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FINAL SITE SPECIFIC WORK PLAN ADDENDUM FOR ENVIRONMENTAL INVESTIGATION  
B-12 BAFFLED PISTOL RANGE MCB CAMP LEJEUNE NC  
3/1/2008  
CH2M HILL

Final

# Site Specific Work Plan Addendum for Environmental Investigation B-12 Baffled Pistol Range

Marine Corps Base Camp Lejeune  
Jacksonville, North Carolina

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# Contents

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<b>1.0</b>	<b>Introduction .....</b>	<b>1-1</b>
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	Climate .....	1-4
1.6	Geology and Hydrogeology.....	1-4
<b>2.0</b>	<b>Technical Management Plan .....</b>	<b>2-1</b>
2.1	Project Personnel, Organization, and Schedule.....	2-1
2.1.1	Project Organization.....	2-1
2.1.2	Project Personnel.....	2-1
2.1.3	Project Schedule .....	2-1
2.2	Technical Approach.....	2-1
2.2.1	Task 1 – Project Planning.....	2-1
2.2.2	Task 2 – Data Evaluation/ Archive Review .....	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
<b>3.0</b>	<b>Field Investigation Plan.....</b>	<b>3-1</b>
3.1	Overall Approach .....	3-1
3.2	Site Preparation and Restoration.....	3-1
3.2.1	Mobilization.....	3-1
3.2.2	Buried Utility Clearance.....	3-2
3.2.3	Boundary and Sample Location Survey .....	3-2
3.2.4	Vegetation Clearing.....	3-2
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.....	3-5
3.4.3	Investigation Derived Waste Management.....	3-7
3.5	Health and Safety Plan.....	3-7
3.6	Data Documentation and Processing Procedures .....	3-7
3.7	Project File Requirements .....	3-7
<b>4.0</b>	<b>Quality Control Plan .....</b>	<b>4-1</b>
<b>5.0</b>	<b>Environmental Protection Plan .....</b>	<b>5-1</b>
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.....	5-3
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.....	5-4
5.10	Detailed Procedures and Methods to Protect and/or Mitigate the Resources/Sites Identified .....	5-4
<b>6.0</b>	<b>References.....</b>	<b>6-1</b>

**Appendices**

- A Archival Records Search Report
- B Health and Safety Plan

**Tables**

- 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 B-12 Range Site Map
- 1-2 Historical Range Fan Boundaries
- 2-1 Project Schedule
- 3-1 Surface and Subsurface Soil Sampling Locations
- 3-2 Groundwater Sampling Locations
- 5-1 B-12 Range Wetland Delineation

# Acronyms and Abbreviations

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AEC	Areas of Environmental Concern
AHA	Activity Hazard Analysis
BEQs	bachelor enlisted quarters
bgs	below ground surface
BMP	Best Management Practice
CAMA	Coastal Area Management Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chain-of-custody
DFOW	definable feature of work
DPT	direct-push technology
ESV	ecological screening values
FTL	Field Team Leader
GIS	Geographical Information System
HSP	Health and Safety Plan
ID	inner diameter
IDW	investigation-derived waste
INRMP	Integrated Natural Resource Management Plan
IRP	Installation Restoration Program
ITRC	Interstate Technology and Regulatory Council
m	meter
MC	munitions constituents
MCB	Marine Corps Base
MEC	munitions and explosives of concern
MRP	Munitions Response Program
MS/MSD	matrix spike/matrix spike duplicate
NAVFAC	Naval Facilities Engineering Command
NCDENR	North Carolina Department of Environment and Natural Resources
PM	Project Manager
PVC	polyvinyl chloride
PRG	preliminary remediation goal
QA	quality assurance
QC	quality control
QCP	Quality Control Plan
RCRA	Resource Conservation and Recovery Act

SLERA	Screening-level Ecological Risk Assessment
SOP	standard operating procedure
SSL	Soil Screening Level
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WP	Work Plan

# Introduction

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## 1.1 Background and Project Objectives

Marine Corps Base (MCB) Camp Lejeune is in the process of investigating closed ranges at the Base to support base construction activities. This investigation will be conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) framework. Construction of Bachelor Enlisted Quarters (BEQs) is proposed for an area within the former B-12 Baffled Pistol Range (B-12 Range) site, Archive Search Report (ASR) site number 2.134. A munitions response program (MRP) Environmental Investigation will be conducted for the portion of the B-12 Range site proposed for construction of the BEQs, and does not include the remainder of the B-12 Range and associated range fans.

The B-12 Range and the extent of all historical B-12 range fans cover an area of approximately 350 acres on the Air Station area of the Base. The area of investigation within the B-12 Range will be a 16-acre area located south of Douglass Road near the intersection of Douglass Road and Schmidt Street, as shown on Figure 1-1. The Environmental Investigation is being conducted to accomplish the following objectives:

- Identify historical activities at the B-12 Range that may have resulted in environmental contamination with munitions and explosives of concern (MEC) and/or munitions constituents (MC) by researching archival records and interviewing current and former installation personnel
- Evaluate the presence and nature of MC contamination that may exist at the B-12 Range by conducting an investigation of soil, groundwater, and, if present, sediment and surface water
- Conduct ecological and human health risk screenings using analytical data collected at the B-12 Range

## 1.2 Work Plan Scope and Organization

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

- Conduct a detailed historical archive search for documents pertaining to the B-12 Range and prior uses of the property
- Interview current installation personnel, and attempt to identify and interview former military personnel, to obtain their accounts of activities that may have impacted the project area

- Conduct a field investigation for MC contamination by sampling and analyzing groundwater, soil, and if present, surface water and sediment
- Prepare an Environmental Investigation 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 B-12 Range, summarizes the history of the site, 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 Environmental Investigation.
- **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 Environmental Investigation at the B-12 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 B-12 Range.
- **Section 6, References**, lists the references cited in the preceding sections.
- **Appendix A, Archival Records Search Report**, presents the results of the records search and personnel interviews that were conducted to identify historical activities that may have resulted in environmental contamination of the project area.
- **Appendix B, Health and Safety Plan (HSP)**, provides an interface with CH2M HILL's overall health and safety program. The HSP also includes MEC avoidance procedures that may be used to ensure that onsite personnel are protected from MEC that may be present at the site.

### 1.3 Site Location and Description

The B-12 Range Site covers an area of approximately 350 acres. The B-12 Range firing line is located immediately south of Curtis Road, approximately 2,200 feet west of A Street with the firing trajectory being to the south-southeast. The B-12 Range Site shown on **Figure 1-1** is compiled from historical range firing fans, as shown in **Figure 1-2**. The site extends south to southeast, across Douglass Road and Perimeter Street (USACE, 1987).

The investigation area within the B-12 Range will include a 16-acre area where construction of Bachelor Enlisted Quarters (BEQs) has been proposed. The proposed locations of the BEQs were provided by MCB Camp Lejeune, while the boundary of the 16-acre investigation area was assumed based on observed site features. The area of investigation is located south of Douglass Road, near the intersection of Douglass Road and Schmidt Street. Based on a review of publicly available aerial photographs and site reconnaissance, the investigation area is approximately 100 percent heavily vegetated with trees and thick undergrowth. Access to the former B-12 range is restricted to military personnel and authorized contractors, public access is restricted.

## 1.4 Site History

The B-12 Range was a Baffled Pistol Range used for service and target practice. According to range overlay maps (**Figure 1-2**; USACE, 1970, 1976, 1987) and the *Master Shore Station Development Plan* (Navy, 1961), the B-12 Range was in use from approximately 1960 until at least 1987. All three range overlay maps, 1970, 1976, and 1987 (USACE 1970, 1976, 1987), show the B-12 Range located in the same location, south of Curtis Road. The three maps also show the firing fan with some variation in shape and size, extending southeast beyond Douglass Road and Perimeter Street. *Regulations Governing Use of Firing Range 5, Field Training and Facilities and Maneuver Areas* listed the following types of munitions as having been employed at this site: .22 caliber rifles, service pistols, and revolvers (USMC, 1966). The *Final Range Identification and Preliminary Range Assessment* (USACE, 2001) also listed the .38 caliber, .45 caliber, and 9mm weapons as munitions used at the B-12 Range.

According to the *Final Range Identification and Preliminary Range Assessment* and the 1958 range overlay map (USACE, 1958), the small arms range B-6 is shown to be located in the same general area as the B-12 range. The B-6 Range was in use from 1950 to 1961 (USACE, 2001). The B-6 Range is also identified on the 1951, 1953, and 1954 range overlay maps, at alternate locations north of Curtis Road. The 1951, 1953, and 1954 B-6 range fans are not located in the project area being investigated in this Work Plan (USACE 1951, 1953, 1954). The following types of munitions were reported to have been employed at the B-6 Range: .22, .32, .38, and .45 caliber.

In November 2007, CH2M HILL completed a detailed investigative review of information relating to the B-12 Range, and conducted interviews with current and former base personnel. The investigative review emphasized obtaining information identifying historical activities that may have resulted in environmental contamination of the project area. Information obtained by this effort is presented in the Archival Records Search Report (**Appendix A**).

An interview with the Base Safety specialist (Richardson, 2007) confirmed that the type of ammunition fired at the B-12 Range included .22 caliber, .38 caliber, .45 caliber, and 9 mm rounds. Initially, the range utilized a large dirt berm as a backstop to catch rounds at impact. Later, the range was equipped with a bullet trap to collect the fired rounds. (Richardson, 2007). The present day bullet trap is located immediately south of the firing line off of Curtis Road. The location of the large soil berm used prior to installation of the bullet trap was not identified in site documentation. Disposal and burial of munitions is not reported or suspected.

## **1.5 Climate**

The climate in the MCB Camp Lejeune area is discussed in Section 1.4 of the MRP Master Project Plans (CH2M HILL, 2007).

## **1.6 Geology and Hydrogeology**

The regional geology and hydrogeology at MCB Camp Lejeune are discussed in Sections 1.6 and 1.7 of the MRP Master Project Plans. Site-specific geologic and hydrogeologic data are not available for this site, but will be collected during the Environmental Investigation and presented in the Environmental Investigation Report.

# Technical Management Plan

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## 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 United States Environmental Protection Agency (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 for investigation derived waste (IDW) management, land surveying, brush clearing, utility locating, direct push soil sampling and temporary well installation, laboratory analysis, and data validation.

### 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**.

### 2.1.3 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 IDW management, utility locating, land surveying, brush clearing, direct push soil sampling and temporary well installation, laboratory analysis, and data validation.

### **2.2.2 Task 2—Data Evaluation/Archive Review**

An archival records search was performed during preparation of this WP to identify previous site activities that may have environmentally impacted the investigation area. Results of the archival records search are presented in Appendix A.

### **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 include:

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

### **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 B-12 Range. All digital data will be created using a software platform that will allow it to be loaded directly into the GIS. 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 B-12 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 Environmental Investigation Report will be prepared to document the findings of the field investigation. The draft Environmental Investigation report will be submitted electronically for concurrent review by NAVFAC and MCB Camp Lejeune. Following receipt of review comments, CH2M HILL will issue a revised Environmental Investigation report to NAVFAC, MCB Camp Lejeune, USEPA and NCDENR for review. A final Environmental Investigation report will be prepared that will address all comments received on the draft document. The report will provide a summary of site history, summarize all field activities, and present a 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, results of a comparison of maximum detected concentrations to ecological screening values (ESVs) in tabular form and

recommendations for further evaluation, if required. This preliminary ecological risk 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 Region 9 residential soil Preliminary Remediation Goals (PRGs) (USEPA, 2004) and North Carolina Soil Screening Levels (SSLs) (NCDENR, 2005).
- Groundwater data will be compared to USEPA Region 9 tap water PRGs (USEPA, 2004) and North Carolina 2L standards (NCAC, 2005).
- Surface water data, if collected, will be compared to both North Carolina surface water standards and USEPA national recommended water quality criteria (NCDENR, 2007; USEPA, 2006).
- Sediment data, if collected, will be compared to USEPA Region 9 residential soil PRGs (USEPA, 2004).

If newer toxicity values are available for a constituent, a new PRG will be calculated using the equations from the USEPA Region 9 PRG table and the updated toxicity values. 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, 2001). The soil concentrations will be compared to two times the average soil background concentration. The groundwater concentrations will be compared directly to the groundwater background concentrations.

# Field Investigation Plan

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## 3.1 Overall Approach

The primary objective for this field investigation is to evaluate the presence and nature of MC contamination that may exist within the 16-acre investigation area of the B-12 Range. Potential site contaminants are heavy metals (primarily lead) and perchlorate, which may leach from spent bullets and residues of materials used in bullet primer and igniter formulations (ITRC, 2003).

Bullet fragments may be collected in samples, but will be removed from the soil matrix so that only metals that have leached into soil will be analyzed. Given that the historical use of the B-12 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 the Standard Operating Procedures (SOPs) provided in the MRP Master Project Plans (CH2M HILL, 2007).

The field investigation will accomplish the above objective through the following activities:

- Collect composite surface soil samples, each comprised of three sample increments, from 32 ½-acre grids located throughout the 16-acre investigation area
- Collect subsurface soil samples from 16 locations using direct-push technology (DPT)
- Collect 16 shallow groundwater samples from temporary wells installed within the surficial aquifer using DPT
- If present, collect surface water and sediment samples from four locations
- Based on the site investigation results, 12 additional surface soil delineation samples may be collected at the site

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

## 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: hand tools, sampling supplies, and vegetation clearance equipment
- Coordinate with local agencies, including 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 Buried Utility Clearance

All buried utilities will be cleared within a 20-foot radius of each site sampling location prior to initiation of subsurface activity.

### 3.2.3 Boundary and Sample Location Survey

Land surveying services will be conducted in accordance with Section 7.4 of the MRP Master Project Plans (CH2M HILL, 2007). The surveying at the B-12 Range will consist of two phases:

- **Phase 1** will be a survey of the site boundary (**Figure 1-1**). The site boundary survey will delineate the extent of the B-12 Range and also the extent of the area that will be subjected to vegetation clearing.
- **Phase 2** of the land surveying will occur after environmental sampling activities have concluded at the site and will entail surveying the coordinates and elevations of temporary monitoring wells and soil sampling locations.

### 3.2.4 Vegetation Clearing

Vegetation less than three inches in diameter will be removed from an estimated 5 acres of the 16-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 non-intrusive mechanical and manual methods. Trees greater than 3 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 archeological 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**).

### 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 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 field and QC 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, 2007).

## 3.4 Field Sampling Plan

### 3.4.1 Field Operations

In order to assess the presence and nature of MC contamination that may exist at the 16-acre investigation area, the project team will investigate groundwater, surface water, soil, and sediment within the project area. This will include collecting surface soil samples, DPT subsurface soil samples, and groundwater samples from temporary wells. If surface water features are present, surface water and sediment samples will also be collected. QA/QC samples will be collected per **Section 3.4.2**.

#### Composite Surface Soil Sampling

Thirty two composite surface soil samples (ASR2.134-SS01 through ASR2.134-SS32) will be collected from depths of 0 to 1 ft bgs at the locations shown on **Figure 3-1**. Each composite sample will be comprised of three sample increments. If a subsurface sampling location is located within the surface soil sampling grid, one of the three surface soil increment locations will be co-located with the subsurface sampling location. Sample locations will be surveyed by professional land surveyor at the conclusion of sampling activities.

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

- Perchlorate (USEPA Method 6850)
- Resource Conservation and Recovery Act (RCRA) metals – silver, arsenic, barium, cadmium, chromium, mercury, lead, and selenium (6010B/7000 series)

### **Direct Push 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 (CH2M HILL, 2007). Sixteen subsurface soil samples (ASR2.134-IS01 through ASR2.134-IS16) will be collected from just above the water table (estimated to range from 5 to 15 feet bgs) at the locations shown in **Figure 3-1**<sup>1</sup>.

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

- Perchlorate (USEPA Method 6850)
- RCRA metals (6010B/7000 series)

### **DPT Temporary Well Installation and Sampling**

Temporary monitoring wells will be installed in each of the sixteen boreholes used for subsurface soil sample collection, as shown on **Figure 3-2**. 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 accordance with *Temporary Well Installation* SOP in **Appendix C** of the MRP Master Project Plans (CH2M HILL, 2007).

Groundwater grab 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, 2007).

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

- Perchlorate (USEPA Method 6850)
- Total and dissolved RCRA metals (6010B/7000 series)

Following sampling and surveying, all temporary wells will be removed from the boreholes and the boreholes will be abandoned by the DPT subcontractor following NCDENR guidelines (NCAC, 2001) by grouting from the bottom of the boring to the ground surface.

### **Surface Water and Sediment Sampling**

Surface water was not observed during the site reconnaissance. However, if surface water is encountered during site clearing, a total of four surface water and four 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, 2007).

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<sup>1</sup> If modifications of sample locations are necessary due to utilities or accessibility issues, the revised sample location(s) will be located as near as possible to the original proposed location.

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

- Perchlorate (USEPA Method 6850)
- Total and dissolved RCRA metals (6010B/7000 series)

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

- Perchlorate (USEPA Method 6850)
- RCRA metals (6010B/7000 series)

Samples will be collected from downstream to upstream to avoid cross-contamination by sediment disturbance and suspension. Locations will be numbered in the field.

A summary of the sampling program for Environmental Investigation activities at the B-12 Range is presented in **Table 3-1**.

## 3.4.2 Analytical Requirements and Sample Handling

### Sample Preservation and Handling

Sample preservation must occur in the field immediately after collection. The containers supplied by the laboratory will contain the applicable preservative. This will protect field personnel from transporting, handling, and measuring concentrated acids and bases. QA/QC samples 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. Field QC samples (including 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 to be shipped to a fixed-base laboratory will be produced electronically. If they cannot be produced electronically, they must be written legibly in indelible ink.

The following information typically is included on the sample label:

- Site 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 B-12 Range (ASR2.134) under the Munitions Response Program. Therefore, the prefix "ASR2.134" 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 (in feet) of the sample:

2-3 = 2 to 3 ft bgs

Under this sample designation format, "ASR2.134-TW01-08A" would mean the following:

ASR2.134-TW01-08A MRP Site B-12 Range (ASR 2.134)

ASR2.134-TW01-08A Groundwater sample from temporary well #1

ASR2.134-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 in the log book.

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

## **3.5 Health and Safety Plan**

The HSP is provided in **Appendix B**.

## **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, 2007).

## **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, 2007).

SECTION 4

# Quality Control Plan

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All applicable work conducted by CH2M HILL and its subcontractors at the B-12 Range will be performed 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 B-12 Range.

The specific QC audit procedures for the definable features of work (DFOW) to be employed at the B-12 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

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## 5.1 Regional Ecological Summary

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

## 5.2 Endangered/Threatened Species within the Project Site

Many protected species have been sited in the vicinity of and aboard 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.

The American alligator is listed on the Federal Threatened and Endangered species list due to its similarity of appearance to the American crocodile. Suitable habitat for the American alligator may occur in the B-12 Range, however, the potential habitat is located approximately 1,000 feet south of the investigation area and is not expected to be affected by investigation activities.

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 B-12 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, 9.26 miles from the B-12 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 B-12 Range is not within any of these buffer zones. Non-nesting eagles may use the B-12 Range 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 B-12 Range.

The B-12 Range is approximately 14.6 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 B-12 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 B-12 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 human activity in proximity to the B-12 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 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 B-12 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 B-12 Range.

Environmental reviews completed in preparation for the 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 within the investigation area at the B-12 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 within the B-12 Range Site (**Figure 5-1**) and within the area of investigation. In addition to the jurisdictional wetlands delineated and presented in **Figure 5-1**, additional wetlands in the southwest corner of the B-12 Range are apparent and clearly located within the vicinity of the investigation area. In order to install the temporary monitoring wells and to collect environmental samples, vegetation removal will be necessary. Work will not be performed in wetland areas. No significant soil disturbance is anticipated from planned site work as described in this WP. No wetlands on or downstream of the B-12 Range are expected to be impacted by the project.

Due to the size of the area of investigation, the site is below the threshold for requiring a storm water pollution prevention plan. However if the potential for runoff to jurisdictional wetlands exist, appropriate protection measures will be put in place.

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

The environmental sampling activities proposed to support this work plan 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 confirmed that no cultural or archaeological resources are known to lie within the area of investigation, although some sites are located within the B-12 Range Site (**Figure**

5-1). If any unmapped 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 **Figure 5-1**, the area of investigation does not encompass nor is it bounded or bordered by surface water bodies. No water resources are expected to be impacted by the project. Should clearing of vegetation 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 B-12 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 activities described in this WP. Vegetation will be removed to access sampling locations. It is estimated that approximately 100% of vegetation less than three inches in diameter will be cut, on approximately 5 acres of the project site. Only vegetation up to 3 inches in diameter will be cut as part of the 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 within the area of investigation.

## **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, 2007). 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 resources be discovered within the project area, a qualified archaeologist will be notified to provide guidance on performing further work in the area
- The PM will seek the guidance of the qualified ecologist to determine appropriate mitigation measures in the event that the performed work activities impact an environmental resource

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## **Tables**

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**TABLE 2-1**

Project Personnel Contact Information  
*Work Plan for Environmental Investigation, B-12 Baffled Pistol Range*  
*MCB Camp Lejeune*  
*Jacksonville, North Carolina*

<b>Name/Title/Organization</b>	<b>Mailing Address</b>	<b>Telephone/Fax/E-mail</b>
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**TABLE 3-1**

## Summary of Sampling Program

*Work Plan for Environmental Investigation, B-12 Baffled Pistol Range**MCB Camp Lejeune**Jacksonville, North Carolina*

Sample Media	Sample ID Number	Sample Depth/Location and Rationale	Analysis		
			RCRA Metals	Dissolved Metals	Perchlorate
Composite Surface Soil	ASR2.134-SS01-T-B through ASR2.134-SS32-T-B	Collected from three location at a depth of 0 – 1 feet bgs from the grid locations shown on Figure 3-1.  Will allow for characterization of surface soil across the site.	X		X
Direct Push Subsurface Soil	ASR2.134-IS01-T-B through ASR2.134-IS16-T-B	Collected from a 2 ft interval just above the water table at each location shown on Figure 3-1.  Will allow for characterization of subsurface soil across site.	X		X
Temporary Well Groundwater	ASR2.134-TW01 through ASR2.134-TW16	Samples will be collected from shallow wells at each location shown on Figure 3-2.  Will allow for characterization of groundwater across site	X	X	X
Sediment	ASR2.134-SD01 through ASR2.134-SD04	Collected from an interval of 0 - 2 inches bgs.  Will allow for characterization of sediment across the site.	X		X
Surface Water	ASR2.134-SW01 through ASR2.134-SW04	Collected from an interval of 0 - .5 inches below the surface of the water body.  Will allow for characterization of surface water across the site.	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

Sediment and Surface water samples will only be sampled if surface water is located in the investigation area during vegetation clearing activities.

**TABLE 3-2**

*Analyses, Bottleware, Preservation, and Holding Time Requirements  
Work Plan for Environmental Investigation, B-12 Baffled Pistol Range  
MCB Camp Lejeune  
Jacksonville, North Carolina*

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

Notes: L = Liter, oz = ounce, HNO<sub>3</sub> = nitric acid

**TABLE 3-3**

## Required QA/QC Samples

*Work Plan for Environmental Investigation, B-12 Baffled Pistol Range**MCB Camp Lejeune**Jacksonville, North Carolina*

<b>Sample Type</b>	<b>Description</b>	<b>Frequency</b>	<b>Analytes</b>
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 for Environmental Investigation, B-12 Baffled Pistol Range**MCB Camp Lejeune**Jacksonville, North Carolina*

<b>Analysis</b>	<b>Sample Matrix</b>	<b>Field Samples</b>	<b>Field Duplicates</b>	<b>Equipment Blanks</b>	<b>Field Blanks</b>	<b>MS/MSDs</b>
<b>Surface Soil Samples</b>						
Perchlorate	Solid	32	4	3	1	2
Total Metals		32	4	3	1	2
<b>Direct Push Subsurface Soil Samples</b>						
Perchlorate	Solid	16	2	2	1	1
Total Metals		16	2	2	1	1
<b>Temporary Well Groundwater Samples</b>						
Perchlorate	Aqueous	16	2	2	1	1
Total Metals		16	2	2	1	1
Dissolved Metals		16	2	2	1	1
<b>Sediment Samples</b>						
Perchlorate	Solid	4	1	1	1	1
Total Metals		4	1	1	1	1
<b>Surface Water Samples</b>						
Perchlorate	Aqueous	4	1	1	1	1
Total Metals		4	1	1	1	1
Dissolved Metals		4	1	1	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 for Environmental Investigation, B-12 Baffled Pistol Range  
 MCB Camp Lejeune  
 Jacksonville, North Carolina

Definable Feature of Work with Auditable Function	Responsible Person(s) <sup>1</sup>	Audit Procedure <sup>2</sup>	QC Phase <sup>3</sup>	Freq. of Audit	Pass/Fail Criteria	Action if Failure Occurs
<b>Planning</b>						
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, Data Manager	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.
<b>Field Operations</b>						
Site preparation (Mobilization)	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)	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)	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)	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)	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)	Site Manager	Hold pre-mobilization meeting and Operations Readiness Review (ORR) 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)	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)	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)	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.
Site Preparation (Vegetation Removal)	Site Manager	Verify environmental controls are correct and functional.	IP/FP	O	Environmental controls are correct and functional.	Ensure that appropriate environmental controls are in place prior to proceeding with vegetation removal.
Site Preparation (Vegetation Removal)	Site Manager	Verify vegetation removal is conducted according to the Field Investigation Plan (Chapter 3 of Work Plan).	FP	D	Verify vegetation removal is conducted according to the Field Investigation Plan (Chapter 3 of Work Plan).	Stop vegetation removal activities until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary.
<b>Final Project Reports and Closeout</b>						
Site Specific Final Report preparation and approval	Project Manager	Verify all phases of environmental investigation were performed correctly and are complete.	FP	O	investigation performed is accurate and complete.	investigation performed is accurate and complete

**TABLE 4-1**  
 Definable Features of Work Auditing Procedures  
 Work Plan for Environmental Investigation, B-12 Baffled Pistol Range  
*MCB Camp Lejeune*  
*Jacksonville, North Carolina*

<b>Definable Feature of Work with Auditable Function</b>	<b>Responsible Person(s)<sup>1</sup></b>	<b>Audit Procedure<sup>2</sup></b>	<b>QC Phase<sup>3</sup></b>	<b>Freq. of Audit</b>	<b>Pass/Fail Criteria</b>	<b>Action if Failure Occurs</b>
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

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

<sup>1</sup> 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.  
<sup>2</sup> Where appropriate, a reference has been included referring the reader to a more detailed description of the procedures being audited.  
<sup>3</sup> 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 for Environmental Investigation, B-12 Baffled Pistol Range*

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.

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.

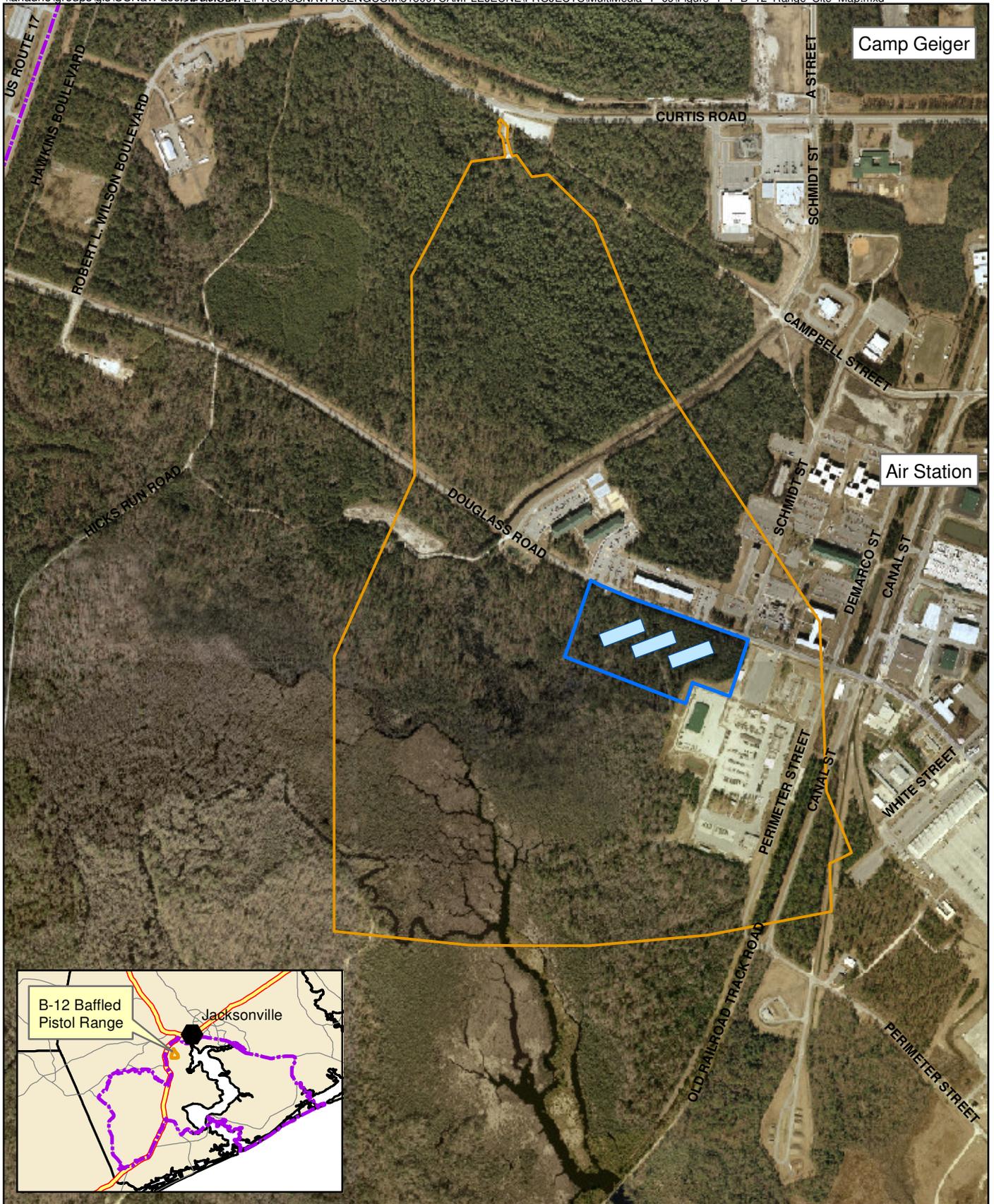
Scientific Name	Common Name	Federal Status	Habitat
<i>Agrotis buchholzi</i>	Buchholz's dart moth	FSC	Found in Forested wetlands, scrub-shrub wetlands, shrubland/chaparral and coniferous woodlands. This moth is found mostly in recently burned habitats. Populations can persist up to about a decade or rarely 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</i> sp.	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>	Awned meadowbeauty	FSC	Found in a variety of wet habitats in the Coastal Plain from New Jersey to Alabama
<i>Lobelia boykinii</i>	Boykin's lobelia	FSC	Grows in swamps and cypress ponds from the coastal plain of Delaware to Florida. The lower portion is often immersed in water, at least seasonally.
<i>Solidago pulchra</i>	Coastal goldenrod	FSC	Bogs, freshwater habitats, grasslands
<i>Parnassia caroliniana</i>	Carolina grass-of-parnassus	FSC	Bogs, freshwater habitats, grasslands
<i>Trillium pusillum</i> var. <i>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.
<i>Thalictrum cooleyi</i>	Cooley's meadowrue	E	Cooley's meadowrue occurs in moist to wet bogs and savannahs. It grows along fireflow 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.

Scientific Name	Common Name	Federal Status	Habitat
<i>Sagittaria weatherbiana</i>	Grassleaf arrowhead	FSC	Found in shallow water of brackish swamps
<i>Dichantheium 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> )
<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

Scientific Name	Common Name	Federal Status	Habitat
<p>E = Endangered—A taxon in danger of extinction throughout all or a significant portion of its range.</p> <p>T = Threatened—A taxon likely to become endangered within the foreseeable future throughout all or a significant portion of its range.</p> <p>FSC = Federal species of special concern—species may or may not be listed in the future.</p> <p>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.</p> <p>*Historic record—the species was last observed in the county more than 50 years ago.</p>			

## **Figures**

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- Legend**
- B-12 Baffled Pistol Range
  - Base Boundary
  - Proposed BEQ Area
  - Proposed BEQ

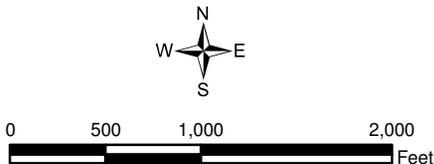
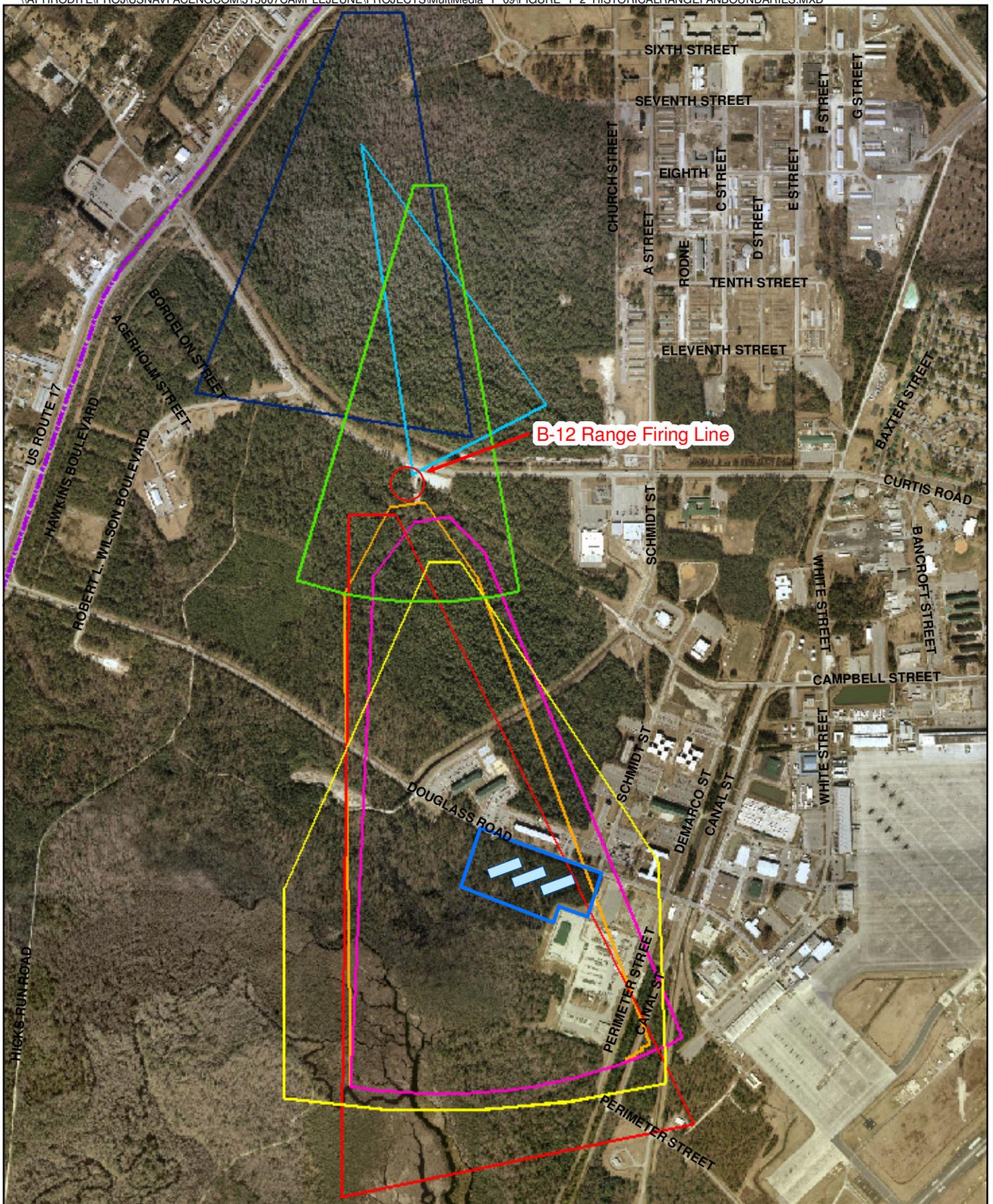


Figure 1-1  
B-12 Range Site Map  
MCB Camp Lejeune  
North Carolina

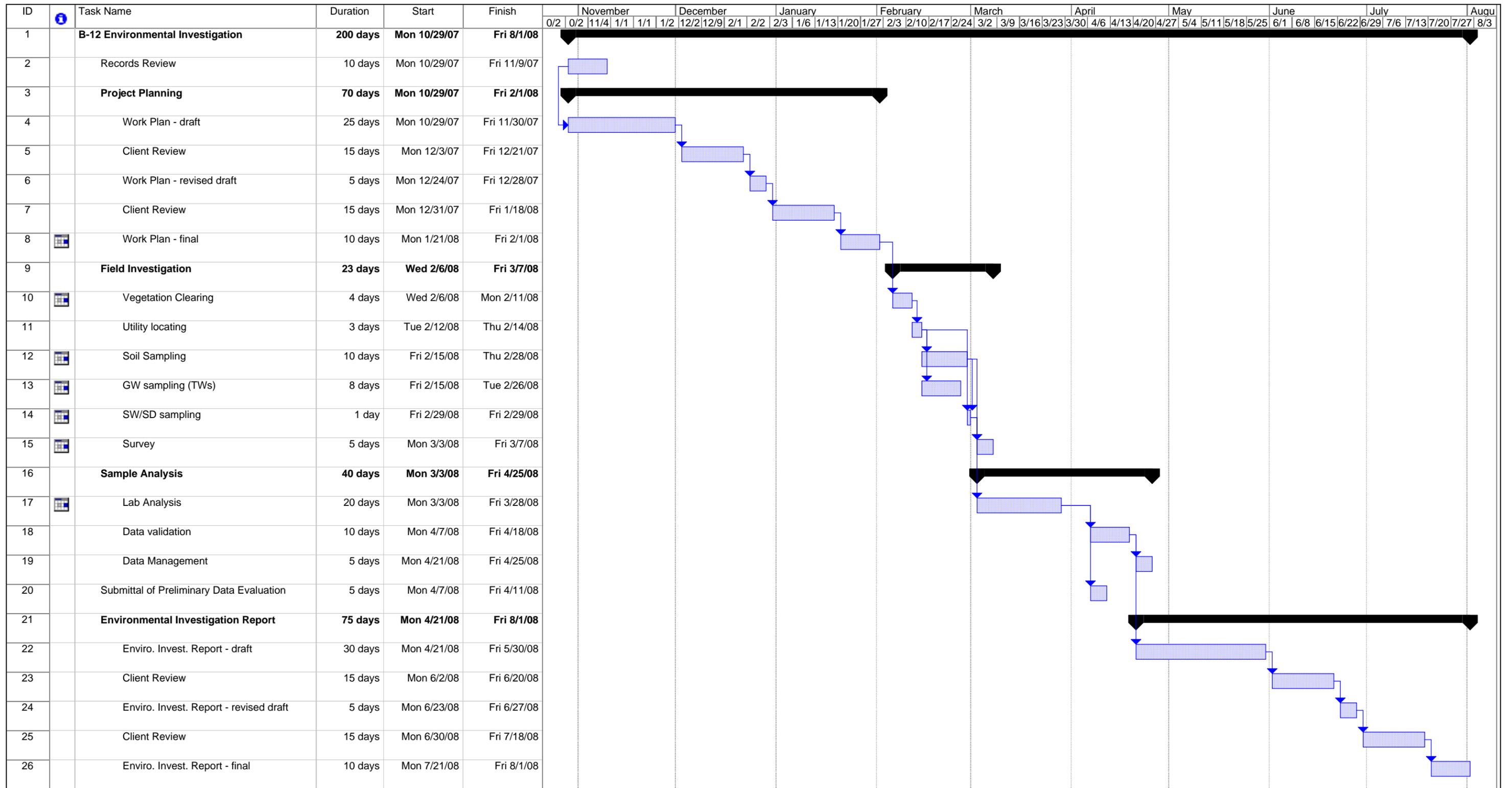


**Legend**

- Proposed BEQ
- Proposed BEQ Area
- Base Boundary
- B-12 1970/1976
- B-12 1987
- B-12 Range Year Unknown
- B-6 1951
- B-6 1953
- B-6 1954
- B-6 1958

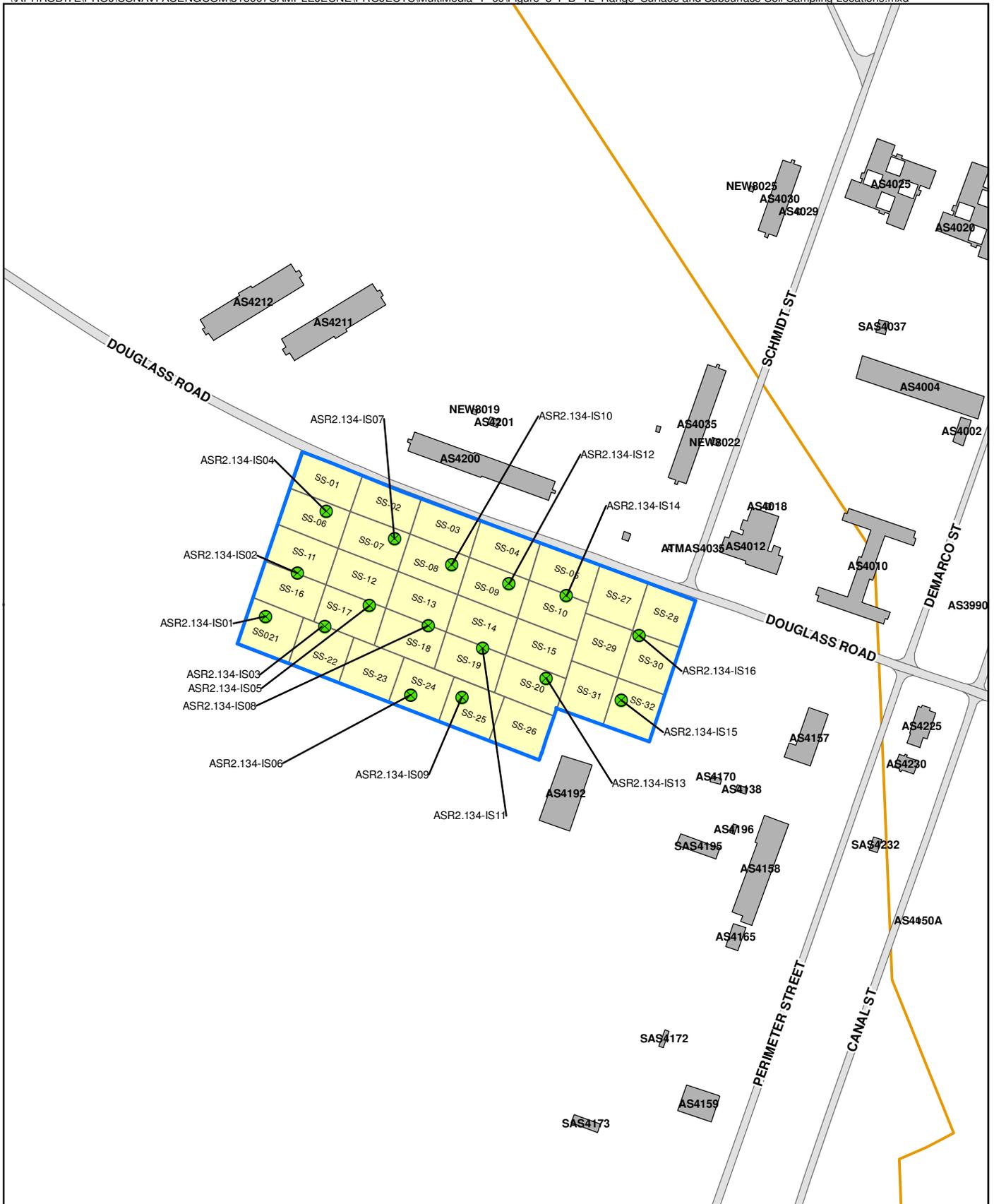


Figure 1-2  
Historical Range Fan Boundaries  
MCB Camp Lejeune  
North Carolina



Project: MM_TO-009 Date: Tue 1/22/08	Task	Progress	Summary	External Tasks	Deadline	
	Split	Milestone	Project Summary	External Milestone		

Figure 2-1  
Project Schedule  
MCB Camp Lejeune  
North Carolina

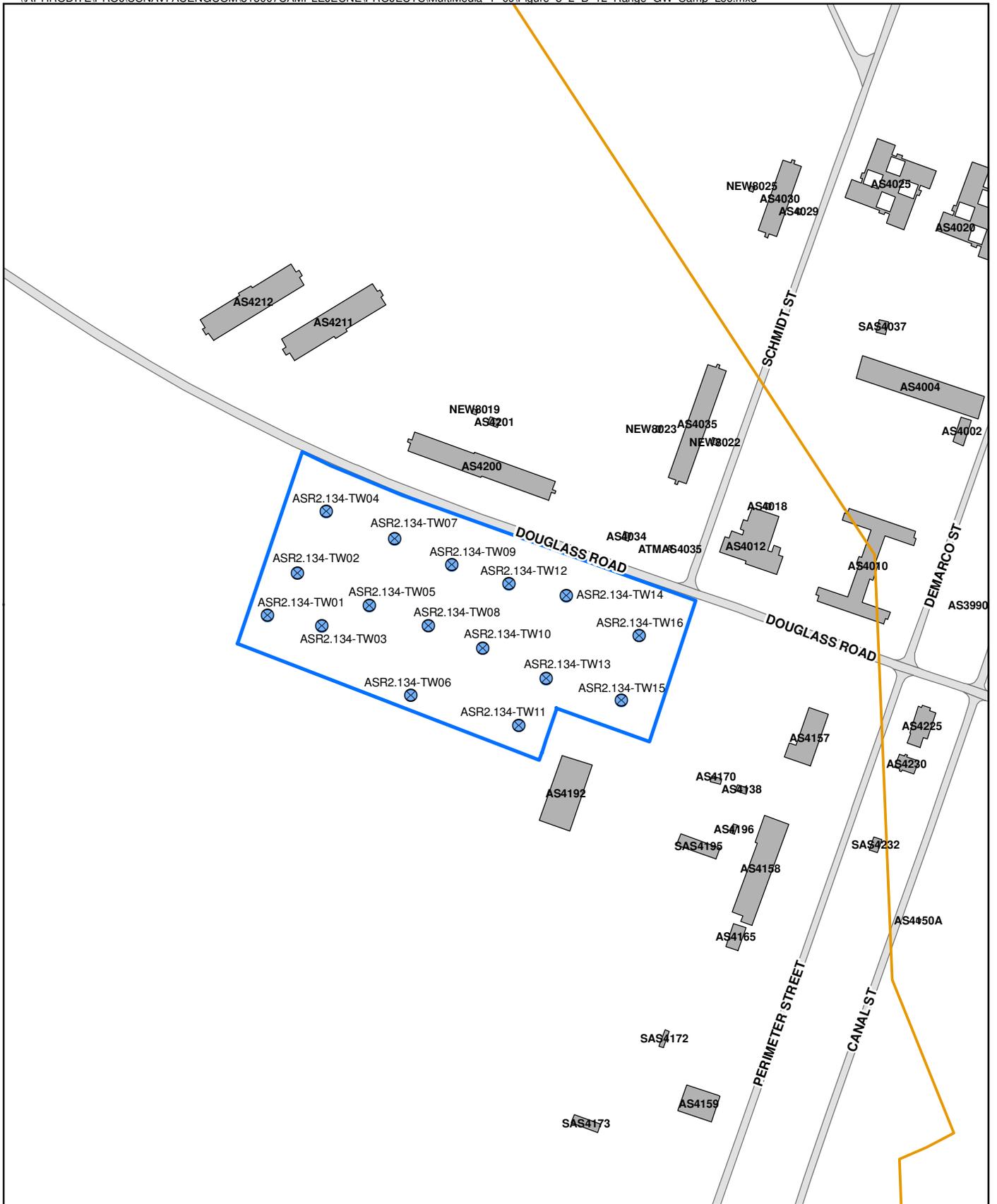


**Legend**

- Subsurface Soil (IS) Samples
- ▭ Proposed BEQ Area
- ▭ B-12 Baffled Pistol Range
- ▭ Surface Soil (SS) Composite Sample Boundaries
- ▭ Roads
- ▭ Buildings



Figure 3-1  
 B-12 Range Surface and Subsurface  
 Soil Sampling Locations  
 MCB Camp Lejeune  
 North Carolina



**Legend**

- ⊗ Temporary Wells
- ▭ Proposed BEQ Area
- ▭ B-12 Baffled Pistol Range
- ▭ Roads
- ▭ Buildings

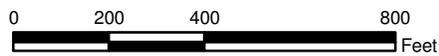


Figure 3 -2  
B-12 Range Groundwater Sampling Locations  
MCB Camp Lejeune  
North Carolina



**Legend**

-  Wetlands
-  Archeological Sites
-  Proposed BEQ Area
-  B-12 Baffled Pistol Range
-  Base Boundary



Figure 5-1  
B-12 Range Wetland Map  
MCB Camp Lejeune  
North Carolina

**Appendix A**  
**Archival Records Search Report**

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# **Archival Records Search Report B-12 Baffled Pistol Range**

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

**Task Order 09**

**January 2008**

Prepared for

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

Under the

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

Prepared by



**Charlotte, North Carolina**

# Contents

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<b>Acronyms and Abbreviations .....</b>	<b>i</b>
<b>1.0 Introduction, Purpose, and Scope.....</b>	<b>1-1</b>
<b>2.0 Site Information .....</b>	<b>2-1</b>
2.1 Ownership and Operational History .....	2-1
2.1.1 MCB Camp Lejeune Ownership History.....	2-1
2.1.2 B-12 Baffled Pistol Range .....	2-1
<b>3.0 References .....</b>	<b>3-1</b>

## Figures

A-1	B-12 Baffled Pistol Range, Air Station, Camp Lejeune, NC, Master Shore Station Development Plan - December 31, 1960
A-2	B-12 Baffled Pistol Range, Air Station, Camp Lejeune, NC, Range Overlay Map - February, 1970
A-3	B-12 Baffled Pistol Range, Air Station, Camp Lejeune, NC, Range Overlay Map - September, 1976
A-4	B-12 Baffled Pistol Range, Air Station, Camp Lejeune, NC, Range Overlay Map - December, 1987
A-5	B-6 Range, Air Station, Camp Lejeune, NC, Range Overlay Map - April, 1958
A-6	B-6 Range, Air Station, Camp Lejeune, NC, Range Overlay Map - August, 1951
A-7	B-6 Range, Air Station, Camp Lejeune, NC, Range Overlay Map - February, 1953
A-8	B-6 Range, Air Station, Camp Lejeune, NC, Range Overlay Map - June, 1954

<b>Attachment A</b>	Resource Review Summary
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# Acronyms and Abbreviations

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°F	degrees Fahrenheit
asl	above sea level
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DGM	Digital Geophysical Mapping
HE	High-Explosive
MC	Munitions Constituents
MCB	Marine Corps Base
MEC	Munitions and Explosives of Concern
MRP	Munitions Response Program
NARA	National Archives and Records Administration
PA/SI	Preliminary Assessment/ Site Inspection
TO	Task Order
UXO	Unexploded Ordnance
WWII	World War II

## SECTION 1

# Introduction, Purpose, and Scope

---

Marine Corps Base (MCB) Camp Lejeune is in the process of investigating closed ranges at the Base following the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) investigation process. A munitions response program (MRP) Environmental Investigation will be conducted at the area of investigation within the B-12 Baffled Pistol Range (B-12 Range).

The results of the environmental investigation will determine if any impacts to soil and groundwater have occurred at the B-12 Range due to past range activities. To support the site investigation effort, this archival records search report has been prepared to provide a narrative of the historical activities at the B-12 Range that may have resulted in environmental contamination with MEC.

The archival records search report is an investigative review of existing information about the site and its surrounding area, with an emphasis on obtaining information from personnel and historical resources that might indicate a potentially hazardous release to the environment. The scope of the report includes:

- A review of existing information about the site (including MCB Camp Lejeune maps, drawings, and reports, and interviews with MCB Camp Lejeune personnel).
- Collection of additional information about the site.

A complete listing of resources identified and investigated for this report is provided in Attachment 1. Attachment 1 also includes details concerning the reviews of the historical information from the Marine Corps Library at Quantico, National Archives and Records Administration (NARA) map and text files, and MCB Camp Lejeune base files.

# Site Information

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## 2.1 Ownership and Operational History

### 2.1.1 MCB Camp Lejeune Ownership History

The history of the land now occupied by MCB Camp Lejeune is documented primarily through land records and maps. Following the start of World War II (WWII), the War Department began purchasing tracts of land in 1941 from local residents to meet the need for an East Coast amphibious training facility. Prior to the Marines occupation, the land had been occupied by white and African-American communities and farms since the Colonial era. The land contained plantation houses, cabins, farm buildings, tobacco barns, stores, and various cemeteries (Global Security Website, 2007).

The initial land transferred to the government was acquired in 14 different transactions between April and October 1941 and totaled 173.8 square miles or 111,155 acres, of which there were 85,155 land acres and about 26,000 acres under water (Loftfield, 1981, Louis Berger Group, 2002). The individual tracts of land were grouped into various 'Areas' for consolidation.

### 2.1.2 B-12 Baffled Pistol Range

The B-12 Range was identified as Archives Search Report (ASR) Site 2.134 in the *Final Range Identification and Preliminary Range Assessment* (USACE, 2001). The area of investigation is located within the B-12 Range, which is situated on the Air Station at MCB Camp Lejeune, south of Douglass Road near Schmidt Street.

The B-12 Range was identified in the 1960 Master Shore Station Development Plan as shown on Figure A-1. The B-12 Range was also identified on the 1970, 1976, and 1987 Range Overlay Maps, presented as Figure A-2, A-3, and A-4, respectively. Based on these figures, the B-12 Range was in use from approximately 1960 until at least 1987. All referenced figures depicting the B-12 Range show the B-12 range fans as being located in approximately the same location, south of Curtis Road. The range fan maps show the B-12 range fan with some variation in shape and size, extending southeast towards Douglass Road and Perimeter Street. *Regulations Governing Use of Firing Range 5, Field Training and Facilities and Maneuver Areas* listed the following types of munitions as having been employed at this site: .22 caliber rifles, service pistols, and revolvers (USMC, 1996). The *Final Range Identification and Preliminary Range Assessment* also listed the .38 caliber, .45 caliber, and 9mm weapons as munitions used at the B-12 Range (USACE, 2001).

According to the *Final Range Identification and Preliminary Range Assessment* and the 1958 range overlay map (Figure A-5), the small arms range B-6 is shown to be located in the same area as the B-12 range. The B-6 Range was in use from 1950 to 1961 (USACE, 2001). The B-6 Range is also identified on the 1951, 1953, and 1954 range overlay maps (Figures A-6, A-7, and A-8, respectively), at alternate locations north of Curtis Road. The 1951, 1953, and 1954

B-6 range fans are not located in the project area being investigated in this WP. The following types of munitions were reported to have been employed at the B-6 Range: .22, .32, .38, and .45 caliber (USACE, 2001).

An interview with the Base Safety specialist (Richardson, 2007) confirmed that the type of ammunition fired at the B-12 Range included .22 caliber, .38 caliber, .45 caliber, and 9 mm rounds. Initially, the range utilized a large dirt berm as a backstop to catch rounds at impact. Later, the range was equipped with a bullet trap to collect the fired rounds. (Richardson, 2007).

### SECTION 3

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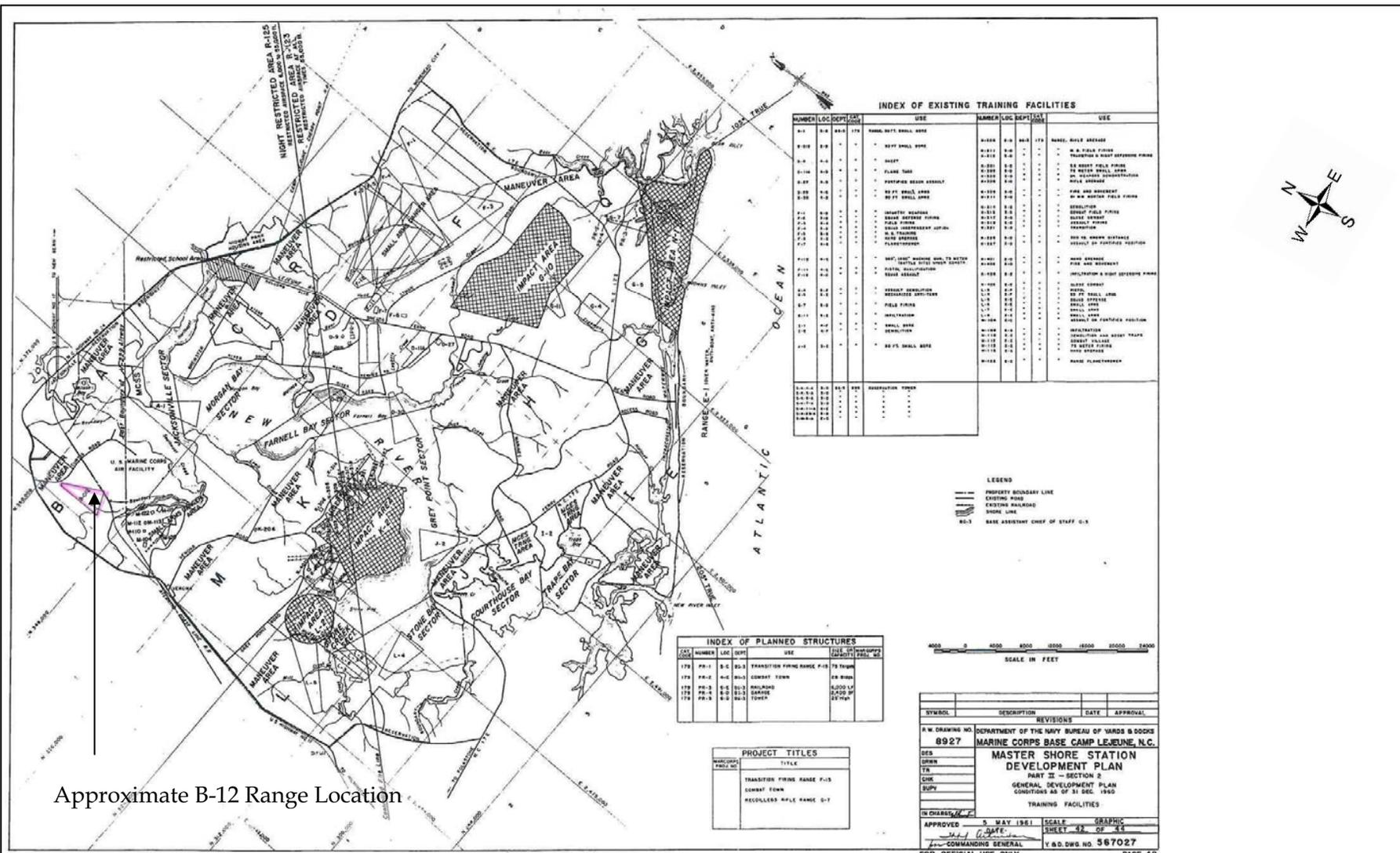
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December 2001.

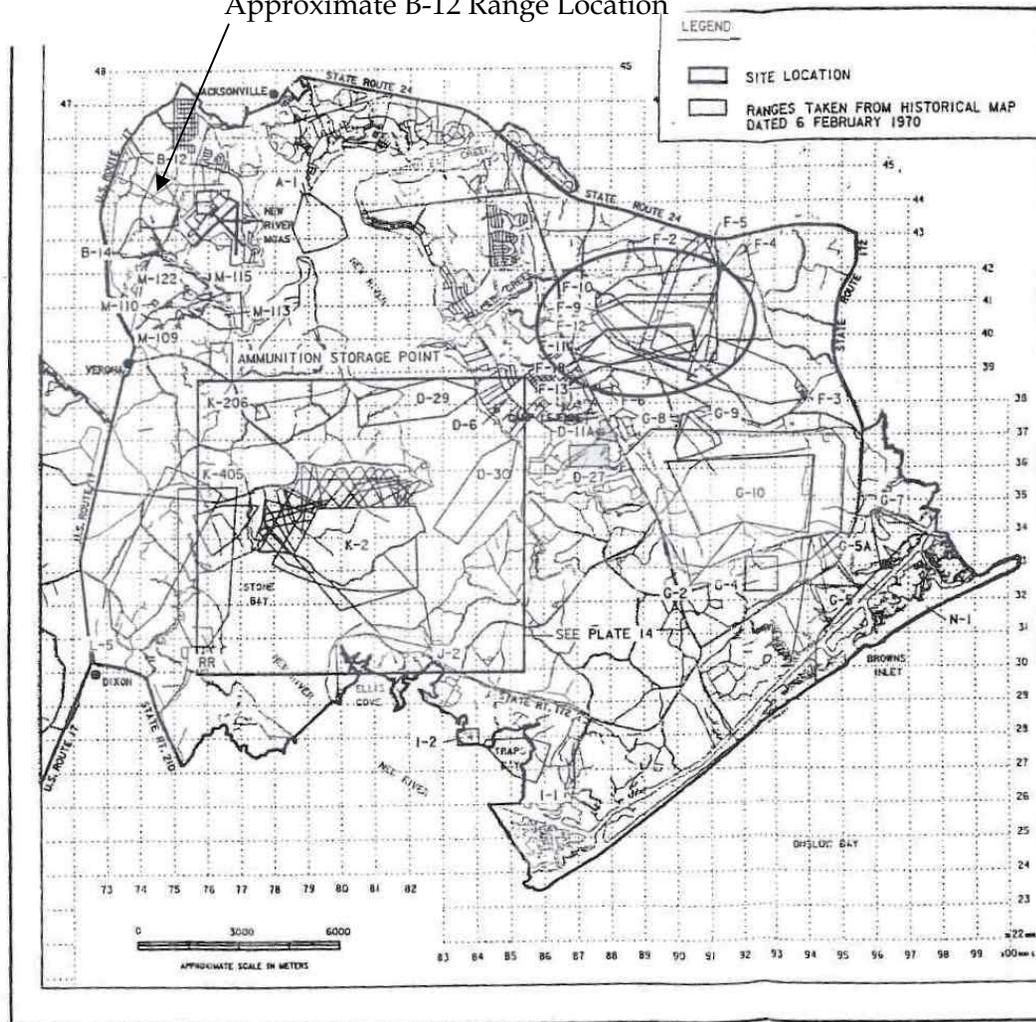
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Base, Camp Lejeune, Onslow County, North Carolina*. November.

## **Figures**

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Approximate B-12 Range Location



**FEATURES**

FEATURE NUMBER	FEATURE DESCRIPTION
A-1	PISTOL AND SHOTGUN RANGE
B-12	BAFFLED PISTOL RANGE
B-14	ASSAULT OF A FORTIFIED POSITION RANGE
D-6	50 FOOT INDOOR SMALL BORE RIFLE AND PISTOL RANGE
D-11A	FLAME TANK AND FLAME THROWER RANGE
D-27	FORTIFIED BEACH ASSAULT AREA
D-29	50 FOOT SMALL BORE RANGE
D-30	50 FOOT SMALL BORE RANGE
F-2	FIELD FIRING RANGE
F-3	FIELD FIRING RANGE
F-4	FIRE CONTROL RANGE
F-5	SQUAD LIVE FIRE AND MANEUVER COURSE
F-6	LIVE HAND GRENADE RANGE
F-9	BATTLE SIGHT RANGE
F-10	MACHINE GUN QUALIFICATION RANGE
F-11	PISTOL RANGE
F-12	FIELD FIRING RANGE
F-13	FLAME THROWER RANGE
F-18	MACHINE GUN FIELD FIRING RANGE
G-2	INFILTRATION RANGE
G-4	DEMOLITION ASSAULT COURSE
G-5	ANTI-TANK RANGE
G-5A	MEDIANIZED ANTI-TANK RANGE
G-7	DIRECT FIRE ARTILLERY RANGE
G-8	GRENADE LAUNCHER RANGE
G-9	LIGHT ANTI-ARMOR WEAPONS AND SHOULDER LAUNCHED MULTI-PURPOSE ASSAULT WEAPONS RANGE
G-10	IMPACT AREA
I-1	50 FOOT SMALL BORE RANGE
I-2	DEMOLITION AREA
J-2	1000 INCH RANGE
K-2	IMPACT AREA - SEE NOTE BELOW
K-206	UNKNOWN RANGE
K-405	COMBAT PISTOL MAREMAMSHIP RANGE
L-5	MULTI-PURPOSE MACHINE GUN RANGE
M-109	INFILTRATION RANGE
M-110	DEMOLITIONS AND ROOBY TRAP RANGE
M-113	HAND GRENADE RANGE (PRACTICE) DEMONSTRATOR
M-115	HAND GRENADE RANGE
M-122	FLAME THROWER RANGE
N-1	IMPACT AREA
RR	RIFLE RANGE

\*\*\*NOTE: SEE PLATE 14 FOR FEATURE NUMBERS AND FEATURE DESCRIPTIONS ON K RANGES.

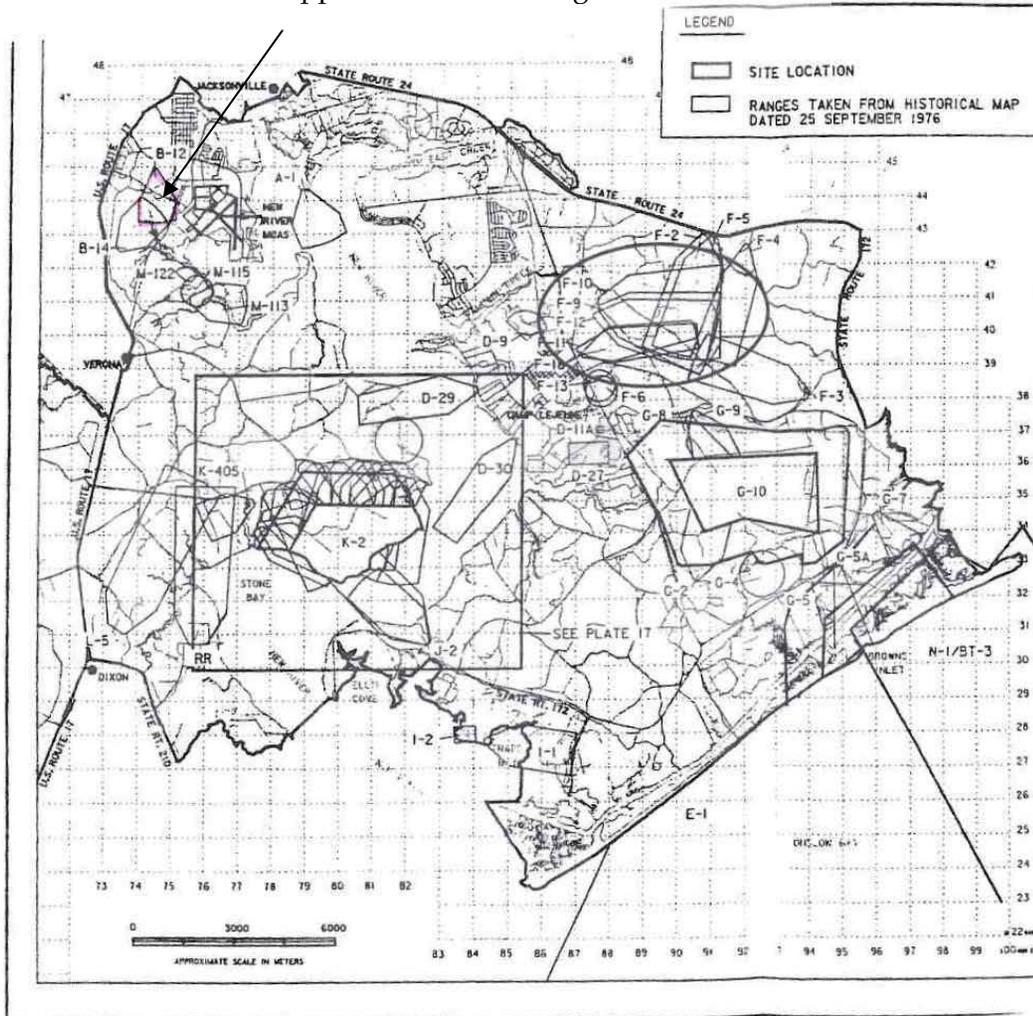
\*\*\*NOTE: HISTORICAL MAP SHEET DATA USED IN THIS REPORT WAS RECTIFIED TO A CURRENT MAP PROVIDED BY MCB CAMP LEJEUNE USING INTERGRAPH CORPORATION SOFTWARE. THE ACCURACY OF FEATURES RECTIFIED FROM THE HISTORICAL MAP SHEET DATA TO THE CURRENT MCB CAMP LEJEUNE MAP MAY VARY.



 <b>U.S. ARMY CORPS OF ENGINEERS</b> ST. LOUIS DISTRICT	
<b>MARINE CORPS BASE</b> <b>(MCB) CAMP LEJEUNE</b> <b>JACKSONVILLE, NORTH CAROLINA</b> <b>ONSLOW COUNTY</b> <b>RANGE OVERLAY MAP-FEBRUARY 1970</b>	
<small>FORM DATE: SEPT 1966</small> <small>16-FD (200 103)</small>	<small>DATE OF BASE MAP: 1966</small> <small>PLATE NO. 13</small>

**Figure A-2**  
 Range Overlay Map  
 B-12 Baffled Pistol Range  
 MCB Camp Lejeune, NC  
 February 1970

### Approximate B-12 Range Location



#### KEY TO FEATURES:

FEATURE NUMBER	FEATURE DESCRIPTION
A-1	PISTOL AND SHOTGUN RANGE
B-12	BAFFLED PISTOL RANGE
B-14	ASSAULT OF A FORTIFIED POSITION RANGE
D-9	SKEET RANGE
G-11A	FLAME TANK AND FLAME THROWER RANGE
D-27	FORTIFIED BEACH ASSAULT AREA
D-29	50 FOOT SMALL BORE RANGE
D-30	50 FOOT SMALL BORE RANGE
E-1	AIR DEFENSE FIRING RANGE
F-2	FIELD FIRING RANGE
F-3	FIELD FIRING RANGE
F-4	FIRE CONTROL RANGE
F-5	SQUAD LIVE FIRE AND MANEUVER COURSE
F-6	LIVE HAND GRENADE RANGE
F-9	BATTLE SIGHT RANGE
F-10	MACHINE GUN QUALIFICATION RANGE
F-11	PISTOL RANGE
F-12	FIELD FIRING RANGE
F-13	FLAME THROWER RANGE
F-18	MACHINE GUN FIELD FIRING RANGE
G-2	INFILTRATION RANGE
G-4	DEMOLITION ASSAULT COURSE
G-5	ANTI-TANK RANGE
G-5A	MECHANIZED ANTI-TANK RANGE
G-7	DIRECT FIRE ARTILLERY RANGE
G-8	GRENADE LAUNCHER RANGE
G-9	LIGHT ANTI-ARMOR WEAPONS AND SHOULDER LAUNCHED MULTI-PURPOSE ASSAULT WEAPONS RANGE
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I-1	50 FOOT SMALL BORE RANGE
I-2	DEMOLITION AREA
J-2	1000 INCH RANGE
K-2	IMPACT AREA - SEE NOTE BELOW
K-405	COMBAT PISTOL MARKSMANSHIP RANGE
L-5	MULTI-PURPOSE MACHINE GUN RANGE
M-113	HAND GRENADE RANGE (PRACTICE) DEMONSTRATOR
M-115	HAND GRENADE RANGE
M-122	FLAME THROWER RANGE
M-1/ST-3	IMPACT AREA
RR	RIFLE RANGE

NOTE: HISTORICAL MAP SHEET DATA USED IN THIS REPORT WAS RECTIFIED TO A CURRENT MAP PROVIDED BY MCB CAMP LEJEUNE USING INTERGRAPH CORPORATION SOFTWARE. THE ACCURACY OF FEATURES RECTIFIED FROM THE HISTORICAL MAP SHEET DATA TO THE CURRENT MCB CAMP LEJEUNE MAP MAY VARY.

NOTE: SEE PLATE 17 FOR FEATURE NUMBERS AND FEATURE DESCRIPTIONS ON X RANGES.



U.S. ARMY CORPS OF ENGINEERS  
ST. LOUIS DISTRICT

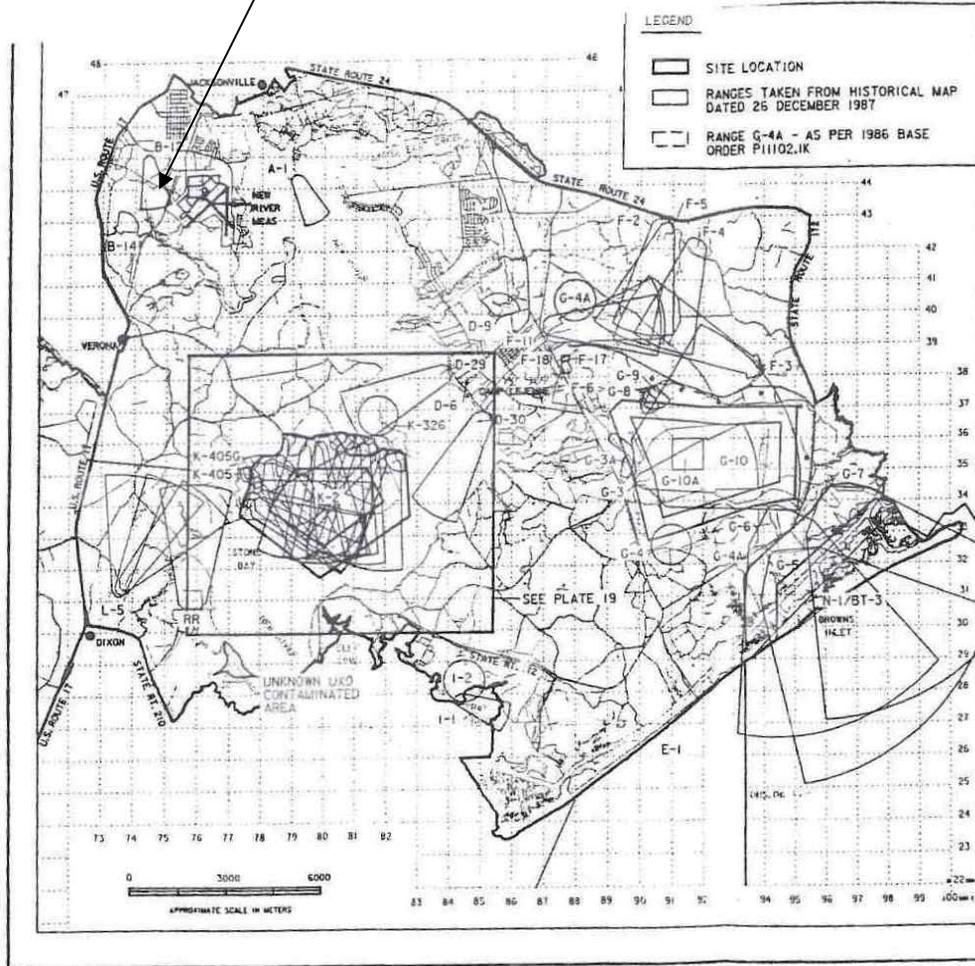
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MARINE CORPS BASE  
(MCB) CAMP LEJEUNE  
JACKSONVILLE, NORTH CAROLINA  
ONSLOW COUNTY  
RANGE OVERLAY MAP-SEPTEMBER 1976

PUB. DATE: SEPT. 1976
DATE OF BASE MAP: 1976
PLATE NO. 17

**Figure A-3**  
Range Overlay Map  
B-12 Baffled Pistol Range  
MCB Camp Lejeune, NC  
September 1976

Approximate B-12 Range Location



**KEY TO FEATURES:**

FEATURE NUMBER	FEATURE DESCRIPTION
A-1	PISTOL AND SHOTGUN RANGE
B-12	BAFFLED PISTOL RANGE
B-14	ASSAULT OF A FORTIFIED POSITION RANGE
D-4	50 FOOT INDOOR SMALL BORE RIFLE AND PISTOL RANGE
D-9	SHEET RANGE
D-29	50 FOOT SMALL BORE RANGE
D-30	50 FOOT SMALL BORE RANGE
E-1	AIR DEFENSE FIRING RANGE
F-2	FIELD FIRING RANGE
F-3	FIELD FIRING RANGE
F-4	FIRE CONTROL RANGE
F-5	SQUAD LIVE FIRE AND MANEUVER COURSE
F-6	LIVE HAND GRENADE RANGE
F-11	PISTOL RANGE
F-17	DRY NET TRAINING
F-18	MACHINE GUN FIELD FIRING RANGE
G-3	INFANTRY WEAPONS RANGE
G-3A	M 257 SMOKE GRENADE LAUNCHER SYSTEM RANGE
G-4	DEMOLITIONS ASSAULT AREA
G-4A	EOD RANGE SHOWN ON 1987 MAP (SOLID LINE)
G-4A	EOD RANGE SHOWN ON 1986 BASE ORDER (DASHED LINE)
G-5	ANTI-TANK RANGE
G-6	TANK GUNNERY RANGE
G-7	DIRECT FIRE ARTILLERY RANGE
G-8	GRENADE LAUNCHER RANGE
G-9	LIGHT ANTI-AIRCRAFT WEAPONS AND SHOULDER LAUNCHED MULTI-PURPOSE ASSAULT WEAPONS RANGE
G-10	IMPACT AREA
G-10A	EOD DISPOSAL AREA
I-1	50 FOOT SMALL BORE RANGE
I-2	DEMOLITION AREA
K-2	IMPACT AREA - SEE NOTE BELOW
K-326	EOD-2 EXPLOSIVE ORDNANCE DISPOSAL AREA
X-405	HAND GRENADE RANGE
X-405G	UNKNOWN RANGE
L-5	MULTI-PURPOSE MACHINE GUN RANGE
N-1/BT-3	IMPACT AREA
RR	RIFLE RANGE



NOTE: HISTORICAL MAP SHEET DATA USED IN THIS REPORT WAS RECTIFIED TO A CURRENT MAP PROVIDED BY MCB CAMP LEJEUNE USING INTERGRAPH CORPORATION SOFTWARE. THE ACCURACY OF FEATURES RECTIFIED FROM THE HISTORICAL MAP SHEET DATA TO THE CURRENT MCB CAMP LEJEUNE MAP MAY VARY.

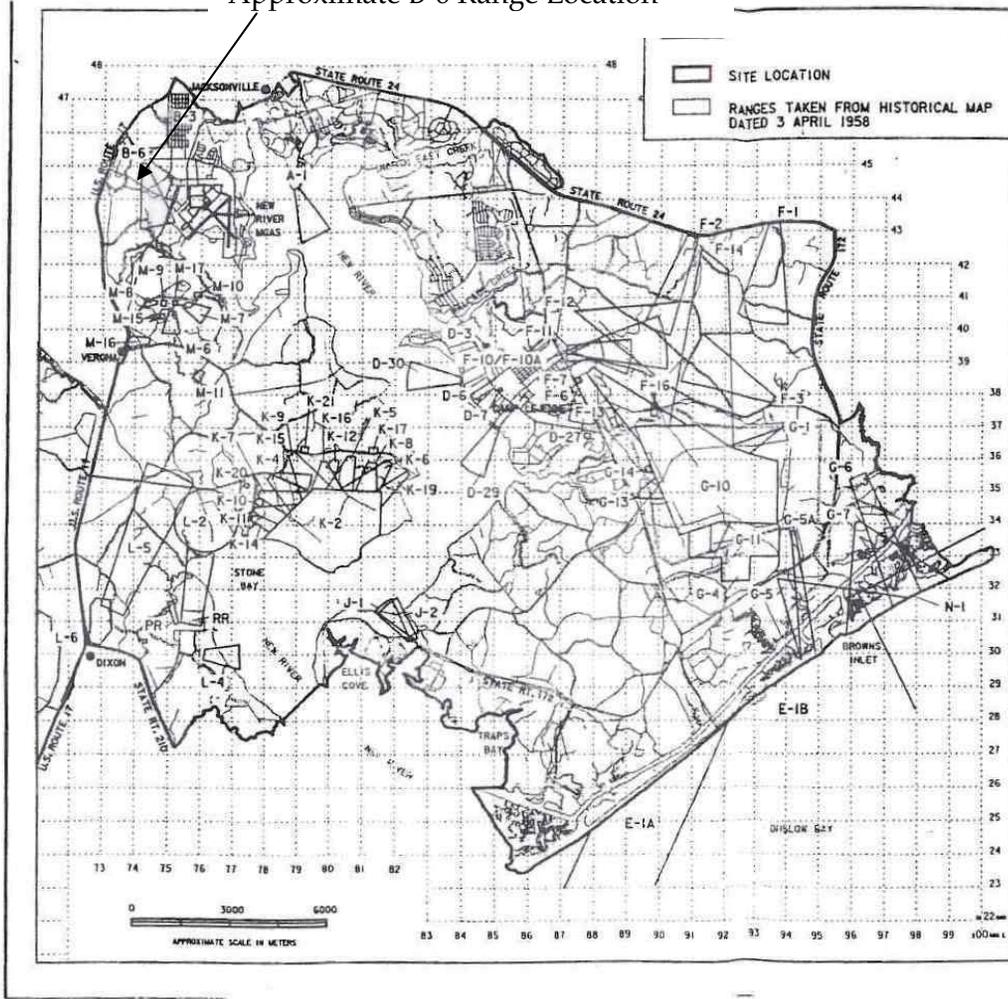
NOTE: SEE PLATE 19 FOR FEATURE NUMBERS AND FEATURE DESCRIPTIONS ON K RANGES.



 <b>U.S. ARMY CORPS OF ENGINEERS</b> ST. LOUIS DISTRICT	
<b>MARINE CORPS BASE</b> <b>(MCB) CAMP LEJEUNE</b> <b>JACKSONVILLE, NORTH CAROLINA</b> <b>ONSLOW COUNTY</b> <b>RANGE OVERLAY MAP-DECEMBER 1987</b>	
PROD. DATE: 28PT. 1987 <small>1:25000 1:50000 1:100000</small>	DATE OF BASE MAP: 28M <small>1:25000 1:50000 1:100000</small>
PLATE NO. 18	

**Figure A-4**  
 Range Overlay Map  
 B-12 Baffled Pistol Range  
 MCB Camp Lejeune, NC  
 December 1987

Approximate B-6 Range Location



RANGE OVERLAY MAP		RANGE OVERLAY MAP	
FEATURE NUMBER	FEATURE DESCRIPTION	FEATURE NUMBER	FEATURE DESCRIPTION
A-1	50 FOOT .22 CALIBER RANGE	K-15	MACHINE GUN FIELD FIRING RANGE 500' AND 1000' RANGE
B-3	GAS CHAMBER	K-16	INFANTRY WEAPONS DEMONSTRATION RANGE
B-6	50 FOOT SMALL ARMS RANGE	K-17	PRACTICE HAND GRENADE COURSE
D-3	GAS CHAMBER	K-19	300 YARD BATTLESIGHT RANGE
D-6	PRACTICE HAND GRENADE RANGE	K-20	HAND GRENADE RANGE
D-7	GAS CHAMBER	K-21	FLAME THROWER RANGE
D-27	FORTIFIED BEACH ASSAULT AREA	L-2	IMPACT AREA
D-29	50 FOOT SMALL BORE RANGE	L-4	1000 INCH RANGE
D-30	50 FOOT SMALL BORE RANGE	L-5	MULTI-PURPOSE MACHINE GUN RANGE
E-1A	AAA AND ANTI-BOAT FIRING RANGE	L-6	MINE WARFARE AND DEMOLITION AREA
E-1B	AAA AND ANTI-BOAT FIRING RANGE	M-6	INFILTRATION COURSE
F-1	FIELD FIRING RANGE	M-7	LANDSCAPE RANGE
F-2	FIELD FIRING RANGE	M-8	ASSAULT OF A FORTIFIED POSITION RANGE
F-3	FIELD FIRING RANGE	M-9	COMBAT VILLAGE AREA
F-6	LIVE HAND GRENADE RANGE	M-10	HAND GRENADE RANGE
F-7	.22 CALIBER RANGE, 1000 INCH	M-11	ASSAULT OF A FORTIFIED POSITION AREA
F-10	MACHINE GUN QUALIFICATION RANGE	M-15	MINE, BOOBYTRAP DISPLAY AREA
F-10A	1000 INCH RANGE	M-16	OUTDOOR CLASSROOM
F-11	PISTOL RANGE	M-17	PRACTICE HAND AND RIFLE GRENADE RANGE
F-12	FIELD FIRING RANGE	N-1	IMPACT AREA
F-13	FIELD FIRING RANGE	PR	PISTOL RANGE
F-14	FIELD FIRING RANGE	RR	RIFLE RANGE
F-16	COMBAT VILLAGE		
G-1	COMBAT RANGE		
G-4	DEMOLITION ASSAULT AREA		
G-5	ANTI-TANK RANGE		
G-5A	MEDIANZED ANTI-TANK RANGE		
G-6	ARTILLERY RANGE		
G-7	DIRECT FIRE ARTILLERY RANGE		
G-10	IMPACT AREA		
G-11	BATTLE INDOCTRINATION COURSE		
G-13	MINIATURE ANTI-AIRCRAFT RANGE		
G-14	TANK MACHINE GUN RANGE		
J-1	1000 INCH RANGE		
J-2	1000 INCH RANGE		
K-2	IMPACT AREA		
E-4	TRANSITION FIRING RANGE		
K-5	COMBAT FIRING RANGE		
K-6	TRANSITION RANGE		
E-7	COMBAT FIRING RANGE		
K-8	CLOSE COMBAT COURSE		
K-9	3.5 INCH ROCKET FIELD FIRING RANGE		
K-10	RIFLE GRENADE FIELD FIRING RANGE		
K-11	INFILTRATION COURSE		
K-14	CLOSE COMBAT COURSE		

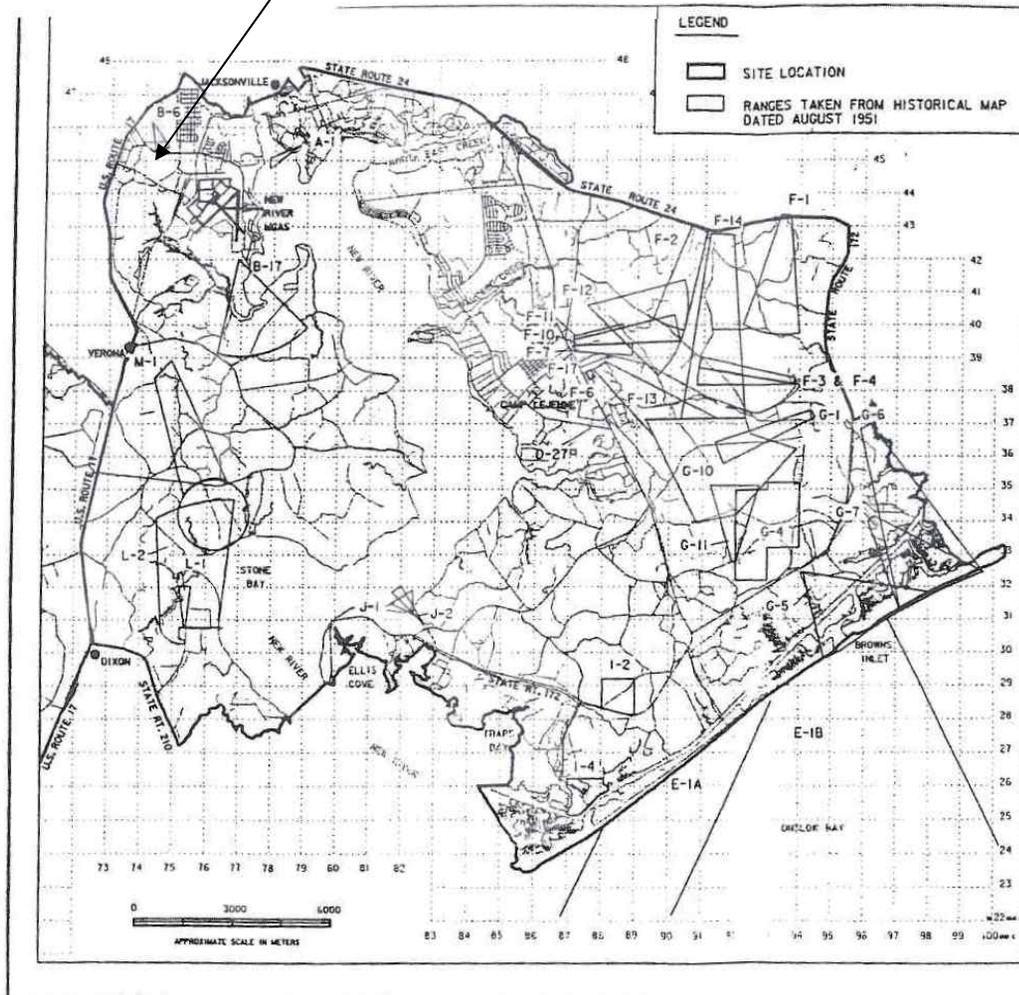
NOTE: HISTORICAL MAP SHEET DATA USED IN THIS REPORT WAS RECTIFIED TO A CURRENT MAP PROVIDED BY MCB CAMP LEJEUNE USING INTERGRAPH CORPORATION SOFTWARE. THE ACCURACY OF FEATURES RECTIFIED FROM THE HISTORICAL MAP SHEET DATA TO THE CURRENT MCB CAMP LEJEUNE MAP MAY VARY.



	U.S. ARMY CORPS OF ENGINEERS ST. LOUIS DISTRICT
MARINE CORPS BASE (MCB) CAMP LEJEUNE JACKSONVILLE, NORTH CAROLINA ONSLow COUNTY RANGE OVERLAY MAP-APRIL 1958	
FILE DATE: 08PT 1964	DATE OF BASE MAP: 1964
DATE: 08/18/2000 SHEET	PLATE NO. 10

**Figure A-5**  
Range Overlay Map  
B-12 Baffled Pistol Range  
MCB Camp Lejeune, NC  
April 1958

Approximate B-6 Range Location



KEY TO FEATURES:

FEATURE NUMBER	FEATURE DESCRIPTION
A-1	50 FOOT .22 CALIBER RANGE
B-6	50 FOOT SMALL ARMS RANGE
B-17	INFANTRY WEAPONS DEMONSTRATION COURSE
D-27	FORTIFIED BEACH ASSAULT AREA
E-1A	AAA AND ANTI-BOAT FIRING RANGE
E-1B	AAA AND ANTI-BOAT FIRING RANGE
F-1	FIELD FIRING RANGE
F-2	FIELD FIRING RANGE
F-3	FIELD FIRING RANGE
F-4	FIELD FIRING RANGE
F-6	LIVE HAND GRENADE RANGE
F-7	.22 CALIBER RANGE, 1000 INCH
F-10	MACHINE GUN QUALIFICATION RANGE
F-11	PISTOL RANGE
F-12	FIELD FIRING RANGE
F-13	FIELD FIRING RANGE
F-14	FIELD FIRING RANGE
F-17	DRY NET MOCK-UP
G-1	COMBAT RANGE
G-4	DEMOLITIONS ASSAULT COURSE
G-5	ANTI-TANK RANGE
G-6	ARTILLERY RANGE
G-7	DIRECT FIRE ARTILLERY RANGE
G-10	IMPACT AREA
G-11	BATTLE INDOCTRINATION COURSE
I-2	DEMOLITION RANGE
I-4	DEMOLITION AREA
J-1	1000 INCH RANGE
J-2	1000 INCH RANGE
L-1	PISTOL RANGE
L-2	RIFLE RANGE
M-1	RANGE M-1

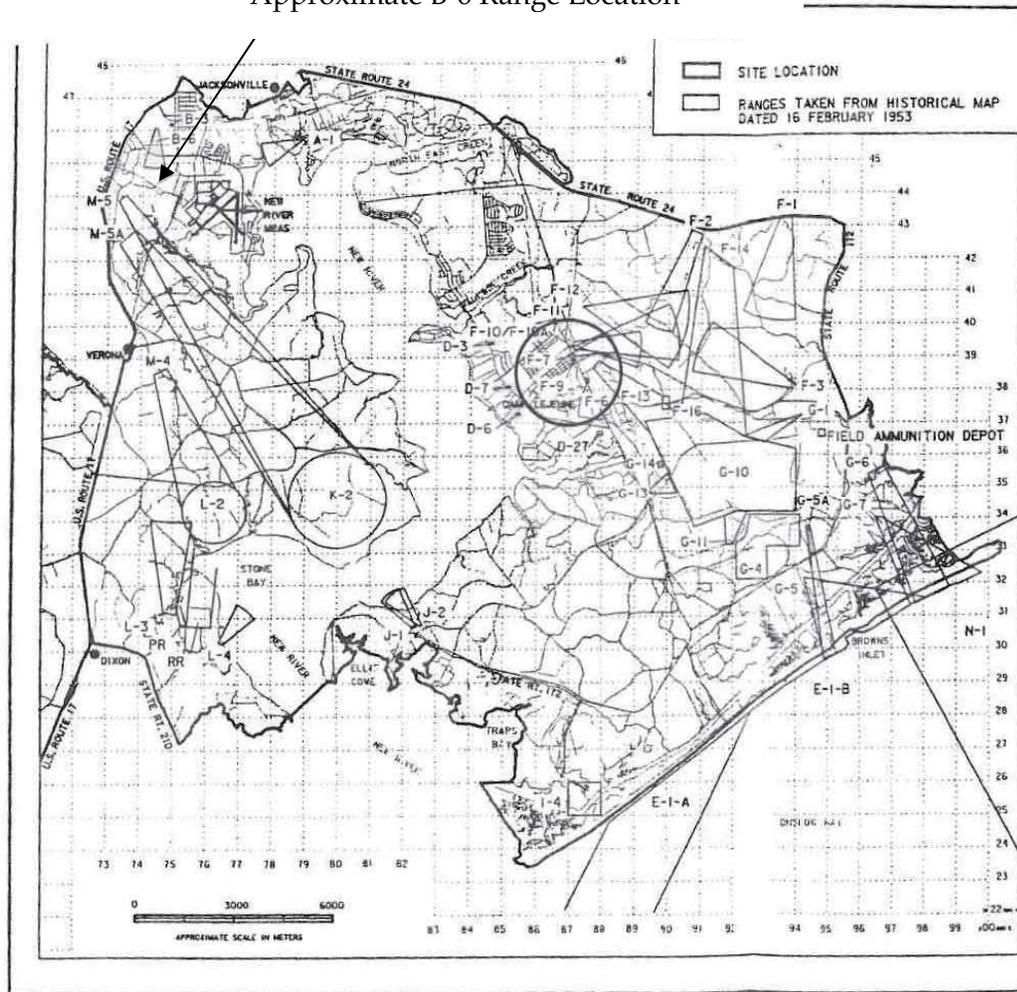
\*\*\*NOTE: HISTORICAL MAP SHEET DATA USED IN THIS REPORT WAS RECTIFIED TO A CURRENT MAP PROVIDED BY MCB CAMP LEJEUNE USING INTERGRAPH CORPORATION SOFTWARE. THE ACCURACY OF FEATURES RECTIFIED FROM THE HISTORICAL MAP SHEET DATA TO THE CURRENT MCB CAMP LEJEUNE MAP MAY VARY.



	U.S. ARMY CORPS OF ENGINEERS ST. LOUIS DISTRICT
	MARINE CORPS BASE (MCB) CAMP LEJEUNE JACKSONVILLE, NORTH CAROLINA ONSLOW COUNTY RANGE OVERLAY MAP-AUGUST 1951
PROJ. DATE: SEPT 1996	DATE OF BASE MAP: 1951

**Figure A-6**  
Range Overlay Map  
B-12 Baffled Pistol Range  
MCB Camp Lejeune, NC  
August 1951

# Approximate B-6 Range Location



### KEY TO FEATURES:

FEATURE NUMBER	FEATURE DESCRIPTION
A-1	50 FOOT .22 CALIBER RANGE
B-3	GAS CHAMBER
B-5	1000 INCH RANGE
D-3	PRACTICE HAND GRENADE COURSE
D-4	PRACTICE HAND GRENADE COURSE
D-7	GAS CHAMBER
D-21	FORTIFIED BEACH ASSAULT AREA
E-1A	AAA AND ANTI-BOAT RANGE
E-1B	AAA AND ANTI-BOAT RANGE
F-1	FIELD FIRING RANGE
F-2	FIELD FIRING RANGE
F-3	FIELD FIRING RANGE
F-4	LIVE HAND GRENADE RANGE
F-7	1000 INCH RANGE
F-9	TRIANGULATION RANGE
F-10	MACHINE GUN QUALIFICATION RANGE
F-10A	1000 INCH RANGE
F-11	PISTOL RANGE
F-12	FIELD FIRING RANGE
F-13	FIELD FIRING RANGE
F-14	FIELD FIRING RANGE
F-16	COMBAT VILLAGE
G-1	COMBAT RANGE
G-4	ASSAULT DEMOLITION AREA
G-5	ANTI-TANK RANGE
G-5A	MECHANIZED ANTI-TANK RANGE
G-6	ARTILLERY RANGE
G-7	DIRECT FIRE ARTILLERY RANGE
G-10	IMPACT AREA
G-11	BATTLE INDOCRINATION RANGE
G-13	MINIATURE ANTI-AIRCRAFT RANGE
G-14	TANK MACHINE GUN RANGE
I-4	DEMOLITION AREA
J-1	1000 INCH RANGE
J-2	1000 INCH RANGE
K-2	IMPACT AREA
L-2	IMPACT AREA
L-3	MACHINE GUN TRANSITION RANGE
L-4	1000 INCH RANGE
M-4	FIELD FIRING RANGE
M-5	ARTILLERY RANGE
M-5A	ARTILLERY RANGE
N-1	DANGER AREA
PR	PISTOL RANGE
RR	RIFLE RANGE



\*\*\*NOTE: HISTORICAL MAP SHEET DATA USED IN THIS REPORT WAS RECTIFIED TO A CURRENT MAP PROVIDED BY MCB CAMP LEJEUNE USING INTERGRAPH CORPORATION SOFTWARE. THE ACCURACY OF FEATURES RECTIFIED FROM THE HISTORICAL MAP SHEET DATA TO THE CURRENT MCB CAMP LEJEUNE MAP MAY VARY.



U.S. ARMY CORPS OF ENGINEERS  
ST. LOUIS DISTRICT

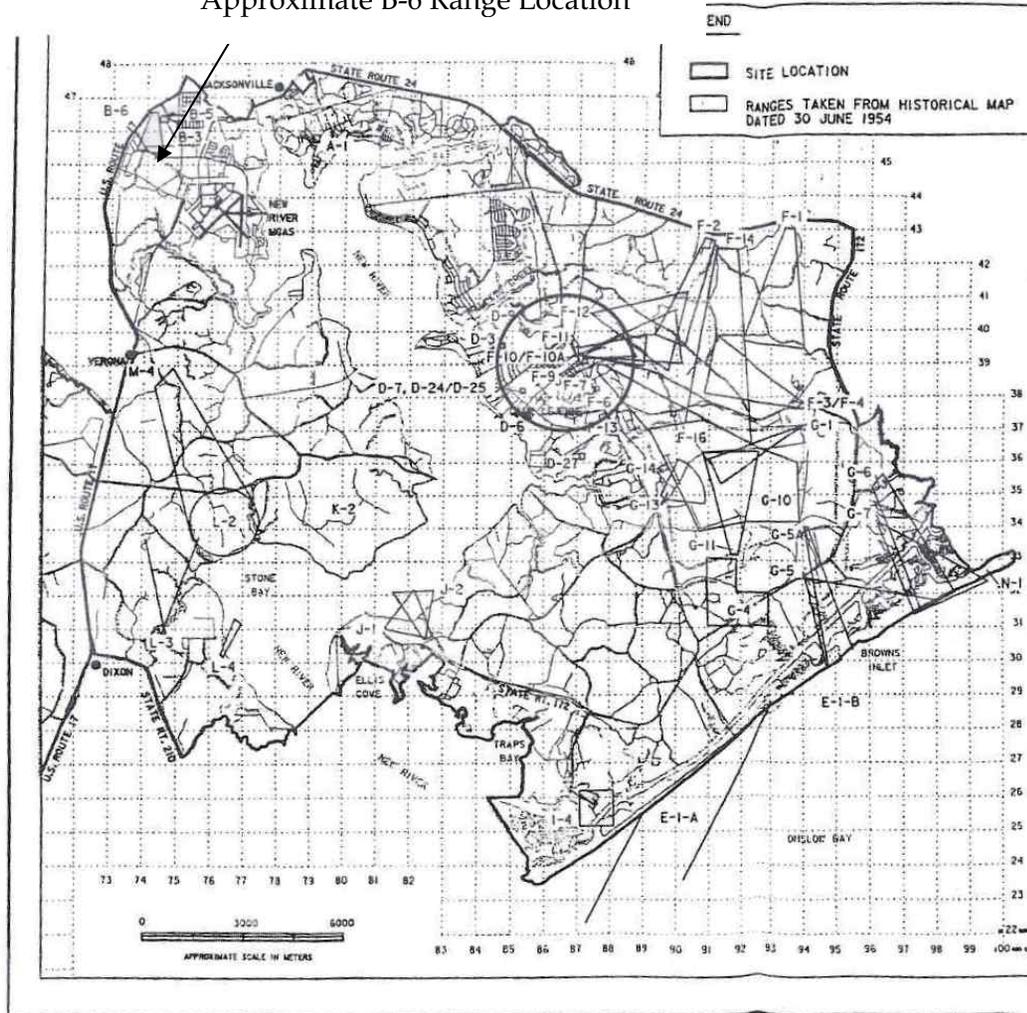
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MARINE CORPS BASE  
(MCB) CAMP LEJEUNE  
JACKSONVILLE, NORTH CAROLINA  
ONSLOW COUNTY  
RANGE OVERLAY MAP-FEBRUARY 1953

PUB. DATE SEPT. 1959    DATE OF BASIC MAP 1949    PLATE NO. 2

**Figure A-7**  
Range Overlay Map B-6  
B-12 Baffled Pistol Range  
MCB Camp Lejeune, NC  
August 1953

Approximate B-6 Range Location



KEY TO FEATURES:

FEATURE NUMBER	FEATURE DESCRIPTION
A-1	50 FOOT .22 CALIBER RANGE
B-3	GAS CHAMBER
B-5	PRACTICE HAND GRENADE COURSE
B-6	50 FOOT SMALL ARMS RANGE
D-3	PRACTICE HAND GRENADE COURSE
D-4	PRACTICE HAND GRENADE COURSE
D-7	GAS CHAMBER
D-8	SKEET RANGE
D-27	FORTIFIED BEACH ASSAULT AREA
E-1A	AAA AND ANTI-BOAT FIRING RANGE
E-1B	AAA AND ANTI-BOAT FIRING RANGE
F-1	FIELD FIRING RANGE
F-2	FIELD FIRING RANGE
F-3	FIELD FIRING RANGE
F-4	FIELD FIRING RANGE
F-6	LIVE HAND GRENADE RANGE
F-7	.22 CALIBER RANGE 1000 INCH
F-8	TRANSILATION RANGE
F-10	1000 INCH RANGE
F-10A	MACHINE GUN QUALIFICATION RANGE
F-11	PISTOL RANGE
F-12	FIELD FIRING RANGE
F-13	FIELD FIRING RANGE
F-14	FIELD FIRING RANGE
F-16	COMBAT VILLAGE
G-1	COMBAT RANGE
G-4	DEMOLITION ASSAULT COURSE
G-5	ANTI-TANK RANGE
G-5A	MECHANIZED ANTI-TANK RANGE
G-6	ARTILLERY RANGE
G-7	DIRECT FIRE ARTILLERY RANGE
G-10	IMPACT AREA
G-11	BATTLE INDOCTRINATION RANGE
G-13	MINIATURE ANTI-AIRCRAFT RANGE
G-14	TANK MACHINE GUN RANGE
I-4	DEMOLITION AREA
J-1	1000 INCH RANGE
J-2	1000 INCH RANGE
K-2	IMPACT AREA
L-2	IMPACT AREA
L-3	MACHINE GUN TRANSITION RANGE
L-4	1000 INCH RANGE
M-4	FIELD FIRING RANGE
H-1	IMPACT AREA



\*\*\*NOTE: HISTORICAL MAP SHEET DATA USED IN THIS REPORT WAS RECTIFIED TO A CURRENT MAP PROVIDED BY MCB CAMP LEJEUNE USING INTERGRAPH CORPORATION SOFTWARE. THE ACCURACY OF FEATURES RECTIFIED FROM THE HISTORICAL MAP SHEET DATA TO THE CURRENT MCB CAMP LEJEUNE MAP MAY VARY.



	U.S. ARMY CORPS OF ENGINEERS ST. LOUIS DISTRICT
MARINE CORPS BASE (MCB) CAMP LEJEUNE JACKSONVILLE, NORTH CAROLINA ONSLOW COUNTY RANGE OVERLAY MAP-JUNE 1954	
PROD. DATE: SEPT. 1989 14-000-0000-1000	DATE OF BASE MAP: 1999   PLATE NO. 0

**Figure A-8**  
Range Overlay Map  
B-12 Baffled Pistol Range  
MCB Camp Lejeune, NC  
June 1954

**Attachment A**

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# Resource Review Summary

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The following table provides a summary of the specific references identified for review, interview, or contact for the archival report.

Resource	Actions Completed
Quantico, Virginia, Marine Corps Library Gray Research Center	Reviewed all available file folders related to Camp Lejeune – No relevant files to copy. Reviewed all available file photos related to Camp Lejeune – No relevant photos to copy.
US National Archives (NARA II) Historical Files	Reviewed text and drawing files from Text Division. Made copies of relevant files.
Barry Zirby/National Archives Text File	See US National Archives Files Review
Camp Lejeune Technical Records files	Reviewed and copied all relevant documents related to historical land use for each site.

## Camp Lejeune Personnel

Bob Lowder/Environmental	Contacted and interviewed
Linda Futrell/ Real Estate Expert	Contacted and interviewed
Anna Watts/ Technical Records	Contacted and interviewed
Carl Baker/ Technical Records	Contacted and interviewed
Duane Richardson/ Base Range Safety Officer	Contacted and interviewed

## Marine Corp Library Review

### Text Division

Contact: Annette Amerman

Site Visit: November 1, 2007

File review at Marine Corps Base, Quantico, Virginia, Gray Research Center, Marine Corps Archives and Special Collections.

No pertinent documents were obtained from the file review.

# National Archives and Records Administration Review

## Text Division

Contact: Mr. Barry Zirby, 301-713-7250 x285

Site visits on November 5 and 6, 2007

Reviewed 17 boxes of files associated with the Marine Corps, 1939-1950

- Record Group 127 (USMC), Office of the Commandant, General Correspondence, January 1939-June 1950, 1275/70-800 (10/45-1/47) to 1275/70-727 (1/44-12/47), Box 218.
- Record Group 127 (USMC), Office of the Commandant, General Correspondence, January 1939-June 1950, 1275/70-800 (10/44-1/45) to 1275/70-800 (7/45-9/45), Box 219.
- Record Group 127 (USMC), Office of the Commandant, General Correspondence, January 1939-June 1950, 2000-10 (1/48-12/48) to 2000-10 (5/24-12/36), Box 1201.
- Record Group 127 (USMC), Office of the Commandant, General Correspondence, January 1939-June 1950, 2000-10 (6/45-4/46) to 2000-10 (5/44), Box 1202.
- Record Group 127 (USMC), Office of the Commandant, General Correspondence, January 1939-June 1950, 2000-20 (1/49-10/49) to 2000-10 (1/45-6/45), Box 1203.
- Record Group 127 (USMC), Office of the Commandant, General Correspondence, January 1939-June 1950, 2000-20 (1/44-6/47) to 2000-20 (5/48-12/48), Box 1204.
- Record Group 127 (USMC), Office of the Commandant, General Correspondence, January 1939-June 1950, 2000-20-5 (6/46-12/47) to 2000-20 (6/43), Box 1205.
- Record Group 127 (USMC), Office of the Commandant, General Correspondence, January 1939-June 1950, 2000-20-10 (7/48-10/47) to 2000-20-5 (4/45-6/46), Box 1206.
- Record Group 127 (USMC), Office of the Commandant, General Correspondence, January 1939-June 1950, 2000-20-10 (7/41-11/42) to 2000-20-10 (1/45-6/45), Box 1207.
- Record Group 127 (USMC), Office of the Commandant, General Correspondence, January 1939-June 1950, 2000-20-10 (7/39-2/40) to 2000-20-10 (2/40-6/41), Box 1208.
- Record Group 127 (USMC), Office of the Commandant, General Correspondence, January 1939-June 1950, 2000-20-20 (1/48-12/48) to 2000-20-15 (1/49-6/50), Box 1209.
- Record Group 127 (USMC), Office of the Commandant, General Correspondence, January 1939-June 1950, 2000-20-20 (1/44-11/46) to 2000-20-20 (11/46-12/47), Box 1210.
- Record Group 127 (USMC), Office of the Commandant, General Correspondence, January 1939-June 1950, 2295-10 Brooklyn to 2285-10 Camp Lejuene, Box 1570.
- Record Group 127 (USMC), Office of the Commandant, General Correspondence, January 1939-June 1950, 2295-10 Camp Lejuene to 2285-10 Camp Lejuene, Box 1571.
- Record Group 127 (USMC), Office of the Commandant, General Correspondence, January 1939-June 1950, 2295-10 Camp Lejuene to 2285-10 Camp Lejuene, Box 1572.

- Record Group 127 (USMC), Quartermaster, General Correspondence, January 1940, 215-4 to 215-6, Box 145.
- Record Group 127 (USMC), Correspondence Files of the Office of the Commandant, Headquarters Support Division Central Files Section, 1950-1958, Box 172.

The boxes contained information primarily related to weapons test results, weapons cost distribution, weapons training classes, weapon specifications, and cleaning and maintenance. The material was not specific to Camp Lejeune and included information for several MC bases.

### **List of Documents Obtained from National Archives**

No pertinent documents were obtained from the file review.

## **MCB Camp Lejeune Base Site Visit and Records Review**

Base Contact: Mr. Bob Lowder, Environmental Management Division, 910-451-9607

File reviews of records in the base Technical Records office were conducted during the site visit. Additionally, interviews were conducted with Bob Lowder/Environmental Manager, Anna Watts/Technical Records, Carl Baker/Technical Records, and Duane Richardson/EOD Base Range Safety Officer.

### **List of Documents Obtained from Camp Lejeune**

#### **Base Real Estate Office**

- “Proposed Borrow Sites, Vicinity Map”, 1992. NAVFAC Drawing 14854, Sheet 1 of 4.
- “Proposed Borrow Area, Camp Geiger”, 1992. NAVFAC Drawing 14855, Sheet 2 of 4.

#### **Base Library**

- Louis Berger Group, Inc. Under USCOE, Wilmington District Contract DACWS4-99-C-0004, *Semper Fidelis: A Brief History of Onslow County, North Carolina and MCB, Camp Lejeune, 2002, United States Marine Corps*, Lt. Col Lynn J. Kimball (USMC, Retired) Consulting Historian.
- Lotfield, Thomas, C. Principal Investigator. UNCW, August 1981. *Archeological and Historical Survey of USMC Base, Camp Lejeune; Naval Facilities Engineering Command Norfolk, Coastal Zone Resource Corp., Vol. II, Contract No. N62470-79-C-4273.*

#### **Environmental Office**

No pertinent documents were obtained from the file review.

**Appendix B**  
**Health and Safety Plan**

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# 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 Atlantic

**PROJECT/SITE NAME:** MULTI-MEDIA TO-09 / MCB Camp Lejeune, MRP Environmental Investigation B-12 Range, Baffled Pistol Range

**SITE ADDRESS:** Jacksonville, North Carolina

**CH2M HILL PROJECT MANAGER:** Jessica Skeean/CLT

**CH2M HILL OFFICE:** Charlotte

**DATE HEALTH AND SAFETY PLAN PREPARED:** November 16, 2007

**DATE(S) OF SITE WORK:** January 2008 through March 2009

**SITE ACCESS:** Access to all sites is restricted. The B-12 Range may be accessed through the MCB Camp Lejeune Main Gate Air Station on the west side of the New River.

**SITE SIZE:** MCB, Camp Lejeune is approximately 236 square miles. The area where Bachelor Enlisted Quarters (BEQs) have been proposed in the B-12 Range the subject of the Environmental Investigation is located on approximately 16 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. B-12 Range is also relatively flat areas with surface elevation at 25 feet above msl. The 100-year flood plain elevation for this area of MCB Camp Lejeune is approximately 10 feet above 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 a MILCON project to construct Bachelor Enlisted Quarters (BEQ) housing complex, covering approximately 16 acres,

### **B-12 Range**

The B-12 Range and associated range fan cover an area of approximately 350 acres and is located south of Curtis Road (**Figure 1-1**). The range fan extends south to southeast, across Douglass Road and Perimeter Street (USACE, 1987). The investigation area within the B-12 Range will include a 16-acre area where construction of BEQs have been proposed. The area of investigation is located south of Douglass Road, near the intersection of Douglass Road and Schmidt Street (**Figure 1-1**). Based on a review of publicly available aerial photographs and site reconnaissance, the investigation area has a gently sloping terrain and is approximately 100 percent heavily vegetated with trees and thick undergrowth.

### **DESCRIPTION OF SPECIFIC TASKS TO BE PERFORMED:**

B-12 Range has the potential to include munitions and explosives of concerns (MEC) and/or environmental contamination with munitions constituents (MC). Due to historical activities within the project area an Environmental Investigation is being conducted to accomplish the following objectives:

1. Identify historical activities at the B-12 Range that may have resulted in environmental contamination with MC by researching archival records and interviewing current and previous installation personnel;
2. Evaluate the presence and nature of any MC contamination that may exist at the B-12 Range by conducting an investigation of groundwater, soil, and if present, sediment, and surface water

The field investigation will accomplish the above objective through the following activities, which will be conducted in accordance with CH2M HILL Standard Operating Procedures (SOPs), and the MRP Master Project Plans (CH2M HILL, 2007):

- Collect surface soil samples from 32 sampling locations throughout the 16-acre site
- Collect subsurface soil samples from 16 locations using direct-push technology (DPT)
- Collect 16 shallow depth groundwater samples from temporary wells installed using DPT
- Collect surface water and sediment samples from four locations if surface water is identified during site clearing activities.

# Table of Contents

<b>1</b>	<b>TASKS TO BE PERFORMED UNDER THIS PLAN</b>	<b>1</b>
1.1	DESCRIPTION OF TASKS	1
1.1.1	<i>Hazwoper-Regulated Tasks</i>	1
1.1.2	<i>Non-HAZWOPER-Regulated Tasks</i>	1
1.2	TASK HAZARD ANALYSIS	2
<b>2</b>	<b>HAZARD CONTROLS</b>	<b>3</b>
2.1	GENERAL HAZARDS	3
2.1.1	<i>General Practices and Housekeeping</i>	3
2.1.2	<i>Hazard Communication</i>	3
2.1.3	<i>Shipping and Transportation of Chemical Products</i>	4
2.1.4	<i>Lifting</i>	4
2.1.5	<i>Fire Prevention</i>	4
2.1.6	<i>Electrical</i>	4
2.1.7	<i>Heat Stress</i>	5
2.1.8	<i>Cold Stress</i>	6
2.1.9	<i>Procedures for Locating Buried Utilities</i>	7
2.1.10	<i>Drilling</i>	8
2.2	BIOLOGICAL HAZARDS AND CONTROLS	8
2.2.1	<i>Snakes</i>	8
2.2.2	<i>Poison Ivy and Poison Sumac</i>	8
2.2.3	<i>Ticks</i>	8
2.2.4	<i>Bees and Other Stinging Insects</i>	9
2.2.5	<i>Bloodborne Pathogens</i>	9
2.2.6	<i>Mosquito Bites</i>	9
2.2.7	<i>Fire Ant Bites</i>	10
2.3	MEC	10
2.4	CONTAMINANTS OF CONCERN	11
<b>3</b>	<b>PROJECT ORGANIZATION AND PERSONNEL</b>	<b>12</b>
3.1	CH2M HILL EMPLOYEE MEDICAL SURVEILLANCE AND TRAINING	12
3.2	FIELD TEAM CHAIN OF COMMAND AND COMMUNICATION PROCEDURES	12
3.2.1	<i>Client</i>	12
3.2.2	<i>CH2M HILL</i>	12
3.2.3	<i>CH2M HILL Subcontractors</i>	13
3.2.4	<i>Contractors</i>	14
<b>4</b>	<b>PERSONAL PROTECTIVE EQUIPMENT (PPE)</b>	<b>16</b>
<b>5</b>	<b>AIR MONITORING/SAMPLING</b>	<b>17</b>
5.1	AIR MONITORING SPECIFICATIONS	17
5.2	CALIBRATION SPECIFICATIONS	18
5.3	AIR SAMPLING	18
<b>6</b>	<b>DECONTAMINATION</b>	<b>19</b>
6.1	DECONTAMINATION SPECIFICATIONS	19
6.2	DIAGRAM OF PERSONNEL-DECONTAMINATION LINE	19
<b>7</b>	<b>SPILL-CONTAINMENT PROCEDURES</b>	<b>19</b>

<b>8</b>	<b>SITE-CONTROL PLAN.....</b>	<b>21</b>
8.1	SITE-CONTROL PROCEDURES.....	21
8.2	UXO SITE CONTROL.....	21
8.2	HAZWOPER COMPLIANCE PLAN.....	22
<b>9</b>	<b>EMERGENCY RESPONSE PLAN.....</b>	<b>23</b>
9.1	PRE-EMERGENCY PLANNING .....	23
9.2	EMERGENCY EQUIPMENT AND SUPPLIES .....	23
9.3	INCIDENT RESPONSE.....	23
9.4	EMERGENCY MEDICAL TREATMENT.....	24
9.5	EVACUATION .....	24
9.6	EVACUATION SIGNALS.....	24
9.7	INCIDENT NOTIFICATION AND REPORTING.....	24
<b>10</b>	<b>APPROVAL.....</b>	<b>25</b>
<b>10</b>	<b>APPROVAL.....</b>	<b>25</b>
10.1	ORIGINAL PLAN.....	25
10.2	REVISIONS .....	25
<b>11</b>	<b>ATTACHMENTS.....</b>	<b>25</b>
ATTACHMENT 1:	EMPLOYEE SIGNOFF FORM – FIELD SAFETY INSTRUCTIONS .....	25
ATTACHMENT 2:	PROJECT-SPECIFIC CHEMICAL PRODUCT HAZARD COMMUNICATION FORM.....	25
ATTACHMENT 3:	CHEMICAL-SPECIFIC TRAINING FORM .....	25
ATTACHMENT 4:	EMERGENCY CONTACTS .....	25
ATTACHMENT 5:	PROJECT H&S FORMS/PERMITS.....	25
ATTACHMENT 6:	PROJECT ACTIVITY SELF-ASSESSMENT CHECKLISTS .....	25
ATTACHMENT 7:	APPLICABLE MATERIAL SAFETY DATA SHEETS.....	25
<b>CH2M HILL HEALTH AND SAFETY PLAN .....</b>	<b>31</b>	
ATTACHMENT 5 .....	31	
PROJECT H&S FORMS AND PERMITS .....	31	
CH2M HILL HEALTH AND SAFETY PLAN .....	1	
ATTACHMENT 6 .....	1	
PROJECT ACTIVITY SELF-ASSESSMENT CHECKLISTS .....	1	
CH2M HILL HEALTH AND SAFETY PLAN .....	3	
ATTACHMENT 7 .....	3	
APPLICABLE MATERIAL SAFETY DATA SHEETS.....	3	

# 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 (Hawwoper).

### 1.1.1 Hawwoper-Regulated Tasks

- Direct-push technology (DPT) soil boring and temporary well installation
- Groundwater sampling
- Surface and subsurface soil sampling
- Surface water and sediment sampling
- MEC Avoidance
- Vegetation Clearing Oversight

### 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	Soil Sampling	Groundwater Sampling	Surface Water/Sediment Sampling	Vegetation Clearing
Flying debris/objects	X				X
Noise > 85dBA	X				X
Electrical	X	X	X	X	X
Suspended loads	X				
Buried utilities, drums, tanks	X				
Slip, trip, fall	X	X	X	X	X
Back injury	X	X	X	X	X
Visible lightning	X	X	X	X	X
Vehicle traffic	X	X	X		X
Fires	X				X
MEC	X	X	X	X	X
Entanglement	X				X
Drilling	X				X
Heavy equipment	X				X
Working near water				X	
IDW Drum Sampling	X	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.

**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 SC-HW 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 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.

### 2.1.6 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.

### **2.1.7 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 SC-HW/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!

### 2.1.8 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 SC-HW/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 <b>not</b> hot—water. Have victim drink warm fluids, but <b>not</b> 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 <b>not</b> coffee or alcohol. Get medical attention.

### 2.1.9 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).

### **2.1.10 Drilling**

(Reference CH2M HILL SOP HS-35, *Drilling*)

- Only authorized personnel are permitted to operate drill rigs.
- Stay clear of areas surrounding drill rigs during every startup.
- Stay clear of the rotating augers and other rotating components of drill rigs.
- Stay as clear as possible of all hoisting operations. Loads shall not be hoisted overhead of personnel.
- Do not wear loose-fitting clothing or other items such as rings or watches that could get caught in moving parts. Long hair should have it restrained.
- If equipment becomes electrically energized, personnel shall be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party shall be contacted to have line de-energized prior to approaching the equipment.
- Smoking around drilling operations is prohibited.

## **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 permamone 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 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 SC-HW 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.

## 2.2.5 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.

## 2.2.6 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.

### 2.2.7 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 MEC

**MEC Avoidance Procedures.** MEC avoidance operations are not required for small arms MR sites, and therefore is not required for the B-12 Range Site. However, if MEC is encountered during the environmental investigation, the following procedures will be required during sampling operations.

Avoidance operations will consist of a team composed of one or more UXO Technicians. A single-person team will consist of a UXO Technician III. Additional personnel will be UXO Technician III or less. **Contact with MEC is prohibited.** The UXO Team will not destroy any MEC encountered. 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.

**Access routes to sampling locations.** Prior to sampling, the UXO Technicians will conduct a reconnaissance of the sampling area. The reconnaissance will include locating the designated sampling or drilling location(s) and insuring that they are free of surface MEC. If surface MEC is detected the point will be relocated as directed. Once the designated point has been cleared, an access route for the sampling crew's vehicles and equipment will be cleared for surface MEC. The access route, at a minimum will be twice the width of the widest vehicle and the boundaries will be clearly marked to prevent personnel from straying into non cleared areas. If surface MEC is encountered, the UXO Team will mark and report the item and divert the approach path around the MEC.

**Soil Sampling Sites.** The UXO Technicians will clear the surface area of the work site for soil samples and clearly mark the boundaries. The area will be large enough to accommodate the direct push equipment and provide a work area for the crews. As a minimum, the cleared area will be a square, with a side dimension equal to twice the length of the largest vehicle or piece of equipment for use on site. If a pre-selected area indicates magnetic anomalies, a new sampling / drill site will be chosen.

**Borehole Sampling.** If surface samples are required they will be obtained prior to the start of boring. The borehole procedures will be completed using direct push technology (DPT) equipment. Prior to DPT sampling, an UXO Technician will advance a borehole using a hand auger, and check the borehole with a down hole magnetometer a minimum of every one foot, to the deepest sampling depth or a maximum of 5 feet to ensure that smaller items of MEC, undetectable from the surface will be detected. The anticipated depth of potential MEC items is anywhere from near-surface to < 1 ft, based on penetration calculations of the types of ammunition previously used on the site. The types of ammunition used included .22 caliber rifles, service pistols, and revolvers. Should any MEC item be identified during DPT sampling, work will stop and the depth of down hole sampling will be re-evaluated.

## 2.4 Contaminants of Concern

(Refer to Project Files for more detailed contaminant information)

Contaminant	Location and Maximum <sup>a</sup> Concentration (ppm)	Exposure Limit <sup>b</sup>	IDLH <sup>c</sup>	Symptoms and Effects of Exposure	PIP <sup>d</sup> (eV)
Lead	GW: SB: SS:	0.050 mg/m <sup>3</sup>	100 mg/m <sup>3</sup>	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypotension	NA
Perchlorate	GW: SB: SS:	Not regulated	UK	Human exposure to high dosages (e.g., pharmacological) of perchlorate can interfere with iodide uptake into the thyroid gland, disrupting the functions of the thyroid and potentially leading to a reduction in the production of thyroid hormone.	UK
Footnotes: <sup>a</sup> 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). <sup>b</sup> Appropriate value of PEL, REL, or TLV listed. <sup>c</sup> 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. <sup>d</sup> PIP = photoionization potential; NA = Not applicable; UK = Unknown.					
2.6 Potential Routes of Exposure					
<b>Dermal:</b> Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 4.					

### 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.

<b>Employee Name</b>	<b>Office</b>	<b>Responsibility</b>	<b>SC-HW/FA-CPR</b>
Jessica Skeean	CLT	PM	Level D SC-HW: FA-CPR
Renee Clore	CLT	TM	Level D SC-HW: FA-CPR
TBD	CLT	FTL	Level D SC-HW: FA-CPR

#### 3.2 Field Team Chain of Command and Communication Procedures

##### 3.2.1 Client

###### Client Contact

Gary Tysor  
NAVFAC Atlantic  
Code: OPCEV  
6506 Hampton Blvd  
Norfolk, Virginia 23508-1278

###### Base Contact

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

Bryan Beck  
NAVFAC Atlantic  
Code: OPCEV  
6506 Hampton Blvd  
Norfolk, Virginia 23508-1278  
(757) 322-4734  
bryan.k.beck@navy.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  
 UXO Safety Officer (UXOSO): TBD if needed

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.

### **UXO TECHNICIAN III**

The UXO Technician III for this project will report directly to the Project Manager on issues pertaining to the operations at the B-12 Range. The UXO Technician III will have the following safety and health related responsibilities:

- Reports directly to the CH2M HILL Project Manager;
- Managing the funding, manpower and equipment necessary to safely conduct site operations;
- Reviewing and becoming familiar with the site Work Plan (WP) and HASP;
- Provide copies of the WP and SSHP to site and subcontract personnel;
- Review the scope of work (SOW) and ensure that the required safety and health elements are addressed in the SSHP and/or WP;
- Coordinating the assignment of personnel and ensuring that the personnel and equipment provided meet the requirements of the WP and SSHP;
- Ensuring implementation of project quality, safety and health procedures;
- Early detection and identification of potential problem areas, including safety & health matters, and instituting corrective measures;
- Directly interfacing with the Project manager and advising him of safety and health matters related to conduct of the site operations.
- Acts as the On-Scene-Incident-Commander (OSIC) in the event of an MEC emergency, notifying and coordinating with off site emergency and medical response agencies.

### **UXO TECHNICIANS**

All UXO Technicians are required to comply with the provisions of this Avoidance Plan, the SSHP, the WP and all applicable Federal, State and local regulations. They will report to the UXO Technician III.

### **3.2.3 CH2M HILL Subcontractors**

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

#### **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, *Contracts, Subcontracts, and HSE&Q Management Practices*)

#### **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 <sup>a</sup>

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

### Reasons for Upgrading or Downgrading Level of Protection

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

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

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

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

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

<sup>e</sup> 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.

<sup>f</sup> 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 Monitoring*)

### 5.1 Air Monitoring Specifications

Instrument	Tasks	Action Levels <sup>a</sup>		Frequency <sup>b</sup>	Calibration
<b>FID:</b> OVA model 128 or equivalent	Soil sampling, drilling and other intrusive work.	<1 ppm 1 to 10 ppm > 10 ppm	Level D Level C Evacuate work area and contact HSM	Initially and periodically during task	Daily
<b>PID:</b> OVM with 10.6eV lamp or equivalent	Soil sampling, drilling and other intrusive work.	<1 ppm 1 to 10 ppm > 10 ppm	Level D Level C Evacuate work area and contact HSM	Initially and periodically during task	Daily
<b>CGI:</b> MSA model 260 or 261 or equivalent	Soil sampling, drilling and other intrusive work.	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
<b>O<sub>2</sub>Meter:</b> MSA model 260 or 261 or equivalent	Soil sampling, drilling and other intrusive work.	>25% <sup>c</sup> O <sub>2</sub> : 20.9% <sup>c</sup> O <sub>2</sub> : <19.5% <sup>c</sup> O <sub>2</sub> :	Explosion hazard; evacuate or vent Normal O <sub>2</sub> O <sub>2</sub> deficient; vent or use SCBA	Continuous during advancement of boring or trench	Daily

<sup>a</sup> Action levels apply to sustained breathing-zone measurements above background.

<sup>b</sup> 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.).

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

<sup>d</sup> Refer to SOP HS-10 for instructions and documentation on radiation monitoring and screening.

<sup>e</sup> 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
<b>PID:</b> OVM, 10.6 or 11.8 eV bulb	100 ppm isobutylene	RF = 1.0	100 ppm	1.5 lpm reg T-tubing
<b>PID:</b> MiniRAE, 10.6 eV bulb	100 ppm isobutylene	CF = 100	100 ppm	1.5 lpm reg T-tubing
<b>PID:</b> TVA 1000	100 ppm isobutylene	CF = 1.0	100 ppm	1.5 lpm reg T-tubing
<b>FID:</b> OVA	100 ppm methane	3.0 ± 1.5	100 ppm	1.5 lpm reg T-tubing
<b>FID:</b> TVA 1000	100 ppm methane	NA	100 ppm	2.5 lpm reg T-tubing
<b>Dust Monitor:</b> Miniram-PDM3	Dust-free air	Not applicable	0.00 mg/m <sup>3</sup> in "Measure" mode	Dust-free area OR Z-bag with HEPA filter
<b>CGI:</b> MSA 260, 261, 360, or 361	0.75% pentane	N/A	50% LEL ± 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"> <li>• Boot wash/rinse</li> <li>• Glove wash/rinse</li> <li>• Outer-glove removal</li> <li>• Body-suit removal</li> <li>• Inner-glove removal</li> <li>• Respirator removal</li> <li>• Hand wash/rinse</li> <li>• Face wash/rinse</li> <li>• Shower ASAP</li> <li>• Dispose of PPE in municipal trash, or contain for disposal</li> <li>• Dispose of personnel rinse water to facility or sanitary sewer, or contain for offsite disposal</li> </ul>	<ul style="list-style-type: none"> <li>• Wash/rinse equipment</li> <li>• Solvent-rinse equipment</li> <li>• Contain solvent waste for offsite disposal</li> </ul>	<ul style="list-style-type: none"> <li>• Power wash</li> <li>• Steam clean</li> <li>• Dispose of equipment rinse water to facility or sanitary sewer, or contain for offsite disposal</li> </ul>

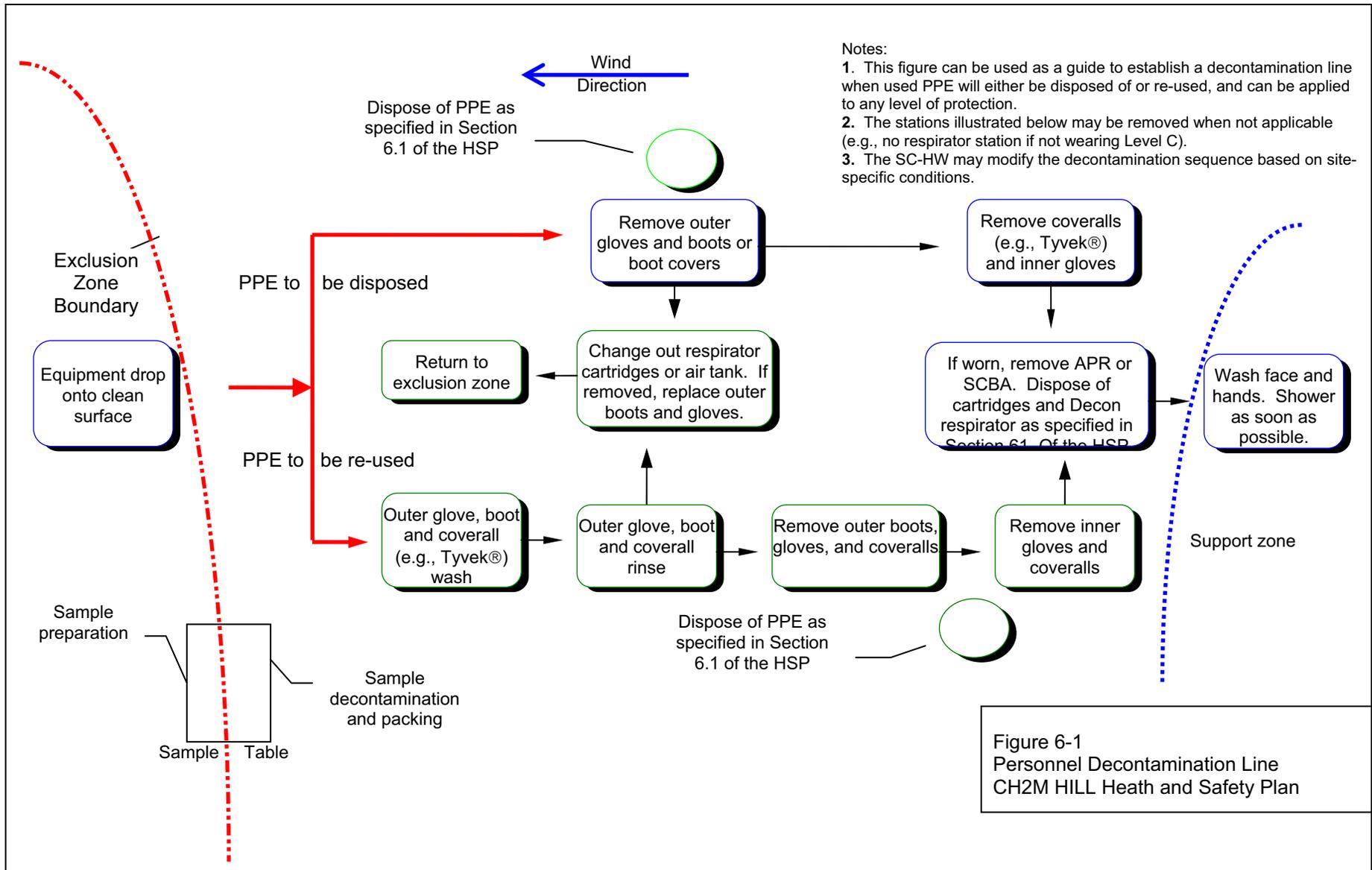
### 6.2 Diagram of Personnel-Decontamination Line

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.



## 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 SC-HW 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 UXO Site Control

As the Range B-12 was used for small arms training, MEC avoidance procedures will not be required at the site unless MEC is encountered during site activities. MEC avoidance procedures are detailed below, should they be required.

Should MEC be encountered, the UXO Technician III coordinates access control and security on site. Due to the hazardous nature of MEC work, only authorized personnel will be allowed within 200 ft of work operations. Authorized personnel are those that have completed the required training, meet medical requirements and are essential to the ongoing operation. This 200 ft buffer is an area large enough to prevent personnel injuries from fragmentation and overpressure resulting from either an unintentional or intentional detonation of MEC.

During duty hours, personnel will provide security at the site. All work will stop if any unauthorized personnel approach within 200 feet of work operations. This will ensure the field team’s safety and the safety of those approaching the work site. Equipment will be returned to a designated area and secured at the end of each work day. Future site control measures to ensure safety are as follows;

- Eating, drinking and smoking are prohibited except in designated areas;
- MEC operations will cease if non-UXO trained or non-essential personnel are present;
- The UXO Technician III will escort all authorized visitors to the site;
- The UXO Technician III will maintain the site entry control log to ensure accurate accountability of personnel;
- The UXO Technician III will brief this UXO Avoidance Plan to all personnel entering the site to inform them of the potential site hazards. All personnel will acknowledge this briefing by signing the briefing log;
- In case of an emergency, personnel will exit the site and move to the designated safe area. The UXO Technician II will assist in determining the severity of the emergency. If the emergency warrants evacuation, the UXO Technician III will notify the Project Manager.

## 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 SC-HW 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 Planning*)

### 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.

<b>Emergency Equipment and Supplies</b>	<b>Location</b>
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.

## 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:** Barak West/CLT **Date:** November 16, 2007

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**Approved By:** Michael Goldman **Date:** November 16, 2007

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**Approved By:** **Date:**

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### 10.2 Revisions

**Revisions Made By:** **Date:**

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**Revisions to Plan:**

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**Revisions Approved By:** **Date:**

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## 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



**Project-Specific Chemical Product Hazard Communication Form**

This form must be completed prior to performing activities that expose personnel to hazardous chemicals products. Upon completion of this form, the SC-HW shall verify that training is provided on the hazards associated with these chemicals and the control measures to be used to prevent exposure to CH2M HILL and subcontractor personnel. Labeling and MSDS systems will also be explained.

**Project Name:** Multi-Media TO-09 / MCB Camp Lejeune, B-12      **Project Number:** 363366  
 Range Environmental Investigation

**MSDSs will be maintained at the following location(s):**      3 ring binder containing HASP

**Hazardous Chemical Products Inventory**

Chemical	Quantity	Location	MSDS Available	Container labels	
				Identity	Hazard
Nitric acid	< 500 ml	Support Zone / sample bottles			
Methanol	< 1 Gallon	Support/Decon Zones			
Hexane	< 1 Gallon	Support/Decon Zones			
pH buffers	< 500 ml	Support Zone			
MSA Sanitizer	< 1 liter	Support/Decon Zones			
Alconox/Liquinox	< 1liter	Support/Decon Zones			

Refer to SOP HS-05 *Hazard Communication* for more detailed information.

**CH2MHILL**

**CHEMICAL-SPECIFIC TRAINING FORM**

Location:	Project #: 363366
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.

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**EMERGENCY CONTACTS**

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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.

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**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**

800/756-1130  
(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: Mollie Netherland/SEA  
Phone: 206/453-5005  
24-hour emergency beeper: 888-444-1226

**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) 604-9095

**Designated Safety Coordinator (DSC)**

Name:  
Phone:

**Regional Human Resources Department**

Name: Carol Miscoe/SAN  
Phone: 210/377-3085 x291

**Project Manager see Site-Specific HSP**

Name: Jessica Skeean/CLT  
Phone: 704-329-0073 x251

**Corporate Human Resources Department**

Name: Pete Hannon/DEN  
Phone: 720/286-3077 x60337  
Cell: 303/886-1229

**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**

Zurich Insurance Company  
Phone: 800/382-2150

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.

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**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

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

**Local hospital:**

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

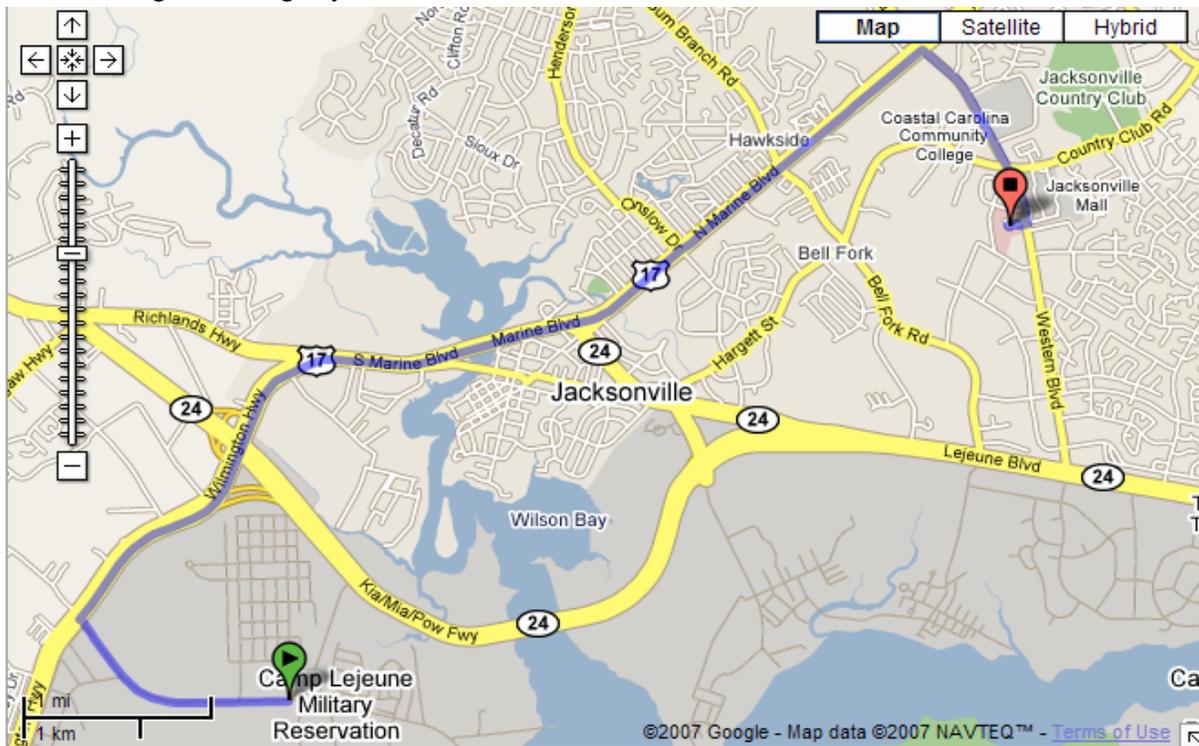
**Local ambulance service:**

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

**From MCB Camp Lejeune**

Directions to Onslow County Memorial Hospital:

1. Head northwest on Douglass Rd. toward Robert L Wilson Blvd.
2. Turn right onto Hawkins Blvd
3. Turn left at Curtis Rd.
4. Turn right at US-17 N/Wilmington Hwy. Continue to follow US-17N
5. Turn right onto Western Blvd
6. Travel approximately 1.1 miles and turn right into Onslow Memorial Hospital
7. Follow signs to 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**



**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.

<b>SECTION 1 - SAFE WORK PRACTICES (4.1)</b>				
	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>N/O</b>
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"/>
<b>SECTION 2 - SUPPORT FUNCTIONS (4.2)</b>				
<b>FORMS/PERMITS (4.2.1)</b>				
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"/>
<b>UTILITY LOCATING (4.2.2)</b>				
12. Location of underground utilities and structures identified	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<b>SECTION 2 (Continued)</b>				
<b>WASTE MANAGEMENT (4.2.3)</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>	<b>N/O</b>
13. Drill cuttings and purge water managed and disposed properly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>DRILLING AT HAZARDOUS WASTE SITES (4.2.4)</b>				
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"/>
<b>DRILLING AT MUNITIONS RESPONSE SITES (4.2.5)</b>				
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"/>
<b>SECTION 3 - DRILLING SAFETY REQUIREMENTS (4.3)</b>				
<b>GENERAL (4.3.1)</b>				
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"/>
<b>DRILL RIG PLACEMENT (4.3.2)</b>				
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"/>
<b>DRILL RIG TRAVEL (4.3.3)</b>				
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"/>
<b>DRILL RIG OPERATION (4.3.4)</b>				
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"/>
<b>DRILL RIG SITE CLOSURE (4.3.5)</b>				
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"/>
<b>DRILL RIG MAINTENANCE (4.3.6)</b>				
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**