the terrain and weather conditions in which they are being operated.
- Vehicles will not be left unattended until the motor is shut off and the parking brake is set.
- Keys may be left in vehicles parked in the exclusion zone (EZ) to allow for emergency evacuation and use.
- A copy of the emergency evacuation routes and emergency telephone numbers will be in each vehicle used onsite.
- All vehicles in the EZ will have at least one fire extinguisher rated at a minimum of 10BC.
- Vehicles transporting explosives will comply with federal, state and local requirements for the transportation of hazardous materials.

2.1.10 Material Handling Equipment Hazards

Material handling equipment may be used at any time during a project as required. The following general guidelines will be enforced:

- 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 ride equipment unless it is designed to accommodate passengers and is 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.

2.1.11 Fire Prevention

(Reference CH2M HILL SOP HS-208, *Fire Prevention*)

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

2.1.12 Electrical

(Reference CH2M HILL SOP HS-206 *Electrical Safety*)

- Only qualified personnel are permitted to work on unprotected energized electrical systems.
- Only authorized personnel are permitted to enter high-voltage areas.
- Do not tamper with electrical wiring and equipment unless qualified to do so. All electrical wiring and equipment must be considered energized until lockout/tagout procedures are implemented.
- Inspect electrical equipment, power tools, and extension cords for damage prior to use. Do not use defective electrical equipment, remove from service.
- All temporary wiring, including extension cords and electrical power tools, must have ground fault circuit interrupters (GFCIs) installed.
- Extension cords must be:
 - equipped with third-wire grounding.
 - covered, elevated, or protected from damage when passing through work areas.
 - protected from pinching if routed through doorways.
 - not fastened with staples, hung from nails, or suspended with wire.
- Electrical power tools and equipment must be effectively grounded or double-insulated UL 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 from overhead power lines for voltages of 50 kV or less, and 10 feet plus ½ inch 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.

2.1.13 Heat Stress

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

- Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50°F to 60°F should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons per day. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours.
- Acclimate yourself by slowly increasing workloads (e.g., do not begin with extremely demanding activities).
- Use cooling devices, such as cooling vests, to aid natural body ventilation. These devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.
- Avoid direct sun whenever possible, which can decrease physical efficiency and increase the probability of heat stress. Take regular breaks in a cool, shaded area. Use a wide-brim hat or an umbrella when working under direct sun for extended periods.
- Provide adequate shelter/shade to protect personnel against radiant heat (sun, flames, hot metal).
- Maintain good hygiene standards by frequently changing clothing and showering.
- Observe one another for signs of heat stress. Persons who experience signs of heat syncope, heat rash, or heat cramps should consult the SSC/DSC to avoid progression of heat-related illness.

Monitoring Heat Stress

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

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

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

2.1.14 Cold Stress

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

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

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

2.1.15 Procedures for Locating Buried Utilities

Do not begin subsurface construction activities (e.g., trenching, excavation, drilling, etc.) until a check for underground utilities and similar obstructions has been conducted. The use of as-built drawings and utility company searches must be supplemented with a geophysical or other survey by a qualified, independent survey contractor to identify additional and undiscovered buried utilities.

Examples of the type of geophysical technologies include:

- **Ground Penetrating Radar (GPR)**, which can detect pipes, including gas pipes, tanks, conduits, cables etc, both metallic and non-metallic at depths up to 30 feet depending on equipment. Sensitivity for both minimum object size and maximum depth detectable depends on equipment selected, soil conditions, etc.
- **Radio Frequency (RF)**, involves inducing an RF signal in the pipe or cable and using a receiver to trace it. Some electric and telephone lines emit RF naturally and can be detected without an induced signal. This method requires knowing where the conductive utility can be accessed to induce RF field if necessary.
- **Dual RF**, a modified version of RF detection using multiple frequencies to enhance sensitivity but with similar limitations to RF
- **Ferromagnetic Detectors**, are metal detectors that will detect ferrous and non-ferrous utilities. Sensitivity is limited, e.g. a 100 mm iron disk to a depth of about one meter or a 25 mm steel paper clip to a depth of about 20 cm.
- **Electronic markers**, are emerging technologies that impart a unique electronic signature to materials such as polyethylene pipe to facilitate location and tracing after installation. Promising for future installations but not of help for most existing utilities already in place.

Procedure

The following procedures shall be used to identify and mark underground utilities during subsurface construction activities on the project:

- The survey contractor shall determine the most appropriate geophysical technique or combinations of techniques to identify the buried utilities on the project, based on the survey contractor's experience and expertise, types of utilities anticipated to be present and specific site conditions.
- The survey contractor shall employ the same geophysical techniques used on the project to identify the buried utilities, to survey the proposed path of subsurface construction work to confirm no buried utilities are present.

- Identify customer specific permit and/or procedural requirements for excavation and drilling activities. For military installations contact the Base Civil Engineer and obtain the appropriate form to begin the clearance process.
- Contact utility companies or the state/regional utility protection service at least two (2) working days prior to excavation activities to advise of the proposed work, and ask them to establish the location of the utility underground installations prior to the start of actual excavation.
- Schedule the independent survey.
- Obtain utility clearances for subsurface work on both public and private property.
- Clearances are to be in writing, signed by the party conducting the clearance.
- Underground utility locations must be physically verified by hand digging using wood or fiberglass-handled tools when any adjacent subsurface construction activity (e.g. mechanical drilling, excavating) work is expected to come within 5 feet of the marked underground system. If subsurface construction activity is within 5 feet and parallel to a marked existing utility, the utility location must be exposed and verified by hand digging every 100 feet.
- Protect and preserve the markings of approximate locations of facilities until the markings are no longer required for safe and proper excavations. If the markings of utility locations are destroyed or removed before excavation commences or is completed, the Project Manager must notify the utility company or utility protection service to inform them that the markings have been destroyed.
- Conduct a site briefing for employees regarding the hazards associated with working near the utilities and the means by which the operation will maintain a safe working environment. Detail the method used to isolate the utility and the hazards presented by breaching the isolation..
- Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon during drilling or change in color, texture or density during excavation that could indicate the ground has been previously disturbed).

2.2 Biological Hazards and Controls

2.2.1 Snakes

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

2.2.2 Poison Ivy and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Become familiar with the identity of these plants. 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.

2.2.3 Ticks

Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray **only outside** of clothing with permethrin or permethrin and spray skin with only DEET; and check yourself frequently for ticks.

If bitten by a tick, grasp it at the point of attachment and carefully remove it. After removing the tick, wash your hands and disinfect and press the bite areas. Save the removed tick. Report the bite to human resources. Look for symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: a rash might appear that looks like a bullseye with a small welt in the center. RMSF: a rash of red spots under the skin 3 to 10 days after the tick bite. In both cases, chills, fever, headache, fatigue, stiff neck, and bone pain may develop. If symptoms appear, seek medical attention.

2.2.4 Tick Analysis Procedure for Lyme disease

1. For tick removal, follow the instructions in your tick removal kit using a fine pointed pair of tweezers. If the tick is alive, place it in two layered zip-lock bags. It is highly recommended that you wear gloves when removing the tick from the skin to avoid infection.
2. It is important to remove the entire tick and place it in a zip lock bag.
3. Place the zip-lock bag in an envelope and fill out the sample submission form from the Clongen website. Please identify yourself as a CH2M HILL employee by completing all the contact information in the form. The cost of the analysis will be paid for; you do not have to use a credit card or check. The account will be assigned a blanket PO and billed directly to Health Resources for payment.
4. In 1 – 3 days, you will be contacted to discuss the results of your tick testing and any necessary treatment. In the mean time, should your current condition change in any way, please contact the Health Resources Nurse Case Manager who assisted you.

2.2.5 Bees and Other Stinging Insects

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

2.2.6 Bloodborne Pathogens

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

Exposure to bloodborne pathogens may occur when rendering first aid or CPR, or when coming into contact with landfill waste or waste streams containing potentially infectious material. Exposure controls and personal protective equipment (PPE) are required as specified in CH2M HILL SOP HS-36, *Bloodborne Pathogens*. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.

2.2.7 Mosquito Bites

Due to the recent detection of the West Nile Virus in the Southeastern United States it is recommended that **preventative measures** 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 DEET since mosquitoes may bite through thin clothing.
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35% DEET (N,N-diethyl-meta-toluamide). DEET in high concentrations (greater than 35%) provides no additional protection.

- Repellents may irritate the eyes and mouth, so avoid applying repellent to the hands.
- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's DIRECTIONS FOR USE, as printed on the product.

Note: Vitamin B and "ultrasonic" devices are NOT effective in preventing mosquito bites.

Symptoms of Exposure to the West Nile Virus

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

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

If you have any questions or to report any suspicious symptoms, contact the project Health and Safety Manager.

2.2.8 Fire Ant Bites

Fire ants are common in the southern U.S. These insects typically build mounds on the land surface that are usually easy to identify. Avoid disturbing these mounds. A bite from a fire ant can be painful but rarely is life threatening. However, it is possible that the bite could cause an allergic reaction. If bitten, check for symptoms of an allergic reaction such as weakness, nausea, vomiting, dizziness, or shortness of breath. If symptoms appear, seek medical attention

2.3 Munitions and Explosives of Concern Hazards and Controls

2.3.1 Possible Munitions and Explosives of Concern

No documentation has been identified to indicate that MEC or material potentially presenting an explosive hazard (MPPEH) has ever been found at the D-9 Skeet Range Site.

The Active Base Skeet Range began operation in 1965-66. Based on a 1979 map, the range was originally located north of Parachute Tower Road, north of the current location.

Range D-9 is one of four live-fire ranges within a training area known as Area D. The range is used for recreational shooting and is operated by the base M CCS. The weapons accommodated include 12, 16, 20, 28, and 410 gauge shot guns. The sizes of lead shots used on the range include 7.5, 8, 8.5 and 9 lead shots. Although the total amounts of ammunition used on the skeet ranges are not available, it is estimated that several 100,000 are fired each year.

There are 10 firing points and 8 skeet houses on the range. White Flyer clays and biodegradable targets are the types of clay pigeons used on the skeet range. The fields are raked every 6 months to clear the clay pieces and the raked pieces are disposed of off site. However, accumulation of these elements in one specific area can affect the soil pH and vegetation growth

Materials potentially present in the surface soils at the site included small-arms such as buckshot. Limited soil sampling in the vicinity of the Skeet Range was conducted during an Area of Concern (AOC) Background Study in 2001, which reported Lead concentrations in the surface soil as 120 mg/kg.

Based on the activities conducted at the site, there should be no UXO present. Items that may be present at the site include: ammunition dunnage, range residue, skeet shots, barbed wire, and buried garbage. If MEC is encountered at the site, base UXO technicians will be contacted to properly handle the situation.

2.3.2 Hazard Mitigation

According to Mr. James Gagnon of the Natural Resources Conservation Service (NRCS), Edenton Technical Services Office, frost upheaval in the coastal plain region of North Carolina is considered unlikely since the climate only allows frost action to occur to a maximum depth of approximately 6 inches. No other natural

phenomena (e.g., drought, flooding, erosion, tidal changes) exist for this area. Therefore, migration of MEC (other than through human transport) is not considered likely.

2.3.3 Types of Explosives to be used on Site

No explosives are anticipated to be stored or used on the project site. During the course of this project, if MEC is encountered explosives storage and usage will be reassessed.

2.3.4 Explosives Storage, Transportation and Management

No explosives are anticipated to be stored or used on the project site.

2.3.5 MEC Avoidance Procedures

MEC avoidance operations will not be required during sampling operations based on known historical activity at the base. In the event of encountering MEC, base UXO technicians must be contacted. All MEC contacts and suspected MEC anomalies will be reported to the site manager who will in turn notify MCB Camp Lejeune personnel in accordance with contractual requirements.

2.4 Contaminants of Concern

(Refer to Project Files for more detailed contaminant information)

Contaminant	Location and Maximum ^a Concentration (ppm)	Exposure Limit ^b	IDLH ^c	Symptoms and Effects of Exposure	PIP ^d (eV)
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	GW: SB: SS:	NR	UN	Toxic by injection and ingestion.	NA
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	GW: SB: SS:	1.5 mg/m ³	50	Skin, eye, and mucous membrane irritant. Exposure can cause convulsions.	NA
1,3,5-Trinitrobenzene (1,3,5-TNB)	GW: SB: SS:	NR	UN	Toxic by injection and ingestion. Some mutagenic data reported.	NA
1,3-Dinitrobenzene (1,3-DNB)	GW: SB: SS:	1 mg/m ³	10	Toxic by skin contact. Liver and kidney damage. Damage to the central nervous system	NA
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	GW: SB: SS:	0.1 mg/m ³	5	Toxic by injection and ingestion. Some mutagenic and tetragenic data reported	NA
Nitrobenzene	GW: SB: SS:	1 ppm	25	Toxic by skin exposure. Skin, eye, and mucous membrane irritant. Respiratory disruption. Anemia	9.92
2,4,6-Trinitrotoluene (2,4,6-TNT)	GW: SB: SS:	0.5 mg/m ³	500	Toxic by skin exposure. Skin, eye, and mucous membrane irritant, Liver damage, jaundice. Cyanosis, dermal sensitization, sneezing, anemia, cardiac irregularity.	10.59
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	GW: SB: SS:	1.5 mg/m ³	50	Anoxia, cyanosis, anemia, jaundice, reproductive effects.	UN
2-Amino-4,6-dinitrotoluene (2-AM-DNT)	GW: SB: SS:	1.5 mg/m ³	50	Anoxia, cyanosis, anemia, jaundice, reproductive effects.	UN
2,4-Dinitrotoluene (2,4-DNT)	GW: SB: SS:	1.5 mg/m ³	50	Anoxia, cyanosis, anemia, jaundice, reproductive effects.	UN
2,6-Dinitrotoluene (2,6-DNT)	GW: SB: SS:	1.5 mg/m ³	50	Anoxia, cyanosis, anemia, jaundice, reproductive effects.	UN
2-Nitrotoluene (2-NT)	GW: SB: SS:	2 ppm	200	Anoxia, cyanosis, anemia, headache, lassitude, dizziness	9.45

2.4 Contaminants of Concern

(Refer to Project Files for more detailed contaminant information)

Contaminant	Location and Maximum ^a Concentration (ppm)	Exposure Limit ^b	IDLH ^c	Symptoms and Effects of Exposure	PIP ^d (eV)
3-Nitrotoluene (3-NT)	GW: SB: SS:	2 ppm	200	Anoxia, cyanosis, anemia, headache, lassitude, dizziness	9.45
4-Nitrotoluene (4-NT)	GW: SB: SS:	2 ppm	200	Anoxia, cyanosis, anemia, headache, lassitude, dizziness	9.45
Perchlorate	GW: SB: SS:	UK	UK	Irritants to skin, eyes, and mucous membranes.	NA
Arsenic	GW: SB: SS:	0.01 mg/m ³	5 Ca	Ulceration of nasal septum, respiratory irritation, dermatitis, gastrointestinal disturbances, peripheral neuropathy, hyperpigmentation	NA
Barium	GW: SB: SS:	0.5 mg/m ³	50	Skin and eye irritation, slowed pulse, skin burns, gastroenteritis	NA
Cadmium	GW: SB: SS:	0.005 mg/m ³	9 Ca	Pulmonary edema, coughing, chest tightness/pain, headache, chills, muscle aches, nausea, vomiting, diarrhea, difficulty breathing, loss of sense of smell, emphysema, mild anemia	NA
Chromium	GW: SB: SS:	0.5 mg/m ³	25	Irritated eyes, sensitization dermatitis, histologic fibrosis of lungs	NA
Lead	GW: SB: SS:	0.05 mg/m ³	100	Weakness lassitude, facial pallor, pal eye, weight loss, malnutrition, abdominal pain, constipation, anemia, gingival lead line, tremors, paralysis of wrist and ankles, encephalopathy, kidney disease, irritated eyes, hypertension	NA
Mercury	GW: SB: SS:	0.05 mg/m ³	10	Skin and eye irritation, cough, chest pain, difficult breathing, bronchitis, pneumonitis, tremors, insomnia, irritability, indecision, headache, fatigue, weakness, GI disturbance	NA
Selenium	GW: SB: SS:	0.2 mg/m ³	1	Skin and eye irritation, visual disturbance, metallic taste in the mouth, skin burns, dermatitis, chills.	NA
Silver	GW: SB: SS:	0.01 mg/m ³	1	Argyrosis, discoloration of skin and nail beds, cyanosis.	NA

2.4 Contaminants of Concern

(Refer to Project Files for more detailed contaminant information)

Contaminant	Location and Maximum ^a Concentration (ppm)	Exposure Limit ^b	IDLH ^c	Symptoms and Effects of Exposure	PIP ^d (eV)
<p>Footnotes:</p> <p>^a Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), S (Surface Soil), SL (Sludge), SW (Surface Water).</p> <p>^b Appropriate value of PEL, REL, or TLV listed.</p> <p>^c IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen.</p> <p>^d PIP = photoionization potential; NA = Not applicable; UK = Unknown. NR = Not Regulated</p> <p>UK</p>					
Potential Routes of Exposure					
<p>Dermal: Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 4.</p>					

3 Project Organization and Personnel

3.1 CH2M HILL Employee Medical Surveillance and Training

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

The employees listed below are enrolled in the CH2M HILL Comprehensive Health and Safety Program and meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated “SC-HW” have completed a 12-hour site safety coordinator course, and have documented requisite field experience. An SC-HW with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones. Employees designated “FA-CPR” are currently certified by the American Red Cross, or equivalent, in first aid and CPR. At least two FA-CPR designated employees must be present during all tasks performed in exclusion or decontamination zones. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Employee Name	Office	Responsibility	SC-HW/FA-CPR
Jessica Skeean	CLT	PM	Level D SC-HW: FA-CPR
Dan Tomczak	RDU	Task Manager	Level D SC-HW: FA-CPR
TBD	TBD	FTL	Level D SC-HW: FA-CPR

3.2 Field Team Chain of Command and Communication Procedures

3.2.1 Client

Client Contact

Bryan Beck
NAVFAC Mid-Atlantic
Code: OPCEV
6506 Hampton Blvd
Norfolk, Virginia 23508-1278
Direct: (757) 322-4734
Fax: (757) 322-4805
Email: bryan.k.beck@navy.mil

Base Contact

Robert Lowder
Camp Lejeune - EMD
Building 12
Marine Corps Base Camp Lejeune, NC 28542-0004
Direct (910) 451-9607
Fax: (910) 451-5997
Email: robert.a.lowder@usmc.mil

3.2.2 CH2M HILL

Project Manager: Jessica Skeean/CLT
ESBG Munitions Response Safety Officer: Dan Young/NVR

Health and Safety Manager: Michael Goldman/ATL
Munitions Response Senior Advisor: Tom Roth/ATL
Field Team Leader: TBD
Safety Coordinator- Hazardous Waste (SC-HW): TBD

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

3.2.3 CH2M HILL Subcontractors

(Reference CH2M HILL SOP HS-215, *Subcontractor, Contractor, and Owner*)

Subcontractor: To be determined

Subcontractor Contact Name:

Telephone:

The subcontractors listed above are covered by this HSP and must be provided a copy of this plan. However, this plan does not address hazards associated with the tasks and equipment that the subcontractor has expertise in (e.g., drilling, excavation work, electrical). Subcontractors are responsible for the health and safety procedures specific to their work, and are required to these procedures submit (SOP & AHA, etc.) to CH2M HILL for review before the start of field work. Subcontractors must comply with the established health and safety plan(s). The CH2M HILL SC-HW should verify that subcontractor employee training, medical clearance, and fit test records are current and must monitor and enforce compliance with the established plan(s). CH2M HILL's oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

CH2M HILL should continuously endeavor to observe subcontractors' safety performance. 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. In addition to this level of observation, the SC-HW is responsible for confirming CH2M HILL subcontractor performance against both the subcontractor's safety plan and applicable self-assessment checklists. Self-assessment checklists contained in Attachment 6 are to be used by the SC-HW to review subcontractor performance.

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

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

3.2.4 Contractors

(Reference CH2M HILL SOP HS-215, *Subcontractor, Contractor, and Owner*)

Contractor: To be determined

Contractor Contact Name:

Telephone:

This plan 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 the contractor's work, and we must never assume such responsibility through our actions (e.g., advising on H&S issues). In addition to this plan, CH2M HILL staff should review contractor safety plans so that we remain aware of appropriate precautions that apply to us. Except in unusual situations when conducted by the HSM, CH2M HILL must never comment on or approve

contractor safety procedures. Self-assessment checklists contained in Attachment 6 are to be used by the SC-HW to review the contractor's performance ONLY as it pertains to evaluating our exposure and safety.

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

- Request the contractor to brief CH2M HILL employees and subcontractors on the precautions related to the contractor's work.
- When an apparent contractor non-compliance/unsafe condition or practice poses a risk to CH2M HILL employees or subcontractors:
 - Notify the contractor safety representative
 - Request that the contractor determine and implement corrective actions
 - If needed, stop affected CH2M HILL work until contractor corrects the condition or practice. Notify the client, Project Manager, and HSM as appropriate.
- If apparent contractor non-compliance/unsafe conditions or practices are observed, inform the contractor safety representative. Our obligation is limited strictly to informing the contractor of our observation – the contractor is solely responsible for determining 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. Our obligation is limited strictly to immediately warning the affected individual(s) and informing the contractor of our observation – the contractor is solely responsible for determining and implementing necessary controls and corrective actions.
- Document all oral health and safety related communications in project field logbook, daily reports, or other records.

4 Personal Protective Equipment (PPE)

(Reference CH2M HILL SOP HS-117, *Personal Protective Equipment*, HS-121, *Respiratory Protection*)

PPE Specifications ^a

Task	Level	Body	Head	Respirator ^b
General site entry Surveying Surface Soil Sampling Geophysical Surveying	D	Work clothes; steel-toe, leather work boots; work glove.	Hardhat ^c Safety glasses Ear protection ^d	None required
Geoprobe boring	Modified D	Work clothes or cotton coveralls Boots: Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat ^c Safety glasses Ear protection ^d	None required
Groundwater sampling Soil boring Investigation-derived waste (drum) sampling and disposal	Modified D	Coveralls: Uncoated Tyvek® Boots: Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat ^c Splash shield ^c Safety glasses Ear protection ^d	None required.
Tasks requiring upgrade	C	Coveralls: Uncoated Tyvek® Boots: Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers Gloves: Inner surgical-style nitrile & outer chemical-resistant nitrile gloves	Hardhat ^c Splash Shield ^c Safety glasses Ear protection ^d	Full face air purifying respirator fitted with organic vapor cartridges. ^{b, e}

Reasons for Upgrading or Downgrading Level of Protection

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

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

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

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

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

^e Cartridge change-out schedule is at least every 8 hours (or one work day), except if relative humidity is > 85%, or if organic vapor measurements are > midpoint of Level C range (refer to Section 5)--then at least every 4 hours. If encountered conditions are different than those anticipated in this HSP, contact the HSM.

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

5 Air Monitoring/Sampling

(Reference CH2M HILL SOP HS-207 - *Exposure Assessment for Airborne Chemical Hazards*)

5.1 Air Monitoring Specifications

Instrument	Tasks	Action Levels ^a	Frequency ^b	Calibration	
FID: OVA model 128 or equivalent	Geoprobe	<1 ppm 1 to 10 ppm > 10 ppm	Level D Level C Evacuate work area and contact HSM	Initially and periodically during task	Daily
PID: OVM with 10.6eV lamp or equivalent	Geoprobe	<1 ppm 1 to 10 ppm > 10 ppm	Level D Level C Evacuate work area and contact HSM	Initially and periodically during task	Daily
CGI: MSA model 260 or 261 or equivalent	Geoprobe	0-10% : 10-25% LEL: >25% LEL:	No explosion hazard Potential explosion hazard Explosion hazard; evacuate or vent	Continuous during advancement of boring or trench	Daily
O₂Meter: MSA model 260 or 261 or equivalent	Geoprobe	>25% ^c O ₂ : 20.9% ^c O ₂ : <19.5% ^c O ₂ :	Explosion hazard; evacuate or vent Normal O ₂ O ₂ deficient; vent or use SCBA	Continuous during advancement of boring or trench	Daily

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

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

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

^d Refer to SOP HS-10 for instructions and documentation on radiation monitoring and screening.

^e Noise monitoring and audiometric testing also required.

5.2 Calibration Specifications

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

Instrument	Gas	Span	Reading	Method
PID: OVM, 10.6 or 11.8 eV bulb	100 ppm isobutylene	RF = 1.0	100 ppm	1.5 lpm reg T-tubing
PID: MiniRAE, 10.6 eV bulb	100 ppm isobutylene	CF = 100	100 ppm	1.5 lpm reg T-tubing
PID: TVA 1000	100 ppm isobutylene	CF = 1.0	100 ppm	1.5 lpm reg T-tubing
FID: OVA	100 ppm methane	3.0 ± 1.5	100 ppm	1.5 lpm reg T-tubing
FID: TVA 1000	100 ppm methane	NA	100 ppm	2.5 lpm reg T-tubing
Dust Monitor: Miniram-PDM3	Dust-free air	Not applicable	0.00 mg/m ³ in "Measure" mode	Dust-free area OR Z-bag with HEPA filter
CGI: MSA 260, 261, 360, or 361	0.75% pentane	N/A	50% LEL \pm 5% LEL	1.5 lpm reg direct tubing

5.3 Air Sampling

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

Method Description

None anticipated.

Personnel and Areas

Results must be sent immediately to the HSM. Regulations may require reporting to monitored personnel.

Results reported to:

HSM: Michael Goldman/ATL

MRSO: Dan Young/NVR

6 Decontamination

(Reference CH2M HILL SOP HS-506, *Decontamination*)

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

6.1 Decontamination Specifications

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

6.2 Diagram of Personnel-Decontamination Line

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

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

7 Spill-Containment Procedures

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

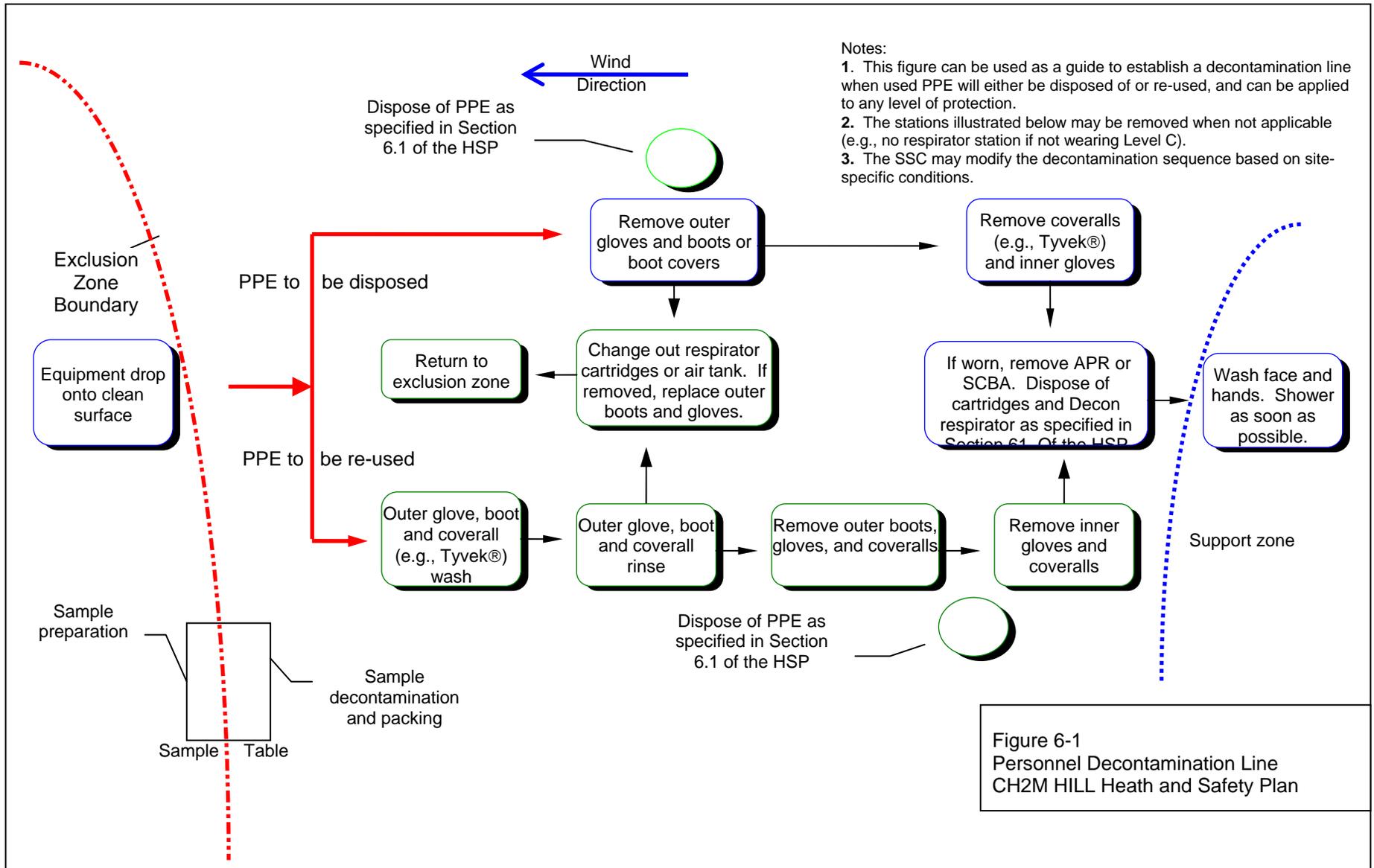


Figure 6-1
Personnel Decontamination Line
CH2M HILL Health and Safety Plan

8 Site-Control Plan

8.1 Site-Control Procedures

(Reference CH2M HILL SOP HS-510, *Site Control*)

- The SC-HW will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing on site safety: general discussion of Health and Safety Plan, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies.
- The SC-HW records attendance at safety briefings in a logbook and documents the topics discussed.
- Post the OSHA job-site poster in a central and conspicuous location in accordance with CH2M HILL SOP HS-116, *OSHA Postings*.
- Establish support, decontamination, and exclusion zones. Delineate with flags or cones as appropriate. Support zone should be upwind of the site. Use access control at entry and exit from each work zone.
- Establish onsite communication consisting of the following:
 - Line-of-sight and hand signals
 - Air horn
 - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the “buddy system.”
- Initial air monitoring is conducted by the SSC in appropriate level of protection.
- The SC-HW is to conduct periodic inspections of work practices to determine the effectiveness of this plan – refer to Sections 2 and 3. Deficiencies are to be noted, reported to the HSM, and corrected.

8.2 Hazwoper Compliance Plan

(Reference CH2M HILL SOP HS-220, *Site-Specific Written Safety Plans*)

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

- In many cases, air sampling, in addition to real-time monitoring, must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site, or while non-Hazwoper-trained staff are working in proximity to Hazwoper activities. Other data (e.g., soil) also must document that there is no potential for exposure. The HSM must approve the interpretation of these data. Refer to subsections 2.5 and 5.3 for contaminant data and air sampling requirements, respectively.
- When non-Hazwoper-trained personnel are at risk of exposure, the SSC must post the exclusion zone and inform non-Hazwoper-trained personnel of the:
 - nature of the existing contamination and its locations
 - limitations of their access
 - emergency action plan for the site
- Periodic air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-Hazwoper-trained personnel (e.g., in an adjacent area) are not exposed to airborne contaminants.
- When exposure is possible, non-Hazwoper-trained personnel must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.
- Remediation treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the Hazwoper standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only Hazwoper-trained personnel (minimum of 24 hour of training) will be permitted to enter the site. All non-Hazwoper-trained personnel must not enter the TSDF area of the site.

9 Emergency Response Plan

(Reference CH2M HILL, SOP HS-106, *Emergency Response*)

9.1 Pre-Emergency Planning

The SC-HW performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CH2M HILL onsite parties, the facility, and local emergency-service providers as appropriate.

- Review the facility emergency and contingency plans where applicable.
- Determine what onsite communication equipment is available (e.g., two-way radio, air horn).
- Determine what offsite communication equipment is needed (e.g., nearest telephone, cell phone).
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel.
- Field Trailers: Post “Exit” signs above exit doors, and post “Fire Extinguisher” signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases.
- Rehearse the emergency response plan before site activities begin, including driving route to hospital.
- Brief new workers on the emergency response plan.

The SC-HW will evaluate emergency response actions and initiate appropriate follow-up actions.

9.2 Emergency Equipment and Supplies

The SC-HW should mark the locations of emergency equipment on the site map and post the map.

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):	

9.3 Incident Response

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

- Shut down CH2M HILL operations and evacuate the immediate work area.
- Notify appropriate response personnel.
- Account for personnel at the designated assembly area(s).
- Assess the need for site evacuation, and evacuate the site as warranted.

Instead of implementing a work-area evacuation, note that small fires or spills posing minimal safety or health hazards may be controlled.

9.4 Emergency Medical Treatment

The procedures listed below may also be applied to non-emergency incidents. Injuries and illnesses (including overexposure to contaminants) must be reported to Human Resources. If there is doubt about whether medical treatment is necessary, or if the injured person is reluctant to accept medical treatment, contact the CH2M HILL medical consultant. During non-emergencies, follow these procedures as appropriate.

- Notify appropriate emergency response authorities listed in Section 9.8 (e.g., 911).
- The SC-HW 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.
- Initiate first aid and CPR where feasible.
- Get medical attention immediately.
- Perform decontamination where feasible; lifesaving and first aid or medical treatment take priority.
- Make certain that the injured person is accompanied to the emergency room.
- When contacting the medical consultant, state that the situation is a CH2M HILL matter, and give your name and telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.
- Report incident as outlined in Section 9.7.

9.5 Evacuation

- Evacuation routes and assembly areas (and alternative routes and assembly areas) are specified on the site map.
- Evacuation route(s) and assembly area(s) will be designated by the SC-HW before work begins.
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
- The SC-HW 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 SC-HW will account for all personnel in the onsite assembly area.
- A designated person will account for personnel at alternate assembly area(s).
- The SC-HW will write up the incident as soon as possible after it occurs and submit a report to the Corporate Director of Health and Safety.

9.6 Evacuation Signals

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

9.7 Incident Notification and Reporting

- Upon any project incident (fire, spill, injury, near miss, death, etc.), immediately notify the PM and HSM. Call emergency beeper number if HSM is unavailable.
- For CH2M HILL work-related injuries or illnesses, contact and help Human Resources administrator complete an Incident Report Form (IRF). IRF must be completed within 24 hours of incident.
- For CH2M HILL subcontractor incidents, complete the Subcontractor Accident/Illness Report Form and submit to the HSM.
- Notify and submit reports to client as required in contract.

9.8 Emergency Contacts

EMERGENCY CONTACTS

If an injury occurs, notify the injured person's personnel office as soon as possible after obtaining medical attention for the injured person. Notification MUST be made within 24 hours of the injury.

24-hour CH2M HILL Emergency Contact – 800/756-1130

<p>Medical Emergency – 911 or Hospital ER (On-Base) #: (910) 451-4840 (910) 451-4841 (910) 451-4842 Onslow County ER (Off-Base) #: (910) 577-2240 Ambulance (On-Base) #: (910) 451-3004 (910) 451-3005 Ambulance (Public) #: (910) 451-9111 LEPC (Poison Control)#: (800) 222-1222</p>	<p>CH2M HILL Medical Consultant Occupational Health Nurse 1-800-756-1130 (notify the PM before contacting)</p>
<p>Fire/Spill Emergency – 911 or Base Fire Response #: (910) 451-9111</p>	<p>Local Occupational Physician Occupational Medicine Specialists 4815 Oleander Dr. Wilmington, NC 28403 910 452-1111</p>
<p>Security & Police – 911 or Base Security #: (910) 451-2555</p>	<p>Corporate Director Health and Safety Name: Angelo Liberatore Phone: 770/604-9182</p>
<p>On-Scene Coordinator Name: Fire Chief Phone: (910) 451-5815</p>	<p>Environmental Management Division (EMD) Names: Bob Lowder Phone: (910) 451-9607</p>
<p>Utilities Emergency Water: Gas: Contact Base EMD Electric:</p>	<p>Health and Safety Manager (HSM) Name: Michael Goldman/ATL Phone: (770) 604-9182 x 52133 Cell: (770) 331-3127</p>
<p>Designated Safety Coordinator (DSC) Name: TBD Phone:</p>	<p>Regional Human Resources Department Name: Mary Jo Jordan/GNV Phone: 352/355-2867</p>
<p>Project Manager Name: Jessica Skeeane/CLT Phone: 704-329-0073 x251</p>	<p>Corporate Human Resources Department Name: John Monark/COR Phone: 303/771-0900</p>
<p>Federal Express Dangerous Goods Shipping Phone: 800/238-5355 CH2M HILL Emergency Number for Shipping Dangerous Goods Phone: 800/255-3924</p>	<p>Worker's Compensation and Auto Claims Sterling Administration Services Phone: 800/420-8926 After hours: 800/497-4566 Report fatalities AND report vehicular accidents involving pedestrians, motorcycles, or more than two cars.</p>
<p>Contact the Project Manager. Generally, the Project Manager will contact relevant government agencies.</p>	
<p>Facility Alarms: TBD</p>	<p>Evacuation Assembly Area(s): TBD by the SC-HW; will probably be the local hotel where the field team is staying</p>
<p>Facility/Site Evacuation Route(s): follow main roads towards access gates and off the Base</p>	

10 Approval

This site-specific Health and Safety Plan has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

10.1 Original Plan

Written By: Thomas Konopka/RDU

Date: December 19, 2007

Approved By:

Date:

Approved By:

Date:

10.2 Revisions

Revisions Made By: Paul Weber

Date: May 14, 2008

Revisions to Plan: Removed UXO references

Revisions Approved By: Michael Goldman

Date: May 14, 2008

Revisions Made By: Michael Goldman

Date: September 22, 2008

Revisions to Plan: Added BBLPS requirements, updated contacts.

Revisions Approved By: Michael Goldman

Date: May 14, 2008

11 Attachments

Attachment 1:	Employee Signoff Form – Field Safety Instructions
Attachment 2:	Project-Specific Chemical Product Hazard Communication Form
Attachment 3:	Chemical-Specific Training Form
Attachment 4:	Emergency Contacts
Attachment 5:	Project H&S Forms/Permits
Attachment 6:	Project Activity Self-Assessment Checklists
Attachment 7:	Applicable Material Safety Data Sheets
Attachment 8:	Behavior Based Loss Prevention System



CHEMICAL-SPECIFIC TRAINING 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.

EMERGENCY CONTACTS

If an injury occurs, notify the injured person's personnel office as soon as possible after obtaining medical attention for the injured person. Notification MUST be made within 24 hours of the injury.

24-hour CH2M HILL Emergency Contact – 800/756-1130

Medical Emergency – 911 or

Hospital ER (On-Base) #: (910) 451-4840
 (910) 451-4841
 (910) 451-4842
 Onslow County ER (Off-Base) #: (910) 577-2240
 Ambulance (On-Base) #: (910) 451-3004
 (910) 451-3005
 Ambulance (Public) #: (910) 451-9111
 LEPC (Poison Control)#: (800) 222-1222

CH2M HILL Medical Consultant

Dr. Peter Greaney
 GMG WorkCare, Orange, CA
 800/455-6155
 (After hours calls will be returned within 20 minutes)

Fire/Spill Emergency – 911 or

Base Fire Response #: (910) 451-9111

Local Occupational Physician

Occupational Medicine Specialists
 4815 Oleander Dr.
 Wilmington, NC 28403
 910 452-1111

Security & Police – 911 or

Base Security #: (910) 451-2555

Corporate Director Health and Safety

Name: Keith Christopher
 Phone: 703/356-1113

On-Scene Coordinator

Name: Fire Chief
 Phone: (910) 451-5815

Environmental Management Division (EMD)

Names: Bob Lowder
 Phone: (910) 451-9607

Utilities Emergency

Water:
 Gas: Contact Base EMD
 Electric:

Health and Safety Manager (HSM)

Name: Michael Goldman/ATL
 Phone: (770) 604-9182 x 396

Designated Safety Coordinator (DSC) see Site-Specific HASP

Name:
 Phone:

Regional Human Resources Department

Name: Mary Jo Jordan/GNV
 Phone: 352/355-2867

Project Manager see Site-Specific HASP

Name: Dan Tomczak
 Phone: 919-875-4311 x19

Corporate Human Resources Department

Name: John Monark/COR
 Phone: 303/771-0900

Federal Express Dangerous Goods Shipping

Phone: 800/238-5355

CH2M HILL Emergency Number for Shipping Dangerous Goods

Phone: 800/255-3924

Worker's Compensation and Auto Claims

Sterling Administration Services
 Phone: 800/420-8926 After hours: 800/497-4566

Report fatalities AND report vehicular accidents involving pedestrians, motorcycles, or more than two cars.

Contact the Project Manager. Generally, the Project Manager will contact relevant government agencies.

Facility Alarms: TBD

Evacuation Assembly Area(s): TBD by the SC-HW; will probably be the local hotel where the field team is staying

Facility/Site Evacuation Route(s): follow main roads towards access gates and off the Base

Route to Hospital: (Depends on location within base area)

Nearest On-Base hospital:

Base Naval Hospital (only to be used in extreme emergency)
Building NH100
100 Brewster Blvd.
Camp Lejeune, NC 28547
Phone: (910) 451-4840, (910) 451-4841, (910) 451-4842

Local hospital:

Onslow County Memorial Hospital
317 Western Boulevard
Jacksonville, NC 28546
Phone: (910) 577-2240

Local ambulance service:

Base Ambulance: (910) 451-3004, (910) 451-3005
Public Ambulance: (910) 451-9111

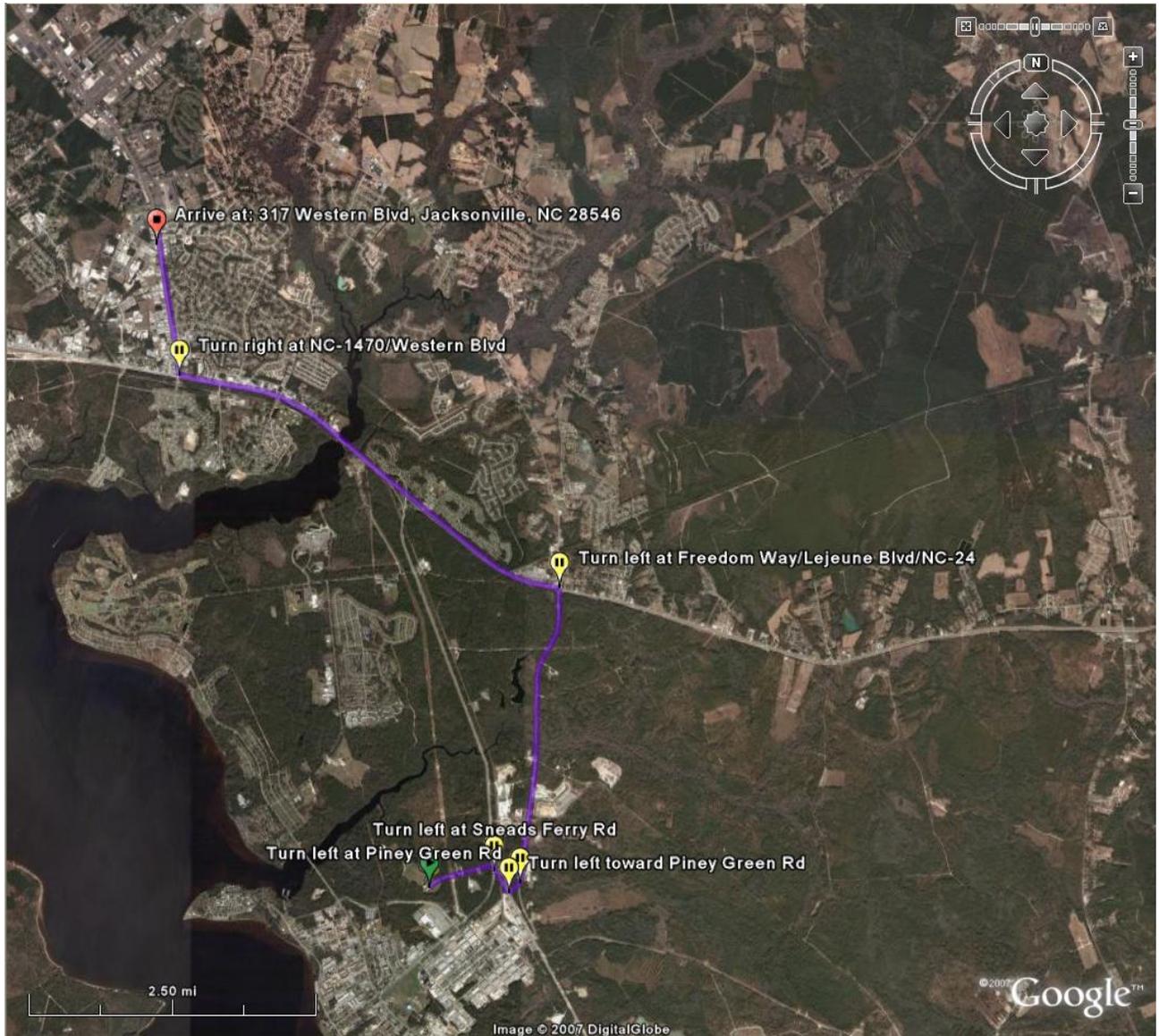
From MCB Camp Lejeune

Directions to the Base Naval Hospital (Building NH100)
(nearest hospital; only to be used in an extreme emergency)

1. Proceed north to Holcomb Boulevard (towards Highway 24).
2. Turn left onto Brewster Boulevard (heading west)
3. Continue on Brewster Boulevard until intersection with the driveway to the Naval Hospital.
4. Turn onto Hospital driveway, and proceed to emergency room.

Directions to Onslow County Memorial Hospital:

1. From Holcomb Boulevard, exit Base through main gate.
2. Follow Highway 24 west until intersecting with Western Boulevard.
3. Turn right onto Western Boulevard.
4. The Onslow County Memorial Hospital is on the left, approximately 2 miles (fifth stop light) from Highway 24.
5. Follow the signs to the emergency room.



CH2M HILL HEALTH AND SAFETY PLAN

Attachment 5

Project H&S Forms and Permits

To be completed as needed for task specific operations.

CH2M HILL HEALTH AND SAFETY PLAN

Attachment 6

Project Activity Self-Assessment Checklists

CH2MHILL

HS&E Self-Assessment Checklist - DRILLING

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's written safety plan.

This checklist is to be used at locations where: 1) CH2M HILL employees are potentially exposed to drilling hazards, 2) CH2M HILL staff are providing support function related to drilling activities, and/or 3) CH2M HILL oversight of a drilling subcontractor is required.

Safety Coordinator may consult with drilling subcontractors when completing this checklist, but shall not direct the means and methods of drilling operations nor direct the details of corrective actions. Drilling subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately, or all exposed personnel shall be removed from the hazard until corrected.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

- Evaluate CH2M HILL employee exposures to drilling hazards (complete Section 1).
- Evaluate CH2M HILL support functions related to drilling activities (complete Section 2)
- Evaluate a CH2M HILL subcontractor's compliance with drilling safety requirements (complete entire checklist).
Subcontractors Name: _____

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the drilling subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in SOP HSE-35.

SECTION 1 - SAFE WORK PRACTICES (4.1)

	Yes	No	N/A	N/O
1. Personnel cleared during rig startup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Personnel clear of rotating parts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Personnel not positioned under hoisted loads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Loose clothing and jewelry removed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Smoking is prohibited around drilling operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Personnel wearing appropriate personal protective equipment (PPE), per written plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Personnel instructed not to approach equipment that has become electrically energized	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION 2 - SUPPORT FUNCTIONS (4.2)

FORMS/PERMITS (4.2.1)

8. Driller license/certification obtained	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Well development/abandonment notifications and logs submitted and in project files	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Water withdrawal permit obtained, where required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Dig permit obtained, where required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

UTILITY LOCATING (4.2.2)

12. Location of underground utilities and structures identified	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
---	--------------------------	--------------------------	--------------------------	--------------------------

CH2MHILL**HS&E Self-Assessment Checklist - DRILLING**

Page 2 of 3

SECTION 2 (Continued)				
WASTE MANAGEMENT (4.2.3)	Yes	No	N/A	N/O
13. Drill cuttings and purge water managed and disposed properly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILLING AT HAZARDOUS WASTE SITES (4.2.4)				
14. Waste disposed of according to project's written safety plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Appropriate decontamination procedures being followed, per project's written safety plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILLING AT ORDNANCE EXPLOSIVES (OE)/UNEXPLODED ORDNANCE (UXO) SITES (4.2.5)				
16. OE plan prepared and approved	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. OE/UXO avoidance provided, routes and boundaries cleared and marked	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Initial pilot hole established by UXO technician with hand auger	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Personnel remain inside cleared areas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SECTION 3 - DRILLING SAFETY REQUIREMENTS (4.3)				
GENERAL (4.3.1)				
20. Only authorized personnel operating drill rigs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Daily safety briefing/meeting conducted with crew	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Daily inspection of drill rig and equipment conducted before use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILL RIG PLACEMENT (4.3.2)				
23. Location of underground utilities and structures identified	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Safe clearance distance maintained from overhead power lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Drilling pad established, when necessary	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Drill rig leveled and stabilized	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Additional precautions taken when drilling in confined areas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILL RIG TRAVEL (4.3.3)				
28. Rig shut down and mast lowered and secured prior to rig movement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Tools and equipment secured prior to rig movement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Only personnel seated in cab are riding on rig during movement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Safe clearance distance maintained while traveling under overhead power lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Backup alarm or spotter used when backing rig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILL RIG OPERATION (4.3.4)				
33. Kill switch clearly identified and operational	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. All machine guards are in place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Rig ropes not wrapped around body parts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Pressurized lines and hoses secured from whipping hazards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Drill operation stopped during inclement weather	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Air monitoring conducted per written safety plan for hazardous atmospheres	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Rig placed in neutral when operator not at controls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILL RIG SITE CLOSURE (4.3.5)				
40. Ground openings/holes filled or barricaded	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Equipment and tools properly stored	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. All vehicles locked and keys removed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
DRILL RIG MAINTENANCE (4.3.6)				
28. Defective components repaired immediately	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Lockout/tagout procedures used prior to maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Cathead in clean, sound condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Drill rig ropes in clean, sound condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Fall protection used for fall exposures of 6 feet (U.S.) 1.5 meters (Australia) or greater	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Rig in neutral and augers stopped rotating before cleaning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Good housekeeping maintained on and around rig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

CH2M HILL HEALTH AND SAFETY PLAN

Attachment 7

Applicable Material Safety Data Sheets

CH2M HILL HEALTH AND SAFETY PLAN

Attachment 8

Behavior Based Loss Prevention System

Behavior Based Loss Prevention System

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

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

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

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

Activity Hazard Analysis

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

Activity Hazard Analysis will be prepared before beginning each project activity posing H&S hazards to project personnel using the AHA form provided in Attachment 6. The AHA shall identify the work tasks required to perform each activity, along with potential H&S hazards and recommended control measures for each work task. In addition, a listing of the equipment to be used to perform the activity, inspection requirements and training requirements for the safe operation of the equipment listed must be identified.

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

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

Pre-Task Safety Plans

Daily safety meetings are held with all project personnel in attendance to review the hazards posed and required H&S procedures/AHAs, that apply for each day's project activities. The PTSPs serve the same purpose as these general assembly safety meetings, but the PTSPs are held between the crew supervisor and their work crews to focus on those hazards posed to individual work crews. At the start of each day's activities, the crew supervisor completes the PTSP, provided in Attachment 6, with input from the work crew, during their daily safety meeting. The day's tasks, personnel, tools and equipment that will be used to perform these tasks are listed, along with the hazards posed and required H&S procedures, as identified in the AHA. The use of PTSPs, better promotes worker participation in the hazard recognition and control process, while reinforcing the task-specific hazard and required H&S procedures with the crew each day. The use of PTSPs is a common safety practice in the construction industry.

Loss Prevention Observations

Loss Prevention Observations (LPO's) shall be conducted by SC or designee for specific work tasks or operations comparing the actual work process against established safe work procedures identified in the project-specific HSP and AHAs. LPO's are a tool to be 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 LPO each week for tasks/operations addressed in the project-specific HSP or AHA. The SC or designee shall complete the LPO form in **Attachment 6** for the task/operation being observed.

Loss/Near Loss Investigations

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

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

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

- Gather all relevant facts, focusing on fact-finding, not fault-finding, while answering the who, what, when, where and how questions.
- Draw conclusions, pitting facts together into a probable scenario.
- Determine incident root cause(s), which are basic causes on why an unsafe act/condition existed.
- Develop and implement solutions, matching all identified root causes with solutions.
- Communicate incident as a Lesson Learned to all project personnel.
- Filed follow-up on implemented corrective active action to confirm solution is appropriate.

The SC or designee shall perform an incident investigation, as soon as practical after incident occurrence during the day of the incident, for all Loss and Near Loss Incidents that occur on the project. Loss and Near Loss incident investigations shall be performed using the following incident investigation forms provided in **Attachment 6**:

- Incident Report Form (IRF)
- Root Cause Analysis Form

All Loss and Near Loss incident involving personal injury, property damage in excess of \$1,000 or near loss incidents that could have resulted in serious consequences shall be investigated by completing the incident investigation forms and submitting them to the PM and RHSM within 24 hours of incident occurrence. A preliminary Incident Investigation and Root Cause Analysis shall be submitted to the Project Manager and RHSM within 24 hours of incident occurs. The final Incident Investigation and Root Cause Analysis shall be submitted after completing a comprehensive investigation of the incident.

CH2MHILL

Pre-Task Safety Plan (PTSP)

Project: _____ Location: _____ Date: _____		
Supervisor: _____ Job Activity: _____ _____		
Task Personnel: _____ _____ _____ _____		
List Tasks: _____ _____ _____ _____		
Tools/Equipment Required for Tasks (ladders, scaffolds, fall protection, cranes/rigging, heavy equipment, power tools): _____ _____ _____		
Potential H&S Hazards, including chemical, physical, safety, biological and environmental (check all that apply):		
<input type="checkbox"/> Chemical burns/contact	<input type="checkbox"/> Trench, excavations, cave-ins	<input type="checkbox"/> Ergonomics
<input type="checkbox"/> Pressurized lines/equipment	<input type="checkbox"/> Overexertion	<input type="checkbox"/> Chemical splash
<input type="checkbox"/> Thermal burns	<input type="checkbox"/> Pinch points	<input type="checkbox"/> Poisonous plants/insects
<input type="checkbox"/> Electrical	<input type="checkbox"/> Cuts/abrasions	<input type="checkbox"/> Eye hazards/flying projectile
<input type="checkbox"/> Weather conditions	<input type="checkbox"/> Spills	<input type="checkbox"/> Inhalation hazard
<input type="checkbox"/> Heights/fall > 6 feet	<input type="checkbox"/> Overhead Electrical hazards	<input type="checkbox"/> Heat/cold stress
<input type="checkbox"/> Noise	<input type="checkbox"/> Elevated loads	<input type="checkbox"/> Water/drowning hazard
<input type="checkbox"/> Explosion/fire	<input type="checkbox"/> Slips, trip and falls	<input type="checkbox"/> Heavy equipment
<input type="checkbox"/> Radiation	<input type="checkbox"/> Manual lifting	<input type="checkbox"/> Aerial lifts/platforms
<input type="checkbox"/> Confined space entry	<input type="checkbox"/> Welding/cutting	<input type="checkbox"/> Demolition
Other Potential Hazards (Describe): _____ _____ _____ _____		

Hazard Control Measures (Check All That Apply):			
PPE <input type="checkbox"/> Thermal/lined <input type="checkbox"/> Eye <input type="checkbox"/> Dermal/hand <input type="checkbox"/> Hearing <input type="checkbox"/> Respiratory <input type="checkbox"/> Reflective vests <input type="checkbox"/> Flotation device	Protective Systems <input type="checkbox"/> Sloping <input type="checkbox"/> Shoring <input type="checkbox"/> Trench box <input type="checkbox"/> Barricades <input type="checkbox"/> Competent person <input type="checkbox"/> Locate buried utilities <input type="checkbox"/> Daily inspections	Fire Protection <input type="checkbox"/> Fire extinguishers <input type="checkbox"/> Fire watch <input type="checkbox"/> Non-spark tools <input type="checkbox"/> Grounding/bonding <input type="checkbox"/> Intrinsically safe equipment	Electrical <input type="checkbox"/> Lockout/tagout <input type="checkbox"/> Grounded <input type="checkbox"/> Panels covered <input type="checkbox"/> GFCI/extension cords <input type="checkbox"/> Power tools/cord inspected
Fall Protection <input type="checkbox"/> Harness/lanyards <input type="checkbox"/> Adequate anchorage <input type="checkbox"/> Guardrail system <input type="checkbox"/> Covered opening <input type="checkbox"/> Fixed barricades <input type="checkbox"/> Warning system	Air Monitoring <input type="checkbox"/> PID/FID <input type="checkbox"/> Detector tubes <input type="checkbox"/> Radiation <input type="checkbox"/> Personnel sampling <input type="checkbox"/> LEL/O2 <input type="checkbox"/> Other	Proper Equipment <input type="checkbox"/> Aerial lift/ladders/scaffolds <input type="checkbox"/> Forklift/heavy equipment <input type="checkbox"/> Backup alarms <input type="checkbox"/> Hand/power tools <input type="checkbox"/> Crane with current inspection <input type="checkbox"/> Proper rigging <input type="checkbox"/> Operator qualified	Welding & Cutting <input type="checkbox"/> Cylinders secured/capped <input type="checkbox"/> Cylinders separated/upright <input type="checkbox"/> Flash-back arrestors <input type="checkbox"/> No cylinders in CSE <input type="checkbox"/> Flame retardant clothing <input type="checkbox"/> Appropriate goggles
Confined Space Entry <input type="checkbox"/> Isolation <input type="checkbox"/> Air monitoring <input type="checkbox"/> Trained personnel <input type="checkbox"/> Permit completed <input type="checkbox"/> Rescue	Medical/ER <input type="checkbox"/> First-aid kit <input type="checkbox"/> Eye wash <input type="checkbox"/> FA-CPR trained personnel <input type="checkbox"/> Route to hospital	Heat/Cold Stress <input type="checkbox"/> Work/rest regime <input type="checkbox"/> Rest area <input type="checkbox"/> Liquids available <input type="checkbox"/> Monitoring <input type="checkbox"/> Training	Vehicle/Traffic <input type="checkbox"/> Traffic control <input type="checkbox"/> Barricades <input type="checkbox"/> Flags <input type="checkbox"/> Signs
Permits <input type="checkbox"/> Hot work <input type="checkbox"/> Confined space <input type="checkbox"/> Lockout/tagout <input type="checkbox"/> Excavation <input type="checkbox"/> Demolition <input type="checkbox"/> Energized work	Demolition <input type="checkbox"/> Pre-demolition survey <input type="checkbox"/> Structure condition <input type="checkbox"/> Isolate area/utilities <input type="checkbox"/> Competent person <input type="checkbox"/> Hazmat present	Inspections: <input type="checkbox"/> Ladders/aerial lifts <input type="checkbox"/> Lanyards/harness <input type="checkbox"/> Scaffolds <input type="checkbox"/> Heavy equipment <input type="checkbox"/> Cranes and rigging	Training: <input type="checkbox"/> Hazwaste <input type="checkbox"/> Construction <input type="checkbox"/> Competent person <input type="checkbox"/> Task-specific (THA) <input type="checkbox"/> Hazcom
Field Notes: _____ _____ _____			

Name (Print): _____
 Signature: _____

Date: _____

Safe Work Observation Form			
Project:	Observer:	Date:	
Position/Title of worker observed:		Background Information/ comments:	
Task/Observation Observed: _____			
<ul style="list-style-type: none"> ❖ Identify and reinforce safe work practices/behaviors ❖ Identify and improve on at-risk practices/acts ❖ Identify and improve on practices, conditions, controls, and compliance that eliminate or reduce hazards ❖ Proactive PM support facilitates eliminating/reducing hazards (do you have what you need?) ❖ Positive, corrective, cooperative, collaborative feedback/recommendations 			
Actions & Behaviors	Safe	At-Risk	Observations/Comments
Current & accurate Pre-Task Planning/Briefing (Project safety plan, STAC, AHA, PTSP, tailgate briefing, etc., as needed)			Positive Observations/Safe Work Practices:
Properly trained/qualified/experienced			
Tools/equipment available and adequate			
Proper use of tools			Questionable Activity/Unsafe Condition Observed:
Barricades/work zone control			
Housekeeping			
Communication			
Work Approach/Habits			
Attitude			
Focus/attentiveness			Observer's Corrective Actions/Comments:
Pace			
Uncomfortable/unsafe position			
Inconvenient/unsafe location			
Position/Line of fire			
Apparel (hair, loose clothing, jewelry)			
Repetitive motion			Observed Worker's Corrective Actions/Comments:
Other...			

Activity:	Date:
	Project:
Description of the work:	Site Supervisor:
	Site Safety Officer:
	Review for latest use: Before the job is performed.

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

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

PRINT NAME

SIGNATURE

Supervisor Name: _____

Date/Time: _____

Safety Officer Name: _____

Date/Time: _____

Employee Name(s): _____

Date/Time: _____

Date/Time: _____