Final

Addendum No. 1—Terrestrial Intrusive Investigation Work Plan to Conduct Phase I RCRA Facility Investigation

Piñeros Island
Naval Activity Puerto Rico

Contract Task Order 172

April 2010

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Atlantic

Under the

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Prepared by

CH2MHILL

Virginia Beach, Virginia

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Acronyms and Abbreviations

APHIS-USDA	Animal and Plant Health Inspection Service of the United States Department of Agriculture
ATF	Bureau of Alcohol, Tobacco, Firearms, and Explosives
bgs	below ground surface
BIP	blow-in-place
BRAC	Base Realignment and Closure
CAP	Corrective Action Plan
CAR	Corrective Action Request
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Action—Navy
CLP	Contract Laboratory Program
cm	centimeter
CTO	contract task order
DDESB	Department of Defense Explosives Safety Board
DFOW	definable feature of work
DGM	digital geophysical mapping
DOJ	United States Department of Justice
DOT	United States Department of Transportation
DQO	data quality objective
EIS	Environmental Information Specialist
EM	electromagnetic
EOD	Explosive Ordnance Disposal
ESQD	explosives safety quantity distance
ESS	Explosives Safety Submission
EZ	exclusion zone
FEC	Facilities and Engineering Command
FTL	Field Team Leader
GIP	Geophysical Investigation Plan
GPS	global positioning system
HE	high explosive
HFD	hazardous fragmentation distance
HSM	Health and Safety Manager
HSP	Health and Safety Plan
ISO	industry standard object
m	meter
MC	munitions constituent
MDAS	material documented as safe

MEC	munitions and explosives of concern
MGFD	munition with the greatest fragmentation distance
MPPEH	material potentially presenting an explosive hazard
MR	munitions response
MRP	Munitions Response Program
MRS	munitions response site
MRSIMS	munitions response site information management system
MS/MSD	matrix spike/matrix spike duplicate
mV	millivolt
NAPR	Naval Activity Puerto Rico
NAVEODTECHDIV	Naval Explosive Ordnance Disposal Technology Division
NAVFAC	Naval Facilities Engineering Command
NEW	net explosive weight
NOSSA	Naval Ordnance Safety and Security Activity
NTR	Navy Technical Representative
PM	Project Manager
PMO SE	Project Management Office Southeast
POC	point of contact
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
QCP	Quality Control Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SM	Site Manager
SOP	standard operating procedure
SSC	Site Safety Coordinator
SUXOS	Senior Unexploded Ordnance Supervisor
TAL	Target Analyte List
TDEM	time-domain electromagnetic
TR	Technical Report
TSD	team separation distance
USACE	United States Army Corps of Engineers
UXO	unexploded ordnance
UXOSO	Unexploded Ordnance Safety Officer
UXOQCS	Unexploded Ordnance Quality Control Specialist

SECTION 1

Introduction

CH2M HILL is conducting a Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at Piñeros Island, Puerto Rico. The Phase I RFI is being conducted for the Department of the Navy, Naval Facilities Engineering Command (NAVFAC), Base Realignment and Closure (BRAC) Program Management Office Southeast (PMO SE), under the Comprehensive Long-term Environmental Action—Navy (CLEAN) III Program. This work is being performed under Contract Task Order (CTO) 172 of Contract No. N62470-02-D-3052.

1.1 Background and Project Objectives

This document is an addendum to the *Work Plan to Conduct Phase I RFI, Piñeros and Cabeza de Perro Islands, Naval Activity Puerto Rico* (CH2M HILL, 2006). Field investigations conducted in 2006 under that Work Plan resulted in the identification of geophysical anomalies representing potential munitions and explosives of concern (MEC) at seven terrestrial munitions response sites (MRSs) on Piñeros Island (**Figure 1-1**).

NAVFAC has authorized intrusive investigation activities to determine the sources of these geophysical anomalies in order to further characterize the presence of MEC on Piñeros Island. This Addendum only addresses terrestrial MRSs; underwater MRSs will be addressed separately.

1.2 Work Plan Addendum Scope and Organization

As stated in the previous section, this document is an addendum to the existing Phase I RFI Work Plan (CH2M HILL, 2006). Sections of the existing Work Plan that apply to this phase of work will be referenced where applicable rather than incorporating them into this Addendum. This Work Plan Addendum presents the detailed approach specifically to be used for implementation of MEC intrusive activities. The intrusive investigation objectives will be accomplished through the performance of the following activities:

- Vegetation clearing with MEC avoidance within MRS-01 and MRS-02
- Identification and intrusive investigation of geophysical anomalies representing potential subsurface MEC through the use of "EM-and-dig" techniques in all seven terrestrial MRSs
- Demilitarization and disposal of all MEC and material potentially presenting an explosive hazard (MPPEH)
- Collection and analysis of surface soil samples for munitions constituents (MCs) at MEC demolition locations
- Performance of a survey of MRS-01 and MRS-02 to allow future relocation of the trails

This Work Plan Addendum is divided into sections providing information on the detailed approach, including procedures to be employed during the execution of the specific field tasks necessary to complete the MEC intrusive investigation within MRS-01 through MRS-07 on Piñeros Island. Appendixes to the Phase I RFI Work Plan (CH2M HILL, 2006) and this Addendum provide supporting documentation that details specific procedures for the execution of the project.

This Work Plan Addendum is consistent with Explosives Safety Submission (ESS) Revision Number 1 (CH2M HILL, 2009), which has been approved by the Naval Ordnance Safety and Security Activity (NOSSA) and Department of Defense Explosives Safety Board (DDESB).

This Work Plan Addendum is organized as follows:

- **Section 1, Introduction,** provides general information about this Work Plan Addendum and presents the project scope and objectives.
- **Section 2, Technical Management Plan,** identifies the overall technical approach, methods, and global operational procedures that will be used to execute MEC intrusive field investigation activities.
- **Section 3, Field Investigation Plan,** identifies the specific methods and operational procedures that will be used to execute field investigation activities, to include mobilization/demobilization, vegetation clearance, MEC avoidance escort, anomaly detection, excavation, identification, and removal, surveying, and proper demilitarization and disposal of MEC and MPPEH.
- **Section 4, Quality Control Plan (QCP),** provides details of the approach, methods, and operational procedures to be employed for quality control (QC) of the field investigation activities. Parts of this section will refer to the original approved Phase I RFI Work Plan (CH2M HILL, 2006).
- **Section 5, Explosives Management Plan,** addresses the management of explosives in accordance with applicable regulations.
- **Section 6, Explosives Siting Plan**, provides explosives safety criteria for planning and siting explosives operations.
- **Section 7, References,** lists the references cited or used in the preceding sections.

In addition, an Environmental Protection Plan, which describes the approach, methods, and operational procedures to be employed to protect the natural environment during the performance of all field tasks, is provided as Section 5 of the Phase I RFI Work Plan (CH2M HILL, 2006).

1.3 Site Location and Description

Section 1.3 of the Phase I RFI Work Plan (CH2M HILL, 2006) provides detailed information on the site location and description.

1.4 Site History

Section 1.4 of the Phase I RFI Work Plan (CH2M HILL, 2006) provides a detailed history of the site.

1.5 Previous Investigations

The surface survey of Piñeros and Cabeza de Perro Islands performed by the Naval Explosive Ordnance Disposal Technology Division (NAVEODTECHDIV) in late 2004 (NAVEODTECHDIV, 2004) is discussed in the Phase I RFI Work Plan (CH2M HILL, 2006). The only other investigation of MEC at Piñeros Island was the Phase I RFI conducted for NAVFAC by CH2M HILL in 2006, which included the following field activities:

- Ecological surveys
- Munitions debris survey
- Terrestrial geophysical survey
- Underwater geophysical survey
- Environmental sampling

The terrestrial and underwater geophysical surveys resulted in the identification of geophysical anomalies representing potential subsurface and underwater MEC.

The terrestrial digital geophysical mapping (DGM) effort was conducted within the seven MRSs using an EM61-MK2 time-domain electromagnetic (TDEM) metal detector in accordance with the Geophysical Investigation Plan (GIP) provided in the Phase I RFI Work Plan (CH2M HILL, 2006). The beach areas (MRS-03, MRS-04, MRS-05, and MRS-6) were surveyed using a grid pattern. The remaining areas (MRS-01, MRS-02, and MRS-07) were surveyed using transects. The results of the terrestrial DGM effort are detailed in **Appendix A** and summarized in **Table 1-1**.

TABLE 1-1
Results of Terrestrial Digital Geophysical Mapping

Munitions Response Site	Area/Length	Number of Anomalies
MRS-01: South Bunker Trail and MRS-02: North Bunker Trail	4,559 feet	90
MRS-03: South Beach	0.284 acres	17
MRS-04: Northeast Beach	0.207 acres	12
MRS-05: Northwest Beach	0.052 acres	12
MRS-06: West Beach	0.056 acres	3
MRS-07: Western Crabbing Area	1,220 feet	35
Total	**5,779 feet (transects) 0.599 acres (grids)**	**169**

MRS-01 (South Bunker Trail) and MRS-02 (North Bunker Trail) are collectively identified in **Appendix A** as the Bunker Trail Transect Area. Geophysical anomalies within MRS-01 and MRS-02 are clustered in several different areas, rather than being uniformly distributed. The average distribution of anomalies was approximately two per 100 linear feet of transect. Anomaly clusters are noted to occur in the following areas:

- Top of the slope leading up from the northern trail head in MRS-02
- Surrounding all three bunker entrances which open onto the trails of MRS-01 and -02
- Top of the slope leading up from the southern trail head in MRS-01
- Area of the southern trail head (MRS-01), by a wooden platform

Metallic debris was observed in the areas of the bunker entrances and by the southern trail head in MRS-02.

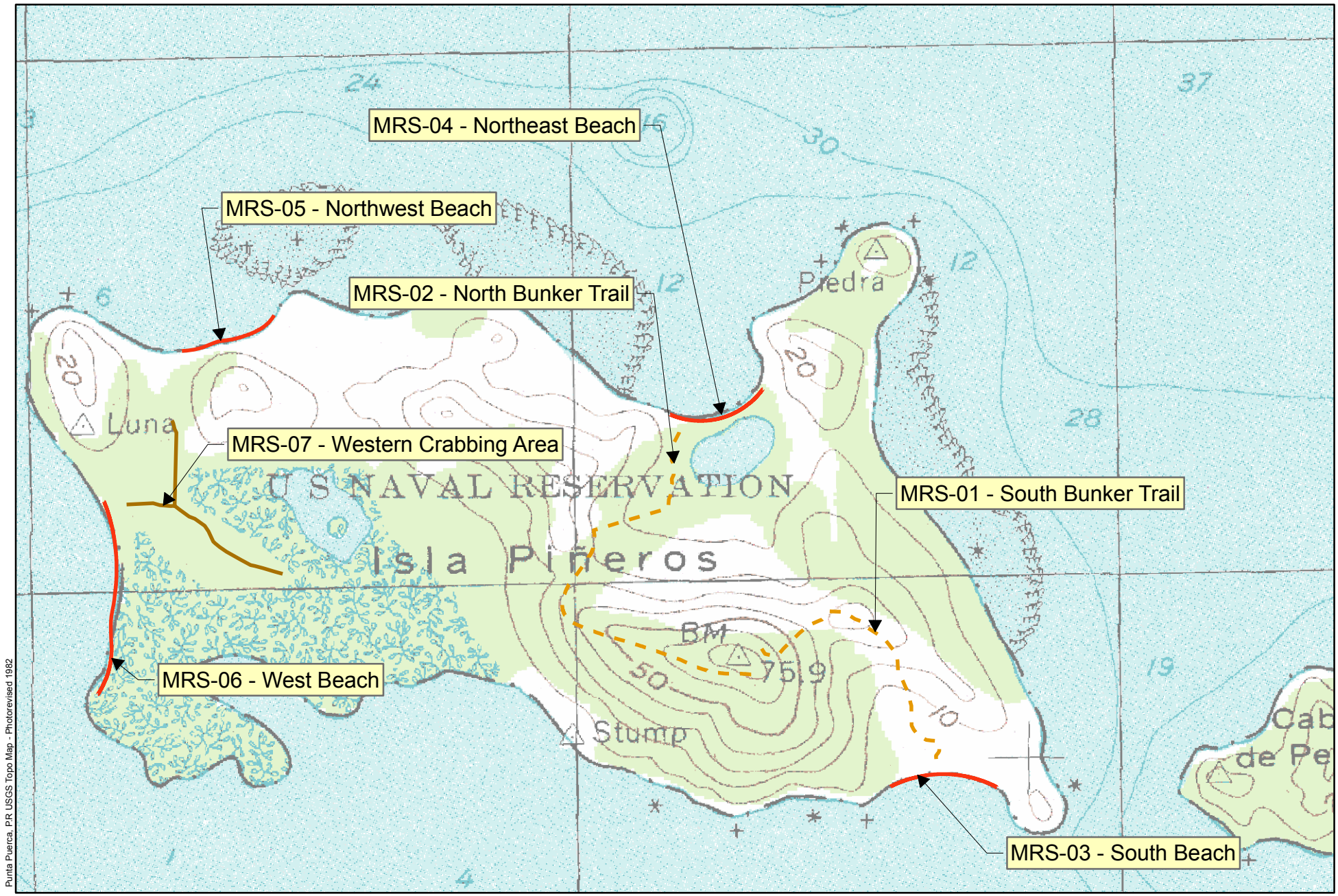
Anomalies within MRS-03, identified in **Appendix A** as Southern Beach, are fairly evenly distributed with the exception of a cluster of anomalies near the entrance to the South Bunker Trail (MRS-02). Seventeen anomalies were identified, with an average distribution of approximately 60 anomalies per acre.

Anomalies within MRS-04, identified in **Appendix A** as Northern Beach Area 1, are fairly evenly distributed. Twelve anomalies were identified, with an average distribution of approximately 58 anomalies per acre.

Anomalies within MRS-05, identified in **Appendix A** as Northern Beach Area 2, are fairly evenly distributed. Twelve anomalies were identified, with an average distribution of approximately 231 anomalies per acre.

Only three anomalies were identified within MRS-06 (West Beach). The average anomaly distribution is 53 per acre.

Three clusters of anomalies were identified within MRS-07 (Western Crabbing Area). The total number of anomalies was 35, with an average distribution of approximately three anomalies per 100 linear feet of transect.



N

0 200 400 800

Feet

1 inch equals 800 feet

- Accessible Beach
- Trail
- Other Geophysical Investigation Areas

Figure 1-1

Munitions Response Sites

Pineros & Cabeza de Perro Islands, Naval Activity Puerto Rico

CH2MHILL

File Path: G:\projects2\PinerosIsland\MXDs\Munitions_Response_Sites.mxd, Date: January 31, 2008 9:29:43 AM, User: JKELLY3

SECTION 2

Technical Management Plan

2.1 Project Organization, Personnel, and Schedule

2.1.1 Project Organization

No changes have been made to the project organization as presented in the Phase I RFI Work Plan (CH2M HILL, 2006), to which this document is an addendum.

2.1.2 Project Personnel

The following project personnel have changed since the Phase I RFI Work Plan (CH2M HILL, 2006). **Table 2-1** provides updated contact information for project team members. The roles and responsibilities of the key personnel are discussed below.

- **Navy Technical Representative (NTR)—**Mark Davidson will represent the Navy's interests in all activities on this project. As a NAVFAC BRAC PMO SE staff member, Mr. Davidson will review all CH2M HILL submittals and track the project's financial and schedule performance.
- **Senior Munitions Response (MR) Technical Consultant—**Tim Garretson will serve as Senior MR Technical Consultant and will provide quality assurance reviews on all submittals.
- **Site Manager (SM) or Senior Unexploded Ordnance Supervisor (SUXOS)—**Fred Pasteris will serve as CH2M HILL's onsite representative to coordinate and oversee the activities of field support personnel and subcontractor personnel. The SM/SUXOS is also responsible for implementation of and compliance with the Health and Safety Plan (HSP) (**Appendix B**) and QC requirements during the field effort.

TABLE 2-1
Updated Project Personnel Contact Information

Name/Title/Organization	Mailing Address	Telephone/Fax/E-mail
Mark Davidson Navy Technical Representative NAVFAC BRAC PMO SE	BRAC PMO SE 4130 Faber Place Dr. Suite 202 N. Charleston, SC 29405	843-743-2124 (office) mark.e.davidson@navy.mil
Timothy Garretson Senior MR Technical Consultant CH2M HILL	5700 Cleveland Street Suite 101 Virginia Beach, VA	757-671-6224 (office) 757-287-5222 (cell) timothy.garretson@ch2m.com
Fred Pasteris Senior Health and Safety Professional Master Bomb Disposal Technician CH2M HILL		360-969-2469 (cell) frederic.pasteris@ch2m.com

2.1.3 Project Schedule

Mobilization and site work in the MRS work areas will be conducted upon approval of this Addendum. The field component of this project is anticipated to be completed within 2 months of the start date. The updated schedule for completing the Phase I RFI terrestrial intrusive investigation is provided as **Figure 2-1**. This schedule will be revised as the project progresses.

2.2 Technical Approach

The technical approach to field operations includes the primary tasks identified herein. The general steps relating to field operations that will be implemented during the intrusive investigation are described in this section. More detailed procedures are provided elsewhere in this Addendum and in the Phase I RFI Work Plan (CH2M HILL, 2006).

2.2.1 Task 1—Project Planning

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

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

Meetings are planned throughout the course of this project. The meetings will be held to discuss proposed work, present investigation findings, and discuss project status.

Three versions of the Addendum will be prepared under this task. A draft Addendum will be submitted electronically for NAVFAC review. A revised Addendum that incorporates NAVFAC comments will be submitted for regulatory review. A final Addendum will be prepared that will address all comments on the draft document.

Subcontractor procurement is also included under this task. Anticipated subcontractor services include MEC avoidance escort and intrusive operational support, transportation (i.e., chartered boat), vegetation clearing, surveying, laboratory analysis, and data validation.

2.2.2 Task 2—Site Work

All field activities will be performed under this task. The field investigation will be conducted in phases. The scope of the field investigation and the detailed technical procedures are presented in **Section 3**. The primary field investigation activities include:

- Site preparation, consisting of the following sequential activities:
  - Mobilization
  - Vegetation removal
- MEC intrusive operations, consisting of the following activities:
  - "EM-and-dig" intrusive technique, consisting of metal detection using an EM61-MK2, manual excavation, anomaly source identification and logging using the

Munitions Response Site Information Management System (MRSIMS), and MEC/MPPEH demilitarization and disposal.

- Soil sampling and MC analysis
- Surveying of all investigated anomalies and the path of the South and North Bunker Trails (MRS-01 and MRS-02)

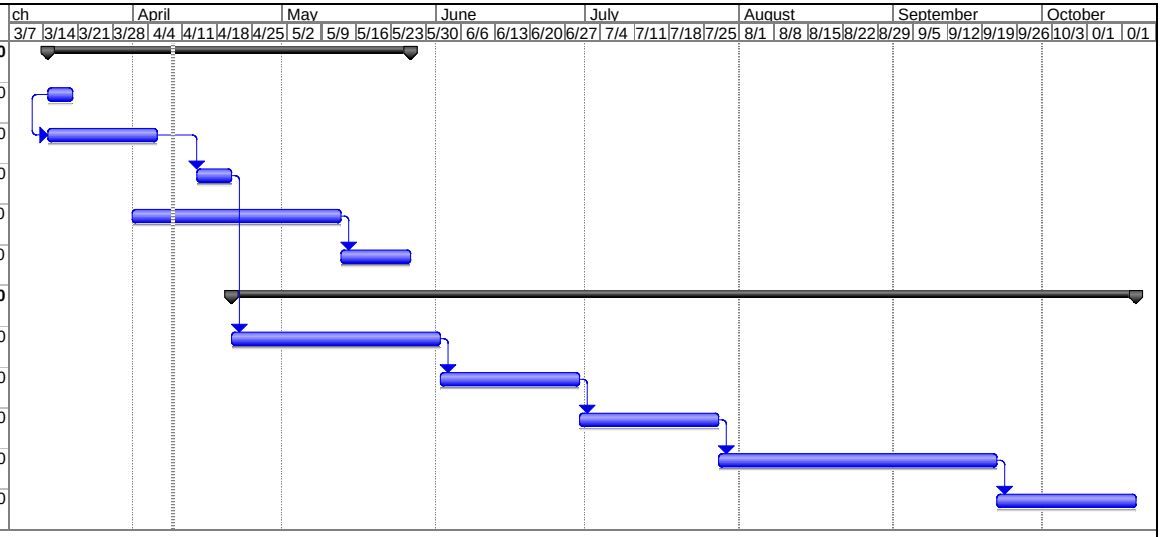
2.2.3 Task 3—Sample Management, Analysis, and Validation

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 3** of this Addendum and in Section 3.5 of the Phase I RFI Work Plan (CH2M HILL, 2006).

2.2.4 Task 4—Reporting

As discussed in Section 2.1.10 of the Phase I RFI Work Plan (CH2M HILL, 2006) a Phase I RFI Report will be prepared to document the findings of the field investigations.

ID	Task Name	Duration	Start	Finish
1	**Field Investigation**	**53 days**	**Mon 3/15/10**	**Wed 5/26/10**
2	Vegetation Clearing	5 days	Mon 3/15/10	Fri 3/19/10
3	Intrusive Investigation	16 days	Mon 3/15/10	Mon 4/5/10
4	Surveying	5 days	Wed 4/14/10	Tue 4/20/10
5	MC Laboratory Analysis	6 wks	Thu 4/1/10	Wed 5/12/10
6	MC Data Validation	2 wks	Thu 5/13/10	Wed 5/26/10
7	**Phase I RFI Report**	**130 days**	**Wed 4/21/10**	**Tue 10/19/10**
8	Draft Report for Client Review	6 wks	Wed 4/21/10	Tue 6/1/10
9	Client Review of Draft Report	4 wks	Wed 6/2/10	Tue 6/29/10
10	Draft Report for Regulatory Review	4 wks	Wed 6/30/10	Tue 7/27/10
11	Regulatory Review of Draft Report	8 wks	Wed 7/28/10	Tue 9/21/10
12	Final Report	4 wks	Wed 9/22/10	Tue 10/19/10



Project: Pineros Schedule 2010_04_09
Date: Fri 4/9/10

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

Figure 2-1
Project Schedule

SECTION 3

Field Investigation Plan

The main objectives of this field event are to:

- Perform an intrusive investigation to characterize the presence of subsurface MEC and MPPEH in the terrestrial MRSs
- Demilitarize and dispose of any MEC/MPPEH identified during the course of the intrusive investigation
- Perform a survey of the South and North Bunker trails (MRS-01 and MRS-02) to allow future relocation

These objectives will be accomplished during the field investigation through the following activities, which will be conducted in accordance with CH2M HILL Standard Operating Procedures (SOPs) provided in Appendix E of the Phase I RFI Work Plan (CH2M HILL, 2006):

- Vegetation clearing with MEC avoidance within MRS-01 and MRS-02.
- Detection of anomalies using an EM61-MK2 TDEM metal detector within MRS-01 through MRS-07.
- Investigation of detected anomalies using hand tools to a depth of 2 feet.
- Demilitarization of MEC and MPPEH using blow-in-place (BIP) procedures.
- Disposal of material documented as safe (MDAS) and any other debris found or generated during field work.
- Surveying of all investigated anomalies and the trail comprising MRS-01 and MRS-02

3.1 Site Preparation

3.1.1 Site Mobilization and Demobilization

Mobilization and demobilization will be completed as described in Sections 3.2.1 and 3.2.3 of the Phase I RFI Work Plan (CH2M HILL, 2006).

3.1.2 Vegetation Removal

Vegetation was cleared in a 4-foot wide path along the South and North Bunker Trails (MRS-01 and MRS-02) during the 2006 DGM effort. It is anticipated that the vegetation has since re-grown and will again require clearing.

Vegetation clearing will be conducted by a local contractor who will use hand tools and hand-held power tools (e.g., chainsaws). Vegetation to be cut consists primarily of vines and low brush. Vegetation less than four inches in diameter will be removed from a 4-foot wide

path along the trail leading from the bunker to the north and south beaches. Vegetation will be cut to within 6 inches of ground surface. Trees that are greater than four inches in diameter will not be removed. The cut vegetation will be moved to areas adjacent to the cleared areas. In accordance with the Environmental Protection Plan (Section 5 of the Phase I RFI Work Plan [CH2M HILL, 2006]), vegetation within 50 feet of the water line and within 10 meters (m) (33 feet) of any lagoons will not be cut. A minimum of 10 feet of vegetation will be left uncut at the trailheads on the north and south beaches so that the trails are not visible from the beaches.

The total area of vegetation removal will be approximately 0.4 acre. All vegetation removal operations will be conducted under MEC avoidance escort by a qualified Unexploded Ordnance (UXO) Technician.

3.2 MEC Removal Operations

Due to the dynamic nature (tidal movement and wave action) of the beach areas (MRS-03, MRS-04, MRS-05, and MRS-06), the sources of the geophysical anomalies detected during the September 2006 DGM effort may have shifted or may no longer be present. Also, uncertainties exist in the ability to accurately reacquire all previously-identified anomalies within MRS-01, MRS-02, and MRS-07 due to poor global positioning system (GPS) coverage. Therefore, all MRSs will be intrusively investigated using "EM-and-dig" techniques, rather than implement the traditional reacquisition and dig technique.

3.2.1 "EM-and-Dig" Using EM61-MK2

In order to locate metallic items in the subsurface for intrusive investigation CH2M HILL intends to use an EM61-MK2 TDEM metal detector, the same type of instrument used during the 2006 DGM surveys on Piñeros Island.

The standard EM61-MK2 system consists of two air-cored 1-m by 0.5-m coils, a digital data recorder, batteries, and processing electronics. The EM61-MK2's transmitter generates a pulsed primary magnetic field, which then induces eddy currents in nearby metallic objects. Each of the two spatially separated receiver coils measures these eddy currents. The EM61-MK2 offers the ability to measure the eddy currents at three distinct time intervals in the bottom coil or four intervals if no top coil measurements are recorded (as intended for the "EM-and-dig" operations to be performed at Piñeros). The standard arrangement of coils is such that there is a vertical separation of 40 centimeters (cm).

The EM61-MK2 will be operated in "auto" mode, in which the digital and audio output from the device will be observed by an instrument operator to detect, in real-time, metallic items in the subsurface. The sound frequency is relative to the amplitude of the response of the system. The operator will listen to the audible sound output by the system and observe the digital readout on the Allegro (system recorder) screen to determine anomaly locations (example screen below).

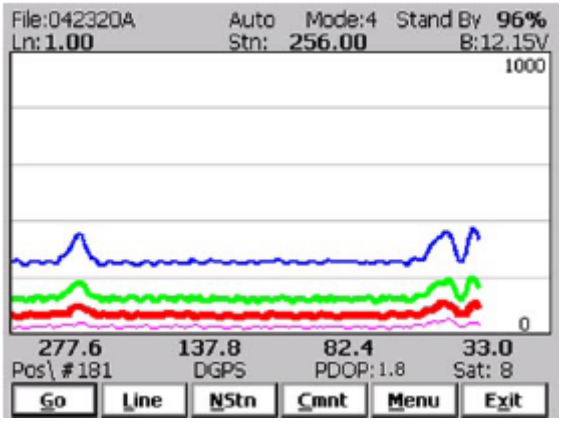


FIGURE 3-1
Example of Digital Readout of EM61-MK2 Logger Screen

Anomalies with amplitudes of 3 millivolts (mV) and higher on time gate ("channel") 2, which is consistent with the anomalies selected from the 2006 DGM data, will be marked for investigation. Anomaly marking will consist of placement of a polyvinyl chloride (PVC) surveyor flag 2 feet north of the center of the anomaly. If an anomaly exists at the 2-foot offset location, an alternate marker location will be selected and the offset distance and direction to that actual anomaly will be written on the flag.

As a continuing part of the QC process, blind QC seeds (1-inch by 4-inch pipes) will be buried in the areas to be investigated to perform ongoing verification that the EM-and-dig process is being performed properly. Seeds will be placed with the intent of an EM-and-dig team encountering at least one per day. Each blind seed will be placed vertically at a depth of approximately 3 to 7 times its diameter and the depth will be recorded. Depth will be measured to the center of mass of the item.

The UXO Quality Control Specialist (UXOQCS) will monitor the investigation to determine whether the blind QC seeds were discovered during the investigation of the area where the seeds were placed. If a blind QC seeds is not discovered, a root cause analysis will be conducted and correction actions taken in accordance with Section 4.4.4 of this Work Plan. Once the correction actions have been implemented, re-investigation will be conducted in all areas investigated between the time that the previous blind QC seed had been successfully located until corrective actions were implemented.

During the 2006 field investigation, GPS reception was inadequate to support the use of sub-meter GPS. It is assumed that the same limitations will exist during the Phase II RFI field investigation. Therefore, anomaly identifiers will be written on the flags after intrusive investigation, the flags placed in the excavation location, and the locations of the flags surveyed when the trail is surveyed by a Professional Land Surveyor.

3.2.2 Manual Excavation of Anomalies

Excavation of individual geophysical anomalies will be performed by qualified UXO Technicians using hand-excavation tools. The UXO team performing this work will be composed of qualified UXO Technicians supervised by a UXO Technician III.

Small hand tools, such as shovels, spades, trowels, and pry bars, will be used to access potential MEC/MPPEH. Hand tools will be used for the majority of the items, which generally are expected to be found near the surface. The following basic technique will be used for anomaly excavation:

- For anomalies identified by the "EM-and-dig" technique, the source of the anomaly will be investigated.
- Until identified otherwise, the anomaly is assumed to be MEC. Excavation will be initiated adjacent to the subsurface anomaly. The excavation will continue until the excavated area has reached a depth below the top of the anomaly as determined by frequent inspection with a handheld all-metals detector (e.g., Whites XLT or comparable).
- Using progressively smaller and more delicate tools to remove the soil carefully, the excavation team will expand the sidewall to expose the metallic item for inspection and identification without moving or disturbing the item.
- Once the item is exposed for inspection, the excavation team will determine if the item is MEC/MPPEH.
- If the item is MEC, it will be handled as discussed below in **Section 3.3.**
- If the item is not MEC, it will be removed and the area will be rechecked with an EM61-MK2 to ensure that a MEC item was not hidden beneath the removed item.

The maximum depth of intrusive investigation will be 2 feet based on the types of munitions used. If the source of an anomaly is found to be deeper than 2 feet, the anomaly identifier and location will be recorded as having a source deeper than 2 feet which was not characterized or removed. The ultimate treatment or disposition of an anomaly detected greater than 2 feet deep will be addressed at a later phase of the overall RFI.

3.2.3 Removal Verification

The following is the procedure to be followed for QC inspections of the MEC intrusive investigation:

1. After the dig team intrusively investigates an anomaly location, the hole is to be left open to the depth investigated and a PVC flag placed in the hole or bent after the investigation is completed.
2. The UXOQCS will inspect at least 10 percent of the intrusively investigated anomaly locations using an EM61-MK2 to determine whether all detectable metallic items within a 2-foot radius of the hole (unless identified as deeper than 2 feet) have been removed. The locations checked will be distributed in a spatially representative sample across each grid and transect.
3. All holes related to intrusive investigations will be filled back to original grade or covered before departing from the project site.
4. Anomaly locations inspected, along with results of the inspection and corrective actions planned in the event that the UXOQCS determines that inspection results require a

change in intrusive team procedures or a re-performance of any work, will be documented by the subcontractor and provided to the CH2M HILL geophysicist.

3.3 Procedures for Reporting and Disposition of MEC and MPPEH Items

This section discusses the procedures for reporting and disposing of MEC and MPPEH items encountered during the project, including the responsibilities of personnel, overall safety precautions, data reporting, transportation, safe holding areas, operations in populated/sensitive areas, demolition operations, and required engineering controls and exclusion zones (EZs) for intrusive operations and intentional detonations. All MEC found will be flagged as MEC and demilitarized by BIP procedures at the end of the field event.

3.3.1 Responsibilities of Personnel

The general responsibilities of project personnel are described in Section 2.1.2 of the Phase I RFI Work Plan (CH2M HILL, 2006).

3.3.2 Overall Safety Precautions

Qualified UXO personnel will dispose of all MEC items using BIP procedures by countercharging these items with an explosive donor charge and detonating the donor charge. This will be performed by a demolition team consisting of one UXO Technician III as the Demolition Supervisor and two UXO Technician II personnel, with the SUXOS responsible for the operation.

The MPPEH storage container will be equipped with grounding for lightning protection.

3.3.3 Data Reporting

Data reporting for each metallic anomaly will be done in accordance with Section 3.4 and 3.7 of the Phase I RFI Work Plan (CH2M HILL, 2006).

3.3.4 Exclusion Zones and Separation Distance

The fragmenting M67 Hand Grenade is the munition with the greatest fragmentation distance (MGFD). The Explosives Safety Quantity Distance (ESQD) arcs and EZ for intentional and unintentional detonations are based on this MGFD (**Table 3-1, Figure 3-2**).

TABLE 3-1
Exclusion Zone Parameters

	MGFDs		EZs (ft)				
			Fragmentation Effects		Blast Overpressure Effects		
Operation	Description	NEW (lb)	HFD	MFD	K328	K40	K24
Unintentional Detonation	M67 Hand Grenade	0.4063	200	464	274	33	18
Intentional Detonation	M67 Hand Grenade	1.5*	200	464*	375*	46*	27*

* NEW of 0.4046 + 1 lb donor charge = NEW of 1.5 lb. (The 1-lb donor charge is the maximum allowable under the approved ESS; the actual donor charge may be less.)

ft = foot, feet; HFD = highest fragmentation distance; lb = pound, MFD = maximum fragmentation distance; NEW = net explosive weight

The minimum separation distance to protect non-essential personnel from unintentional detonations during intrusive operations is 200 feet (hazardous fragmentation distance [HFD]). The team separation distance (TSD) for unintentional detonations is 200 feet. ESQD arcs, EZs, and TSDs, are taken from the DDESB-approved ESS (CH2M HILL, 2008).

If, during the course of this project, a MEC item with a greater fragmentation range than the MGFD is encountered, work will stop, the ESQD arcs will be adjusted and the ESS (CH2M HILL, 2008) will be amended. Work will not be allowed to resume until the ESS is approved.

3.3.5 Anomaly Tracking using MRSIMS

MRSIMS digitally captures, tracks, and creates automated reports on the following:

- Project information (e.g., personnel, teams, instrument serial numbers, grid identification numbers and locations)
- Field Team Leader (FTL) notes (e.g., safety meetings, logbooks, field requests to management)
- DGM and UXO Field Team notes (e.g., grids, files, personnel, methods, instruments, MEC items found)
- DGM data processing notes and delivery data (file names, processing performed, QC of data, delivery dates)
- Grid status (e.g., activities performed by grid and by acre, percents and quantities complete or remaining)
- Demolition tracking (all MEC items noted as needing demolition or demilitarization tracked from initial discovery to final disposition)
- Quality control (e.g., QC on notes, processing, data, comparison of DGM results to intrusive investigation results and field activities)

MRSIMS operates in a multi-contractor capable environment with tools for digital data capture, storage, analysis, QC and rapid display to a web-based interface. The result is a near real-time turnaround of project data to the management team. Field operations data is captured using GPS-enabled handheld devices running mobile forms-based software. The data is transferred to and validated within a centralized relational database.

Specific examples of data to be tracked in MRSIMS include:

- Organization name (performing the excavation)
- mV
- Team chief full name

- Depth to item—depth to the top of the item in inches.
- Easting coordinate
- Northing coordinate
- Orientation—Geographical direction (N, S, E, W) the item is pointing, unless vertical
- Type—type of ordnance, as specific as possible
- Filler—type of filler, such as none, inert, high explosive (HE), white phosphorus, illumination, incendiary, chemical, or smoke
- Fuze—type of fuze, such as none, inert, point detonating, powder train, or base detonating
- Date found—date on which the MEC item was found
- Disposal—disposal status (e.g., blown in place)
- Date disposed—date on which the MEC item was disposed
- Comments—any comments or notes

3.4 MPPEH and Other Debris Disposition

3.4.1 Inspection and Segregation

A systematic approach will be used for collecting, inspecting, and segregating site debris. The approach is designed so that materials undergo a continual evaluation/inspection process from the time they are acquired until the time they are removed from the site. Site debris will be classified and segregated into one of following three categories:

- MEC
- MPPEH
- Other debris

Segregation procedures begin at the time the metal item is discovered by the UXO Technician. At this point, the UXO Technician makes a preliminary determination as to the classification of the item:

- If the item is not munitions-related debris (other debris), it is placed at a temporary non-MPPEH debris accumulation point located within the current operating grid or transect.
- If the item is identified as MPPEH, it is placed in a temporary MPPEH accumulation point located within the current operating grid or transects.
- If the item is identified as MEC, the item will be flagged. No MEC will be considered safe to move and will require demolition by controlled detonation procedures at the end of the field event. Following demolition, the area will be rechecked with the EM61-MK2 to ensure that another item was not hidden beneath the removed item. Soil samples for MC analysis will be collected from each BIP location.

3.4.2 Inspection, Certification, and Verification

The UXO Team will collect the scrap piles deposited in the MRS and will perform an inspection to confirm that segregation of the items according to proper classification has occurred. The MPPEH items will be inspected and subdivided into the following two groups:

- MPPEH (3X) items and MD (5X) items that require treatment/demilitarization
- MD (5X) items that do not require further demilitarization

Items identified as 3X and items identified as 5X still requiring demilitarization will be left in the active MRS until they have been treated or demilitarized, while 5X items not requiring demilitarization will be certified by the SUXOS, verified by the UXO Safety Officer (UXOSO)/UXOQCS, and moved to the central collection point in the storage facility shown on **Figure 3-2.**

Two scrap metal containers will be positioned at the storage facility site shown on **Figure 3-2** and will remain locked when not in active use. One container will be marked "Other Debris (0X)" and will be used to collect non-munitions-related metal debris that is moved from the active MRS.

The other container will be marked "MPPEH-Safe (5X)" to indicate the explosives safety status of the contents. An explosives safety status of "safe" means that the contents have been certified and verified as not presenting an explosion hazard, and are consequently safe for unrestricted transfer or release pending any further demilitarization requirements or trade security controls. Material that has been certified and verified safe is no longer considered MPPEH provided the chain-of-custody remains intact. An authorization letter from the Project Manager (PM) to the Commanding Officer of the cognizant Facilities and Engineering Command (FEC) stating that the specific project personnel are qualified and authorized to sign a certification of MPPEH as safe or hazardous for the site will be on file at the site.

MPPEH that cannot be certified and verified as "Safe" will be categorized as 3X and will remain at the MRS collection point until treated or demilitarized by controlled detonation procedures.

CH2M HILL will confirm that all material is properly inspected by UXO-qualified personnel. The SUXOS will certify that the 5X containers are free of explosive hazards. The UXOSO/UXOQCS will verify that the 5X containers are free of explosive hazards. DD Form 1348-1A will be used as certification/verification documentation. All DD Form 1348-1A forms will clearly show the following information in typed or printed letters:

1. Name of CH2M HILL's SUXOS
2. Organization
3. Signatures
4. CH2M HILL's home office
5. Field office phone number(s) of the persons certifying and verifying the scrap metal

For scrap metal, the DD Form 1348-1A will clearly indicate the following:

1. Basic material content (type of metal, for example, steel or mixed)
2. Estimated weight

3. Unique identification of each sealed container
4. Location where MPPEH was obtained
5. Seal identification, if different from the unique identification of the sealed container

As part of the transfer of MPPEH-Safe (5X) material for final disposition, the following certification/verification will be entered on each DD Form 1348-1A and will be signed by the SUXOS and the UXOQCS.

> *This certifies and verifies that the material potentially presenting an explosive hazard has been 100 percent properly inspected and to the best of our knowledge and belief, is inert and/or free of explosives or related materials.*

CH2M HILL will arrange for maintaining the chain-of-custody and final disposition of the certified and verified materials. The certified and verified material will be released only to an organization that will:

1. Provide signed documentation stating that the organization has received the containers, that each container has an unbroken seal and unique identification, and that after reviewing the documentation accompanying the containers, agrees that the sealed containers contained no explosive hazards when received. This documentation will be signed on company letterhead and state that the contents of these sealed containers will not be sold, traded, or otherwise given to another party until the contents have been smelted and are identifiable only by their basic content.
2. Send notification and supporting documentation to the generating contractor (CH2M HILL) documenting that the sealed containers have been smelted and are now identifiable only by their basic content. These documents will be incorporated into the final report.

3.5 Field Sampling Plan

3.5.1 Field Operations

During this field effort, surface soil samples will be collected from locations where MEC demolition occurs to evaluate the presence of residual MCs. The Phase I RFI Work Plan (CH2M HILL, 2006), to which this plan is an addendum, provides a detailed description of sampling procedures, QC requirements, and SOPs (Section 3, Section 4, and Appendix E of the Phase I RFI Work Plan, respectively). The following sections are specific to this field effort.

Soil samples will be analyzed by a fixed-base laboratory for explosives residues by SW-846 Method 8330, Target Analyte List (TAL) Metals by Contract Laboratory Program (CLP) Method ILM05.4, and Perchlorate by SW-846 Method 6850 (**Tables 3-2 and 3-3**).

All samples will be Level IV validated by a third-party validator, as described in **Section 4**, and laboratory data reports will be certified by a chemist licensed in Puerto Rico.

TABLE 3-2
Analyses, Bottleware, Preservation, and Holding Time Requirements

Media	Analysis	Method	Container	Preservation/ Storage	Holding Times
Soil	Explosives	SW846 8330/2.3.2.4/ 2.3.2.2/2.8.3	One 8-oz bottle, Teflon-lined cap	Cool to 4ºC, 0.008% Na2S2O3	14 days to extract; 40 days to analyze
Soil	Metals	CLP ILM05.4/3.1.1.6/ 3.1.1.4/3.3.3/3.3.4	One 4-oz glass bottle with Teflon-lined cap	4ºC	6 months
Soil	Perchlorate	SW846 6850/HPLC-6850	One 4-oz glass jar	Cool to 0–6°C	28 days

ºC = degrees Celsius; L = liter; oz = ounce

TABLE 3-3
QA/QC Samples and Frequency of Collection Requirements

Sample Type	Description	Frequency	Analytes
Field Blank	Designed to detect possible contamination from ambient conditions, a field blank is analyte-free water collected directly in the sample bottle at the site during the sampling event. It shall be handled like a sample and transported to the laboratory for analysis.	One field blank from each week of the sampling event. Field blanks are collected more frequently during dusty or windy conditions.	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, per type of media	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 percent (one for every 10 field samples collected)	Same parameters as parent sample
Matrix Spike/Matrix Spike Duplicate (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 percent (one for every 20 samples (including field and QA/QC samples) collected)	Same parameters as parent sample

3.5.2 Analytical Requirements and Sample Handling

Sampling Equipment

Samples will be collected using pre-cleaned disposable equipment or equipment that has been decontaminated prior to being brought to the site. If decontamination of sampling

equipment is done prior to being brought onsite, it will be conducted according to the following procedure:

1. Wash equipment with a laboratory detergent (i.e., Alquinox®, Liquinox®, or the equivalent) and hot water, using a brush to remove any particulate matter or surface film.
2. Rinse equipment thoroughly with tap water.
3. Rinse equipment thoroughly with de-ionized or organic-free water.
4. Rinse equipment twice with isopropanol and allow to air dry.
5. Rinse equipment with de-ionized water.
6. Wrap equipment in aluminum foil, with dull side in, to prevent contamination during storage or transport to the field.

Sample Collection

Surface soil samples will be collected following the "TR-02-1" approach, which is summarized below and described in United States Army Corps of Engineers (USACE) Technical Report (TR) ERDC/CRREL TR-02-1, *Guide for Characterization of Sites Contaminated with Energetic Materials* (Thiboutot, Ampleman, and Hewitt, 2002).

Each sampling location will be defined as the area impacted by the in-place demolition of a MEC item and will be up to 1m × 1m in size. Coordinates of the sampling location will be based on the center of the sampling area. Sampling personnel will record the dimensions of each sampling location in the field logbook.

Composite soil samples will be collected by compositing a minimum of thirty sample increments from random locations within each 1m × 1m (maximum) sampling location. The samples will be approximately equal in the amount of soil, which will be collected from depths of 0 to 1 foot. The sample increments at each location will be composited into a single sample following the procedures in SOP A-4, *Homogenization of Soil and Sediment Samples*, located in Appendix E of the Phase I RFI Work Plan (CH2M HILL, 2006), prior to being transferred to the appropriate sample containers.

Additional instructions on sample collection are provided in the SOPs found in Appendix E of the Phase I RFI Work Plan (CH2M HILL, 2006), to which this Plan is an addendum.

Sample Preservation and Handling

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

Quality Assurance and Quality Control

QA/QC requirements for environmental sampling, handling, and management are detailed in Section 4. Field QC samples for this operation will include field blanks, duplicate samples, and matrix spike/matrix spike duplicate (MS/MSD) samples. Required QA/QC samples and the required frequency of collection are listed in Table 3-3. Table 3-4 presents the anticipated number of field samples and their associated QA/QC samples.

TABLE 3-4
Sample Collection Frequencies

Analysis/Test	Sample Matrix	Field Samples	Field Duplicates	Equipment Blanks	Field Blanks	MS/ MSDs	Trip Blanks
Surface Soil Samples							
Explosives Residues (SW-846 8330)	Solid	One per MEC demolition area	10%	1 per day	1 per week	5%	NA
TAL Metals (CLP ILM05.4)	Solid	One per MEC demolition area	10%	1 per day	1 per week	5%	NA
Perchlorate (SW-846 6850)	Solid	One per MEC demolition area	10%	1 per day	1 per week	5%	NA

Notes:
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. If disposable equipment is used, one equipment blank near the start of the sampling event is collected to test the cleanliness of the disposable equipment.
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.
The QA/QC sample quantities shown here may be adjusted if the number of field samples is significantly altered, if the sample collection effort takes longer than expected, or if field conditions warrant otherwise.

Sample Identification System

The following is a general guide for sample identification; an electronic sample–tracking program will be used to manage the flow of information from the field sampling team to the laboratory and to internal and external data users. The tracking program is used to produce sample labels and chain-of-custody forms and to manage the entry of sampling-related data, such as station locations and field measurements. The method of sample identification used depends on the type of sample collected and the sample container.

The field analysis data are recorded in field logbooks, along with sample identity information, while in the custody of the sampling team.

Labels for samples sent to a laboratory for analysis will be produced electronically. If the labels cannot be produced electronically, they must be written 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
- Sample matrix or matrix identifier
- Type of analyses to be conducted

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

[CTO#]-[Media/MRS# or QA/QC]-[Depth Interval]- [Year/Quarter]

An explanation of each of these identifiers is given below.

[CTO#]: This investigation is being conducted under CTO 172. Therefore, the prefix "CTO172" will be used.

[Media]: SS = Surface, IS = Subsurface soil

[Station#]: Soil sample locations will be numbered consecutively and be consistent with the anomaly identifier tracking number assigned within each MRS

[QA/QC]: D = Duplicate sample (following sample type/number)
FB = Field blank
MS= Matrix Spike
MSD= Matrix Spike Duplicate

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

[Depth Interval]: Depth indicators will be used for soil samples. The number will reference the depth interval of the sample in feet:

0–1= 0 to 1 foot below ground surface (bgs)

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

"10" = Year 2010
"A" = Sampling during the first quarter at the site.

Under this sample designation format, "CTO172-SSMRS0102-0-1-10A" would mean the following:

CTO172-SSMRS0102-0-1-10A	CTO 172
CTO172-SSMRS0102-0-1-10A	Soil sample collected from Location 2 within MRS-01
CTO172-SSMRS0102-0-1-10A	Sampled collected from 0 to 1 foot bgs
CTO172-SSMRS0102-0-1-10A	Sample collected in the first quarter of 2010

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

Sample Packaging and Shipping

Samples will be tightly packed in a cooler with bubble wrap packaging material and double-bagged ice as a preservative. Ice will be securely packaged to prevent leakage, and absorbent material will be placed in the cooler to absorb condensation that may form on the outside of the ice packages.

The samples will be shipped to the laboratory via overnight courier. The Animal and Plant Health Inspection Service of the United States Department of Agriculture (APHIS-USDA)

regulates the importation of soil into the United States from foreign sources, including Puerto Rico. In accordance with APHIS-USDA regulations, the receiving laboratory will be permitted as a soil laboratory and will provide a written statement that they will take responsibility for the shipments of soil samples. A copy of the receiving laboratory's permit will be affixed to the exterior of each shipping cooler.

The FTL is responsible for completion of the following activities related to the shipment of 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 chain-of-custody form.
- Affix 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 (samplers must transfer custody to the person responsible for shipping the samples).

3.6 Survey Plan

Once all MR Operations have been completed, a survey will be conducted to track all the locations of the investigated anomalies and to delineate the South and North Bunker trails, MRS-01 and MRS-02, respectively. This will allow future relocation of the trails so that once the island is transferred to the Commonwealth of Puerto Rico they will know where MEC clearance has occurred. The trail will be delineated using a mix of standard surveying benchmarks, stakes, and flagging.

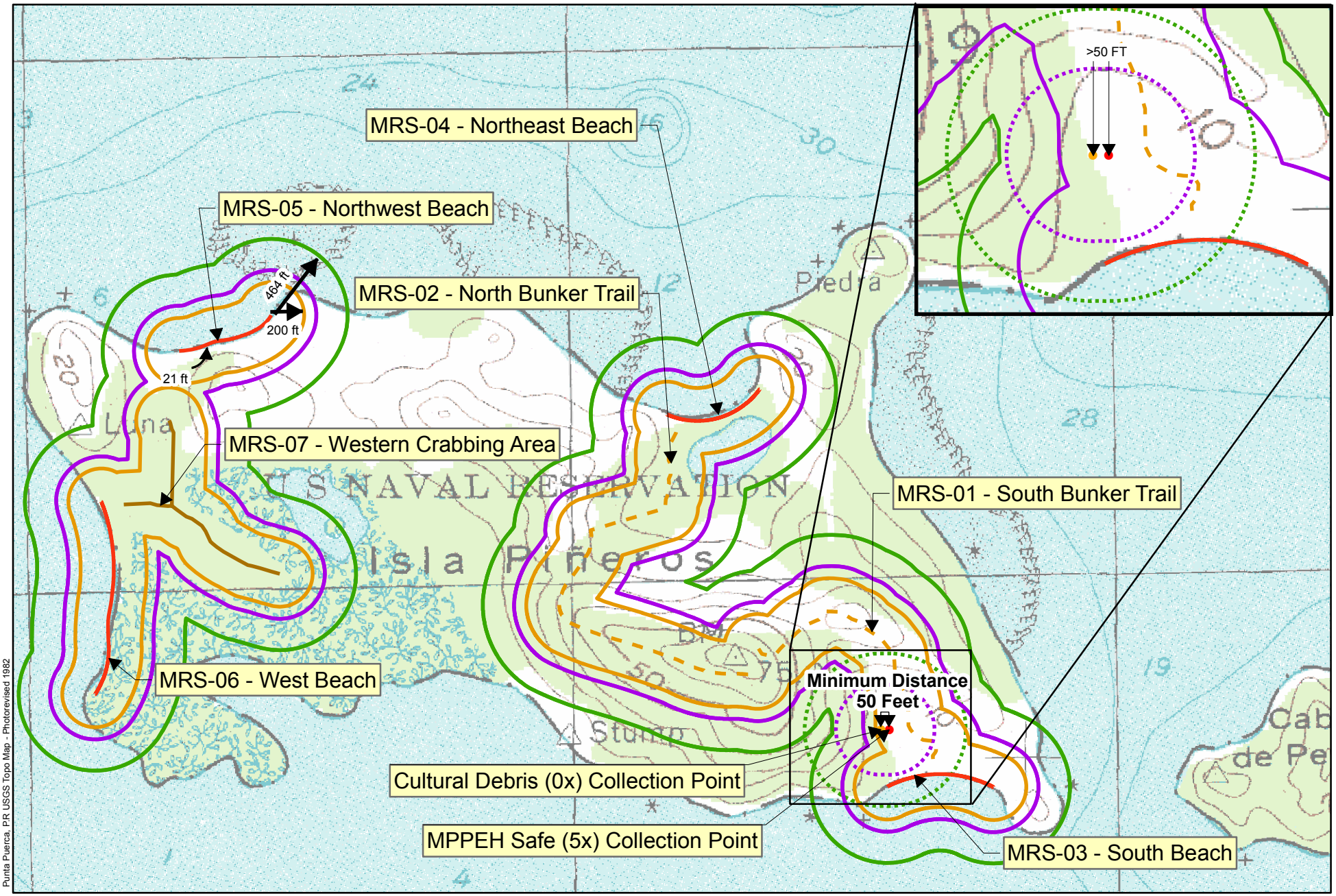
3.7 Investigative-derived Waste Plan

This subsection describes disposal procedures for non-MEC related materials that may be recovered during this investigation as well as waste generated during sampling activities.

Sampling equipment will be disposable and will only be used for one discreet sample. No decontamination will be required between samples or at the end of the sampling day. All solid waste will be containerized in trash bags and transported off Piñeros Island for disposal as municipal and solid waste.

As stated, sampling equipment will be decontaminated prior to shipment to the project site, so no decontamination fluids will be generated onsite.

October 13, 2008
Revision No. 1



- Cultural Debris (0x) Collection Point
- MPPEH Safe (5x) Collection Point
- EZ for Unintentional Detonation, 200 feet
- EZ for Intentional Detonation, 464 feet
- PTR (Public Transportation Route) 274 FT
- Accessible Beach
- Trail
- Other Geophysical Investigation Areas

N

0 200 400 800
Feet
1 inch equals 800 feet

Figure 3-2
Explosives Safety Quantity/Distance (ESQD) Arc
Pineros & Cabeza de Perro Islands, Naval Activity Puerto Rico

CH2MHILL

File Path: G:\projects2\PinerosIsland\MXDs\Munitions_Terrestrial_ESQD_MPPEH-20080915.mxd, Date: September 15, 2008 4:17:56 PM, User: JKELLY3

SECTION 4

Quality Control Plan

4.1 Introduction

Updates to the QCP are presented in this section; see the Phase I RFI Work Plan (CH2M HILL, 2006) for the complete QCP.

4.2 Project Organization and Responsibilities

4.2.1 Project Team Members

Senior Munitions Response Technical Consultant

The Senior MR Technical Consultant for this project is Tim Garretson. The Senior MR Technical Consultant is a company-wide resource with significant experience in the various technical aspects involved in a complex project. The Senior MR Technical Consultant reviews all documents and procedures for technical validity and adherence to CH2M HILL policy. The Senior MR Technical Consultant is responsible for evaluating the technical merit of the work planning documents before field activities begin, and reviewing all deliverables before submittal to NAVFAC and Naval Activity Puerto Rico (NAPR). The Senior MR Technical Consultant assists the PM in selecting an internal QA/QC review team, coordinating review efforts, addressing review comments, and resolving technical issues.

Environmental Information Specialist

The Environmental Information Specialist (EIS) for this project is Bianca Kleist. The EIS is responsible for the structure, organization, format, implementation, and operation of the project database as described in the Phase I RFI Work Plan (CH2M HILL, 2006). The EIS provides a point of communication between the laboratory and the project team, supervises the analytical data quality evaluation, and participates in preparing deliverables to the client. The EIS is also responsible for monitoring project-specific laboratory activities, including checking laboratory invoices and reports. The EIS also supervises the data management team and provides direction to the database manager.

Site Manager and Senior UXO Supervisor

The SM and SUXOS for this project is Fred Pasteris. The SM reports to the PM and is responsible for coordinating field efforts; providing and maintaining sampling equipment and materials; providing shipping and packing materials; and accurately completing the field logbook. The SM will supervise the completion of all chain-of-custody records and the proper handling and shipping of samples. As the lead field representative, the SM is also responsible for ensuring the consistent implementation of project QA/QC measures at the site and for ensuring that field activities are performed in accordance with approved work plans, policies, and field procedures.

The SM for this project will also serve as the Site Safety Coordinator (SSC). The SSC implements the project-specific HSP (**Appendix B**) in the field. The SSC will assist in conducting site briefings and ensure that all final safety checks are performed. The SSC is responsible for stopping any investigation-related operation that threatens the health and safety of the field team or surrounding populace.

Subcontractors

The following services will be provided by subcontractors:

- Vegetation removal
- Site support (charter boats)
- MEC support including MEC avoidance, intrusive investigation, MEC demolition, MPPEH segregation and disposal
- Surveying
- Laboratory analyses
- Data validation

Procurement of subcontractors will be performed in accordance with the Navy CLEAN Contract Procurement Manual.

4.2.2 Project Communication

No updates have been made to Section 4.2.2.

4.3 Environmental Investigation Quality Assurance Objectives

Data quality objectives (DQOs) are qualitative and quantitative statements that specify the quality of data required from field and laboratory data collection activities to support decisions concerning risk and remediation. DQOs are established prior to data collection and describe what data are needed, why the data are needed, and how the data will be used to address the problems being investigated. DQOs help to ensure that all data collected are legally and scientifically defensible. None of the DQOs have changed from the ones presented in the Phase I RFI Work Plan (CH2M HILL, 2006). Refer to Section 4.3 for all Environmental Investigation QA information.

To meet the requirements established by the Navy since 2006 to institute the UFP-SAP Process, **Appendix C** presents the MC Sampling and Analysis Plan "Crosswalk Table" and associated documents.

4.4 MEC-related Quality Assurance Objectives

The MEC-related QA objectives from the Phase I RFI Work Plan (CH2M HILL, 2006) have changed with the additions of MEC Intrusive Investigation as a work task.

4.4.1 Quality Control Procedures for the EM61-EMK2

Confirmation that the EM61-MK2 system is operating in accordance with industry standards will be through QC tests listed in **Table 4-1** and detailed in the following text.

TABLE 4-1
EM61-MK2 Quality Control Tests and Acceptance Criteria

Test	Test Description	Acceptance Criteria	Power on	Beginning of day	Beginning and end of day	2% of Total Area Surveyed
1	Equipment Warm-up	5 minutes	X			
2	Personnel Test	Based on instrument used. Personnel, clothing, etc., should have no effect on instrument response.		X		
3	Vibration Test (Cable Shake)	Data profile does not exhibit data spikes		X		
4	Static Background and Static Spike	±20% of standard item response, after background correction			X	

1. **Equipment Warm-up**. EM61-MK2 instruments will be warmed up for a minimum of 5 minutes. Equipment warm-up will be performed the first time an instrument is turned on for the day or has been turned off for a sufficient amount of time for the specific instrument to cool down.

2. **Personnel Test.** This test checks the response of instruments to personnel and their clothing/proximity to the system. On a daily basis, the instrument coils for those instruments being used that day will be checked for their response to the personnel operating the system. The response will be observed in the field for immediate corrective action and transmitted back to the processor, and analyzed and checked for spikes in the data that can possibly create false anomalies. The personnel test will be conducted at the beginning of the survey operation for each work day.

3. **Vibration Test (Cable Shake).** This test checks the response of instruments to vibration. On a daily basis, the instrument coils for those instruments being used that day will be checked for their response to vibrations in the cables. The response will be observed in the field for immediate corrective action and transmitted back to the processor and analyzed and checked for spikes in the data that can possibly create false anomalies. The vibration test will be conducted at the beginning of the survey operation for each work day.

4. **Static Background and Static Spike.** Static tests are performed by positioning the survey equipment in an area free of metallic contacts and collecting data for a specific period while holding the instrument in a fixed position with nothing near the coils and then with a "spike", a small industry standard object (ISO) (**Figure 4-1**), placed at an

accurately measured distance and orientation from the transmitter coil, as in the example shown in **Figure 4-1**.

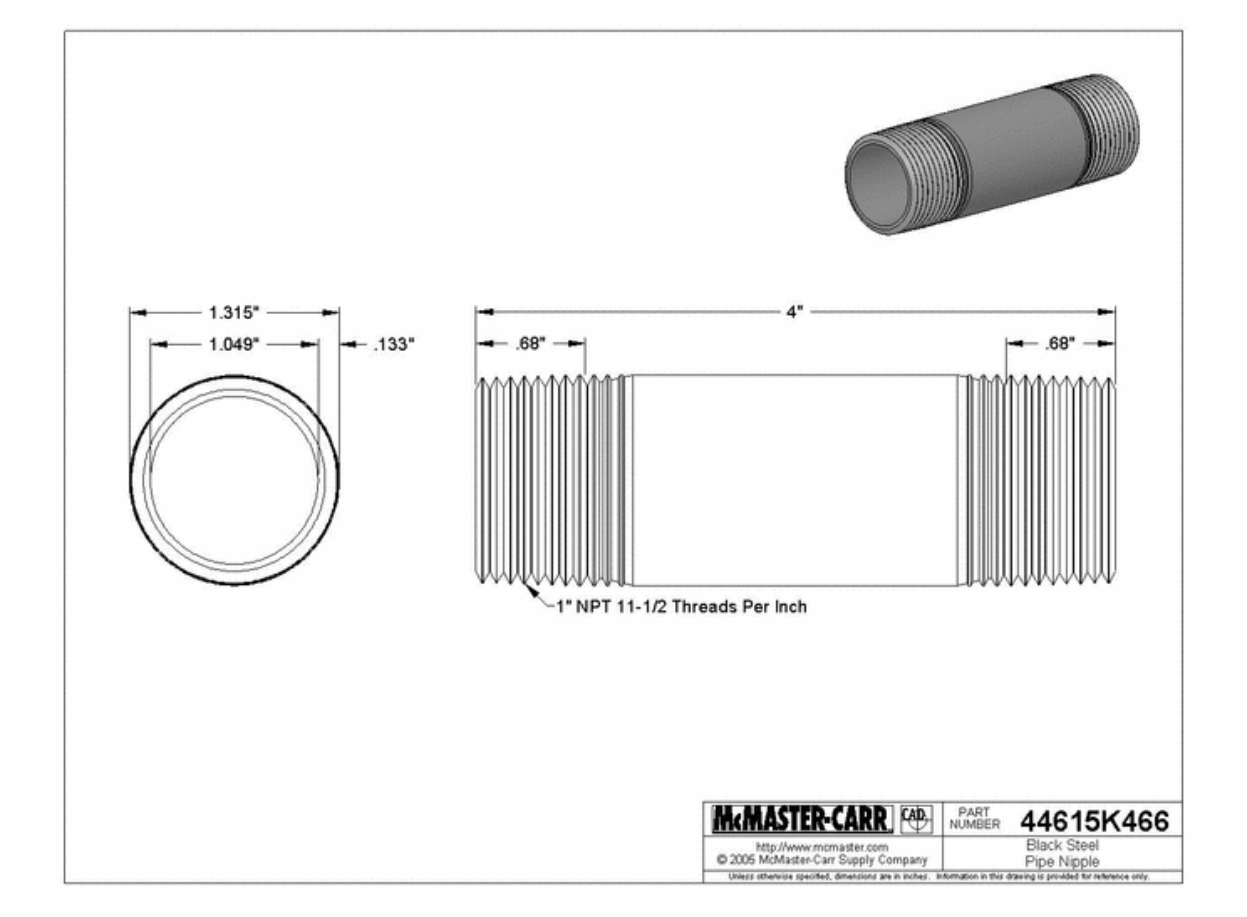


FIGURE 4-1
Industry Standard Object

The purpose of the static test is to determine whether unusual levels of instrument or ambient noise exist and that the instrument is responding as it should. The instrument response to the ISO should be within 20 percent of the predicted response. The ISO can be placed above or below the EM61-MK2 transmitter coil as long as the distance is measured from the center of mass of the item to the horizontal plane of the coil (top of coil if item placed above coil, bottom of coil if item placed below), as illustrated in **Figure 4-2**.

FIGURE 4-2
Example Spike Test Setup

The static background and static spike test are conducted at the beginning and end of each survey operation. This is the test that essentially "opens" and "closes" out a survey operation.

As a continuing part of the QC process, blind QC seeds (1-inch by 4-inch pipes) will be buried in the areas to be investigated to perform ongoing verification that the EM-and-dig process is being performed properly. Seeds will be placed with the intent of an EM-and-dig team encountering at least one per day. Each blind seed will be placed vertically at a depth of approximately 3 to 7 times its diameter and the depth will be recorded. Depth is to be measured to the center of mass of the item.

4.4.2 Definable Features of Work and the Three-Phase Control Process

MEC-related QC will be monitored through the definable features of work (DFOWs) using a three-phase control process. The DFOWs and the three-phase control process are discussed in the following subsections.

Definable Features of Work

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

1. **Planning**
   - Pre-Mobilization Activities (e.g., document management and control, data management, subcontracting)
   - Preparing Work Plan
   - Preparing an ESS Amendment (e.g., preparing and obtaining approval from appropriate Explosive Ordnance Disposal [EOD] personnel)

2. Field Operations

- Site Preparation: mobilization, vegetation removal
- "EM-and-dig" intrusive investigation
- Surveying
- MEC demilitarization
- MPPEH/MDAS disposal
- Demobilization

3. Final Project Reports and Closeout

- Phase I RFI Draft and Final Reports: preparing and obtaining approval
- Data archiving and project closeout

Three Phases of Control

The Corporate MR Safety and QC Officer is responsible for ensuring that the three-phase control process (i.e., the Preparatory Phase, Initial Phase, and Follow-up Phase) is implemented for each DFOW listed in this QCP.

Each control phase is important for obtaining a quality product and meeting the project objectives; however, the preparatory and initial audits are particularly valuable in preventing problems. Production work is not to be performed on a DFOW until successful Preparatory and Initial Phases have been completed.

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

1. Confirm that the appropriate technical procedures are incorporated into the project work plan and review procedures.
2. Confirm that adequate testing is called for to ensure quality delivery.
3. Confirm definition of preliminary work required at the work site and examine the work area to confirm required preliminary work has been properly completed.
4. Confirm availability of required materials and equipment. Examine materials and equipment to confirm compliance with approved submittals and procedures. Ensure equipment testing procedures are in place, with control limits and frequency, for each piece of equipment.
5. Confirm qualifications/training of personnel and verify roles/responsibilities are well-defined and communicated.
6. Confirm with the Health and Safety Manager (HSM) that the site-specific HSP adequately addresses the work operations and that applicable safety requirements have been incorporated into the plan.
7. Discuss methods to be employed during the field activities.
8. Confirm any required permits and other regulatory requirements are met.

9. Verify that lessons learned during previous similar work have been incorporated as appropriate into the project procedures to prevent recurrence of past problems.

Project staff must correct or resolve discrepancies between existing conditions and the approved plans/procedures identified by the PM, Corporate MR Safety and QC Officer, and the team during the Preparatory Phase. The PM or designee must verify that unsatisfactory and nonconforming conditions have been corrected prior to granting approval to begin work.

Results of the activity are to be documented in the Preparatory Inspection Checklist (**Form 4-1b**) specific for the DFOW and summarized in the Weekly QC Report.

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

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

1. The SUXOS will ensure that the field teams are aware of expectations associated with the field methods established under the Preparatory Phase by observing the initial work activities and interacting with the PM and responsible subcontractors' supervisors.

2. Resolve conflicts. The Senior MR Technical Consultant will guide the PM and responsible supervisor(s) in resolving conflicts. Should conflicts arise in establishing the baseline quality for the DFOW, the responsibility to resolve the conflict falls to the PM. Should the conflict not be resolved in a manner that satisfies the project requirements, the Senior MR Technical Consultant must elevate the conflict to the program level (that is, the Program QC Manager) and issue a non-conformance report. The Senior MR Technical Consultant may direct a cessation of work activity with the concurrence of the Program QC Manager should the issue jeopardize the results of the DFOW or put the project at risk of non-conformance.

3. Verify with the HSM that the site-specific HSP was developed to ensure that the identified hazards adequately address field conditions. Confirm that applicable safety requirements are being implemented during field activities.

Upon completion of Initial Phase activities, the results are to be documented in the Initial Phase Inspection Checklist (**Form 4-2b**) and the QC logbook and summarized in the Weekly QC Report. Should results be unsatisfactory, the Initial Phase will be rescheduled and performed again.

Follow-up Phase Completion of the Initial Phase of QC activity leads directly into the Follow-up Phase, which addresses the routine day-to-day activities at the site. Inspection and audit activities associated with each DFOW are addressed in Section 4.4.2 of the Phase I RFI Report (CH2M HILL, 2006). Specific concerns associated with the Follow-up Phase include:

1. Inspection of the work activity to ensure work complies with the Contract and work plans.
2. Evaluation and confirmation that the quality of work is being maintained at least at the level established during the Initial Phase.
3. Evaluation and confirmation that required testing is being performed in accordance with the procedures in this Addendum.
4. Confirmation that nonconforming work is being corrected promptly and in accordance with the direction provided by the PM, SM/SUXOS, Senior MR Technical Consultant, or Corporate MR Safety and QC Officer.

To conduct and document these inspections, the SM/SUXOS is to generate the Follow-up Phase Inspection Checklist (**Form 4-3b**). The Follow-up Phase inspections will be performed daily or as otherwise identified in this QCP until the completion of each DFOW.

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

Additional Audits Additional audits performed on the same DFOW may be required at the discretion of the Program QC Officer, Senior MR Technical Consultant, Corporate MR Safety and QC Officer, HSM, or the PM. Additional preparatory and initial audits are generally warranted under any of the following conditions: unsatisfactory work, changes in key personnel, resumption of work after a substantial period of inactivity (for example, 2 weeks or more), or changes to the project scope of work/specifications.

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

4.4.3 Audit Procedures

The Corporate MR Safety and QC Officer is responsible for verifying compliance with this QCP through audits and surveillance. The PM or a designee is to inspect/audit the quality of work being performed for the definable feature of work. The PM or a designee is to verify that procedures conform to applicable specifications stated in this Work Plan Addendum or other applicable guidance. Identified deficiencies are to be communicated to the responsible individual and documented in the QC logbook and Weekly QC Report. Corrective actions

are to be verified by the Corporate MR Safety & QC Officer and recorded in the Weekly QC Report.

The specific QC audit procedures for the DFOWs, 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 4-2**.

The Inspection Schedule and Tracking Form (**Form 4-5b**) is to be used by the Corporate MR Safety and QC Officer for planning, scheduling and tracking the progress of audits for this project. The information on the form is to be kept up to date and reviewed by the Corporate MR Safety and QC Officer for planning purposes. Audit activities and corrective actions are to be documented by the Corporate MR Safety and QC Officer in accordance with this chapter. Audit records are to be maintained as part of the project QC file.

4.4.4 Corrective/Preventive Action Procedures

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

Preventive Measures

While the entire QC program is directed toward problem prevention, certain elements of the program have greater potential to be proactive. The primary tools for problem prevention on this project are discussed in Three Phases of Control (**Section 4.4.2**), Submittal Management (**Section 4.4.6**), and Personnel Qualification and Training (**Section 4.4.7**). Should these preventive measures fail, tracking and communicating deficiencies provide a mechanism for preventing their recurrence.

Continual Improvement

Project staff at all levels are encouraged to provide recommendations for improvements in established work processes and techniques. The intent is to identify activities that are compliant but can be performed in a more efficient or cost-effective manner. Typical quality improvement recommendations include identifying an existing practice that should be improved and/or recommending an alternate practice that provides a benefit without compromising prescribed standards of quality. Project staff members are to bring their recommendations to the attention of project management or the QC staff through verbal or written means. However, deviations from established protocols are not to be implemented without prior written approval by the PM and concurrence of the Senior MR Technical Consultant. Where a staff-initiated recommendation results in a tangible benefit to the project, public acknowledgment is to be given by the PM.

Deficiency Identification and Resolution

While deficiency identification and resolution occurs primarily at the operational level, QC audits provide a backup mechanism to address problems that either are not identified or cannot be resolved at the operational level. Through implementation of the audit program prescribed in this QCP, the QC staff is responsible for verifying that deficiencies are identified, documented as prescribed herein, and corrected in a timely manner. Deficiencies identified by the QC staff are to be corrected by the operational staff and documented by the QC staff.

Corrective Action Request

A Corrective Action Request (CAR) (**Form 4-6b**) can be issued by any member of the project staff, including CH2M HILL and subcontractor employees. If the individual issuing the CAR is also responsible for correcting the problem, then that individual should do so and document the results on Part B of the CAR (**Form 4-6b**). Otherwise, the CAR should be forwarded to the PM, who is then responsible for evaluating the validity of the request, formulating a resolution and prevention strategy, assigning personnel and resources, and specifying and enforcing a schedule for corrective actions. Once a corrective action has been completed, the CAR and supporting information are to be forwarded to the Corporate MR Safety and QC Officer for closure. Sufficient information is to be provided to allow the QC reviewer to verify the effectiveness of the corrective actions.

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

The PM will determine whether a written Corrective Action Plan (CAP) (Form 4-7b) is necessary, based on whether or not any of the following are met: the CAR priority is high; deficiency requires a rigorous corrective action planning process to identify similar work product or activities affected by the deficiency; or deficiency requires extensive resources and planning to correct the deficiency and to prevent recurrence. The CAP is developed by a PM designee and approved and signed by the PM. The CAP is to indicate whether it is submitted for informational purposes or for review and approval. In either event, the operational staff members are encouraged to discuss the corrective action strategy with the QC staff throughout the process. The CAP form is included at the end of this chapter.

Deficiency and Corrective Action Tracking

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

Lessons Learned and Other Documentation

The lessons learned through the deficiency management process are documented on CARs and CAPs. To share the lessons learned, these documents can be submitted to the Client through a Weekly QC Report summarizing the week's QC activities and including a grouping of the Daily QC Reports (**Form 4-8b**) and all other pertinent reports created during the week.

CARs should be cited in the Weekly QC Report. Minor deficiencies identified during a QC audit that are readily correctable and can be verified in the field are to be documented in the QC logbook and Weekly QC Report without initiating a CAR. Deficiencies that cannot be readily corrected are to be documented by the QC staff on a CAR and in the Weekly QC Report. Copies of CARs are to be referenced in and attached to the Weekly QC Report.

CAPs will also be attached to Weekly QC Reports to document the final outcome of the deficiency. Similar or related deficiencies may be addressed on a single CAP.

4.4.5 Records Generated

Onsite Project File

The SM/SUXOS will establish and maintain an onsite project file in accordance with the CH2M HILL corporate quality manual for document control. The onsite files will be maintained in the project field office or designated field vehicle. The purpose of these files is to maintain a complete set of all documents, reports, certifications, and other records that provide information on project plans, contractual agreements, and project activities.

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

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

- Truck load tickets and shipping papers (if applicable)

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

Records (both digital and hard copy) will be maintained for 5 years before archiving.

Weekly Quality Control Report

The SM/SUXOS is responsible for preparing and submitting the Weekly QC Report to the Program QC Officer for the project file and providing concurrent courtesy copies to the PM. The Weekly QC Report with attachments is to be submitted to the Program QC Officer on the first workday following the dates covered by the report.

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

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

QC and health and safety staff input for the Weekly QC Report is to be provided in writing to the SM/SUXOS at a previously agreed upon time and place, generally no later than 1 hour before normal close of business. For the sake of simplicity and completeness, the format for QC staff input should follow the same format as the Weekly QC Report with only the relevant sections completed.

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

4.4.6 Submittal Management

The PM is responsible for overall management and control of project submittals. The PM is also responsible for submittal scheduling and tracking.

The PM is responsible for ensuring, through detailed review, that submittals as well as the materials and the work they represent, are in full compliance with applicable contractual specifications and the project plans. The PM is also responsible for ensuring that a project file is established and maintained and that project documents are retained and controlled appropriately.

Review of Plans and Specifications

During the Preparatory Phase of a DFOW, the PM is responsible for reviewing the plans and, when necessary, requesting clarification from the project team. The primary purpose of this review is to identify and resolve potential conflicts prior to initiating work operations.

Review and Approval of Submittals

The Senior MR Technical Consultant and the PM must review submittals prepared by CH2M HILL and subcontractors for completeness and compliance with the specifications of the project and Contract. Non-compliant submittals are to be returned to the originator for corrective action and re-submittal to the PM or his designee.

Prior to submittal to the Senior MR Technical Consultant for certification, technical documents (e.g., reports and plans) are to be reviewed by qualified staff. Although part of the QC process, technical reviewers may include, but are not limited to, the QC staff.

For each project document that is submitted for technical review, a Document Review and Release Form (**Form 4-9b**) is to be initiated by the author, submitted with the document to be reviewed, and used to document and track the review process. A copy of the completed Document Review and Release Form is to be submitted to the PM together with the corrected document for his review and certification. Each document is to provide a signature block for PM and Senior MR Technical Consultant certification. Original Document Review and Release Forms, reviewer comments, and annotated versions are to be retained with the deliverable in the project file and reviewed by the QC staff during project audits.

4.4.7 Personnel Qualifications and Training

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

Documentation of Qualification and Training for UXO-qualified Personnel

The SM/SUXOS will maintain records documenting the required qualifications, training, and certifications for each site worker. The SM/SUXOS will monitor expiration dates to provide advance warning to the PM of when employees will require refresher training or other renewals. The Corporate MR Safety and QC Officer will maintain records of site-specific and routine training for personnel and visitors, as required by these project plans. These records will be maintained onsite for audit purposes.

All UXO Personnel

All MEC personnel will comply with the training requirements specified by the Program QC Manager. All UXO qualified personnel will be graduates of one of the following schools or courses:

- U.S. Army Bomb Disposal School, Aberdeen Proving Ground, Maryland
- U.S. Naval EOD School, Indian Head, Maryland
- U.S. Naval EOD School, Eglin Air Force Base, Florida
- U.S. Department of Defense-certified equivalent course (UXO Technician I only)

EOD experience in National Guard or Reserve Units will be based on the actual documented time spent on active duty, not on the total time of service.

UXO Sweep Personnel

UXO sweep personnel assist UXO Technicians and UXO-qualified personnel in the performance of UXO-related operations. UXO sweep personnel do not have to be UXO Technicians; however, they must be provided job and site-specific training. At a minimum, training will include: explosives safety, recognition of MEC (particularly UXO), and the proper use of personal protective equipment. UXO sweep personnel are not involved in the execution of explosives operations and will not have intentional physical contact with MEC. With direction and supervision of UXO-qualified personnel, UXO sweep personnel may:

- Conduct visual and/or detector-aided MEC field search activities.
- Locate subsurface MEC by operating geophysical detection instruments and related equipment.
- Perform field maintenance and tests on geophysical detection instruments and related equipment.
- Remove non-hazardous munitions debris and range-related debris, only after such items have been inspected by a UXO technician or UXO-qualified personnel and determined to be safe for handling.
- Perform site and area security functions.

UXO Technician I

In addition to being able to perform all functions of the UXO sweep personnel listed in this section, for this project, UXO Technician I personnel may, with the direction and supervision from UXO-qualified personnel:

- Reconnoiter and classify MEC.
- Identify all types of military munitions, including possible fuzes and their condition, armed or unarmed; examples are the following:
  - Bombs
  - Guided missiles
  - Projectiles
  - Rockets
  - Land mines and associated components
  - Pyrotechnic items
  - Military explosives and demolition materials
  - Grenades
  - Submunitions
- Operate personnel decontamination stations

UXO Technician I personnel are not classified as UXO-qualified.

UXO Technician II

In addition to being able to perform all functions of the UXO sweep personnel and UXO Technician I listed in this chapter, for this project, UXO Technician II personnel may:

- Determine precise location in field environment using a variety of techniques such as global positioning equipment or basic land navigation using topographical map and compass.
- Perform field-expedient identification procedures to identify contaminated soil.
- Perform limited technical supervision of UXO sweep personnel.
- Escort personnel who are not directly involved in UXO-related operations (e.g., personnel performing environmental monitoring), but who have activities to perform within exclusion zones.
- Inspect MPPEH for the presence of explosive safety hazards.

Corporate Munitions Response Safety and Quality Control Officer

The Corporate MR Safety and QC Officer may:

- Develop and implement the MEC-specific sections of the QCP for all MEC-related operations.
- Identify and verify completion of all corrective actions to ensure all MEC operations comply with requirements.

UXO Team Composition and Roles

For all MEC-related operations, each UXO team will have a minimum of two UXO-qualified personnel, one of which will be the UXO Technician III. A UXO Technician III will supervise all MEC operations and all teams operating within an exclusion zone.

Health and Safety Training

Health and safety training requirements for onsite project personnel have been established in accordance with Occupational Safety and Health Act/Occupational Safety and Health Administration requirements for hazardous site workers (29 CFR 1910.120) and are specified in the HSP (**Appendix B**). These training requirements must be met before project personnel can begin site work.

4.4.8 Testing and Maintenance

Testing and maintenance of equipment such as geophysical instruments, radios, cell phones, vehicles and machinery will be performed per the manufacturer's specifications, this Addendum, and all applicable SOPs.

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

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

TABLE 4-2
Definable Features of Work Auditing Procedures
Addendum to the Work Plan to Conduct Phase I RFI
Piñeros and Cabeza de Perro Islands
Naval Activity Puerto Rico

Definable Feature of Work with Auditable Function	Responsible Person(s)[1]	Audit Procedure[2]	QC Phase[3]	Freq. of Audit	Pass/Fail Criteria	Action if Failure Occurs
Planning						
Geographical Information System (GIS) Setup (Pre-mobilization Activities)	Project GIS Manager	Verify GIS system has been set up and is ready for site data.	PP	O	GIS system has been set up and is ready for site data.	Do not proceed with field activities until criterion is passed.
Document management and control (Pre-mobilization Activities)	Project Manager	Verify appropriate measures are in place to manage and control project documents.	PP	O	Appropriate measures are in place to manage and control project documents.	Do not proceed with field activities until criterion is passed.
Data Management (Pre-mobilization Activities)	Project Manager, Project Geophysicist	Verify appropriate measures are in place to manage and control project data.	PP	O	Appropriate measures are in place to manage and control project data.	Do not proceed with field activities until criterion is passed.
Subcontracting (Pre-mobilization Activities)	Project Manager, Site Manager	Verify subcontractor qualifications, training, and licenses.	PP/IP	O	Subcontractors' qualifications, training, and licenses are up to date and acceptable.	Ensure subcontractor provides the qualifications, training, and licenses or change subcontractor.
Technical and Operational approach (Technical Project Planning)	Project Manager	Verify technical and operational approaches have been agreed on by the project team.	PP/IP	O	Technical and operational approaches have been agreed on by project team and incorporated into the Work Plans.	Do not proceed with field activities until criterion is passed
Work Plan Addendum and Explosives Safety Submission (ESS) Amendment preparation and approval	Project Manager	Verify Work Plan Addendum and ESS Amendment have been prepared and approved.	PP/IP	O	Work Plan and ESS Amendment has been approved	Do not proceed with field activities (excluding site mobilization) until criterion is passed.
Field Operations						
Site preparation (Mobilization)	Project Manager	Verify local agencies are coordinated.	PP/IP	O	Local agencies are coordinated.	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	Project Manager	Verify equipment has been inspected and tested.	PP/IP	E	Equipment passes inspection and testing.	Proceed only with activities for which equipment has passed inspection and testing.
Site preparation (Mobilization)	Project Manager	Verify communications and other logistical support requirements are coordinated.	PP/IP	O	Communications and other logistical support are coordinated.	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	Project Manager	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)	MR Safety & QC Officer, Project 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)	MR Safety & QC Officer, Project 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 (Vegetation Removal)	SM/SUXOS	Verify personnel qualifications and training.	PP/IP	O	Personnel qualifications and training are appropriate.	Ensure subcontractor provides appropriately trained and qualified personnel or replace with properly trained personnel.
Site Preparation (Vegetation Removal)	SM/SUXOS	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)	SM/SUXOS	Verify vegetation removal is conducted IAW Section 3 of the Work Plan.	FP	D	Vegetation removal is conducted IAW Section 3 of the 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.
Site Preparation (Surface MEC identification)	SM/SUXOS	Verify equipment testing is performed per Section C.24 of the Geophysical Investigation Plan (Work Plan Appendix C).	IP/FP	O/D	Equipment passes daily function test in equipment check area.	Repair or replace instrument.
Site Preparation (Surface MEC identification)	SM/SUXOS	Verify area/boundary.	PP/IP	O	Area/boundary is marked.	Stop activities until area/boundary can be verified.

TABLE 4-2
Definable Features of Work Auditing Procedures
Addendum to the Work Plan to Conduct Phase I RFI
Piñeros and Cabeza de Perro Islands
Naval Activity Puerto Rico

Definable Feature of Work with Auditable Function	**Responsible Person(s)[1]**	**Audit Procedure[2]**	**QC Phase[3]**	**Freq. of Audit**	**Pass/Fail Criteria**	**Action if Failure Occurs**
Site preparation (Surface MEC identification)	SM/SUXOS, MR Safety & QC Officer, Project Geophysicist	Verify work methods are conducted IAW the Geophysical Investigation Plan (Work Plan Appendix C) and Health and Safety Plan (Work Plan Appendix B). Survey/Sweeps MEC Surface Sweeps Scrap Inspection Operations	IP/FP	D	Work methods are being performed IAW the Work Plan and SOPs.	Stop activities until Work Plan and SOPs are being followed and any activities not performed within compliance are re-evaluated and re-performed if necessary.
MEC intrusive Investigation using Mag and Dig Techniques	Project Manager Project Geophysicist	Verify mag and dig methods conducted IAW Geophysical Investigation Plan (Chapter 3.3) and DGM SOPs: EM-61-MK2 Metal Detection Surveys Geophysical Surveying with EM-61-MK2.	IP/FP	O/D	DGM Survey conducted IAW Geophysical Investigation Plan (Chapter 3) and DGM SOPs.	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary.
DGM Survey	Project Geophysicist	Check results of QC tests performed as specified in QCP and DGM SOPs.	FP	E	QC tests must pass IAW standards and referenced SOPs.	If a QC test does not pass, a root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action.
DGM Survey	Project Geophysicist	Confirm that DGM survey DQOs are being met.	FP	E	DGM survey DQOs are being met.	If the DQOs are not being met, a root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action.
DGM Data Processing	Project Geophysicist	Verify data checks specified in QCP and SOPs: EM-61-MK2 Data Processing and Database Management Uploading and Downloading Data to the FTP Site.	FP	E	Data checks must pass in accordance with standards established in the Work Plan.	If a QC test does not pass, a root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action.
Demobilization	Project Manager	Verify facilities-support infrastructures are dismantled and shipped to appropriate location and area is returned to original condition.	FP	O	Facilities-support infrastructures are dismantled and shipped to appropriate location and site is returned to original condition.	Ensure that all support facilities are removed and that the site is returned to original condition
Final Project Reports and Closeout						
Final Report	Project Manager	Verify Final Report has been approved.	IP	O	Final Report has been approved.	Take appropriate actions to ensure Report gets approved
Archiving	GIS Manager	Verify data back-up systems are in place.	IP	O	Data back-up systems are in place	Ensure data back-up systems are in place
Project Closeout	Project Manager	Verify purchase orders have been closed out.	IP	O	Purchase orders have been closed out	Ensure purchase orders are closed out
Project Closeout	Project Manager	Verify invoices completed and approved.	IP	O	Invoices completed and approved	Ensure invoices are completed and approved

Notes:
IAW = in accordance with

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

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

SECTION 5

Explosives Management Plan

This Explosives Management Plan details the management of explosives to support the removal and disposal of MEC and MPPEH items that could possibly be discovered during the intrusive investigation activities. In the event that MEC is discovered, the UXO subcontractor will comply with this explosives management plan and follow controlled detonation procedures. This plan was developed in accordance with DID MR-005-03, Federal Acquisition Regulations Subpart 45.5, *Management of Government Property in the Possession of Subcontractors;* Bureau of Alcohol, Tobacco, Firearms, and Explosives *ATF Explosives Laws and Regulations,* P 5400.7 (ATF, 1990); *6055.9-STD, DoD Ammunition and Explosives Safety Standards* (DoD, 2004); U.S. Department of Transportation (DOT) regulations; and local and state laws and regulations.

5.1 Acquisition

CH2M HILL and the UXO subcontractor maintain valid ATF permits for the purchase and use of explosives. The UXO subcontractor will be the primary Point of Contact (POC) for all acquisition and use of the explosives used during this project. Copies of these permits will be maintained at the project site and, upon request, will be made available to any local, state, or federal authority.

5.1.1 Description and Estimated Quantities

The types and quantities of explosives used during this intrusive investigation will be determined in consultation between CH2M HILL's SUXOS and the UXO subcontracting company. All explosives will be supplied by an on-call vendor and will be used for controlled detonation after all anomalies within the seven MRSs have been flagged for demilitarization. Explosives will not be stored onsite.

5.1.2 Acquisition Source

The UXO subcontractor will acquire explosives from a commercial explosives vendor who will deliver the materials directly to NAPR. Explosives will be transported by the UXO Subcontractor to the project site, and used immediately for controlled detonation operations. Authority to order explosives will be given by the CH2M HILL SM/SUXOS prior to the UXO subcontractor ordering explosives.

5.2 Initial Receipt

5.2.1 Procedures for Receipt of Explosives

The UXO subcontractor will take custody of the explosives from the vendor at NAPR and will be responsible for transporting the explosives from NAPR to Piñeros Island and

verifying that the type, quantity, and lot number of each explosive item has been checked against the manifest and properly recorded.

The original receipt and shipping documents will be maintained onsite with other project records by the CH2M HILL SUXOS.

5.2.2 Reconciling Discrepancies

Any discrepancies between the actual type and quantity of explosives received and the shipping documentation will be noted on the shipping documentation with the signatures of both the delivery driver and the individual authorized to receive the explosives. A legible copy will be filed onsite. The authorized individual receiving the explosives will immediately inform the UXOQCS and SUXOS of the discrepancy. The SUXOS will coordinate notification of the commercial explosives vendor.

5.3 Storage

Not applicable. Explosives will not be stored onsite.

5.4 Transportation

Explosives for demolition operations will be provided by a licensed vendor on an on-call basis. The explosives vendor will transport explosive material to the NAPR installation and will transfer them in a "day box" portable magazine to a private charter boat, which will transport the explosives to Piñeros Island.

The explosives vendor's transportation route and the transfer point are shown on **Figure 5-1**. The explosives vendor will enter the NAPR installation at Gate No. 3 on Bennington Drive, where he will be met by the UXO Subcontractor's UXOSO and a NAPR representative. After confirming the vendor's credentials and manifest, he will proceed along the following route: south on Bennington Road; turn left and proceed east on Langley Drive; continue to proceed east on Marina Bypass; turn right and proceed southeast on Forrestal Drive; turn right and proceed southwest on the roadway to Pier 1 or Pier 2.

5.5 Receipt Records and Explosive Inventories

This section describes the procedures for maintaining records of explosives inventories.

5.5.1 Records Management

At the time of an explosives delivery and explosives issuance, the SUXOS will ensure that all additions and subtractions from the shipment inventory are properly recorded. Explosives will be ordered on a just in time for delivery basis, and are expected to be used immediately once onsite.

CH2M HILL will archive all explosives inventory records generated for at least 5 years in accordance with ATF regulations.

5.6 Authorized Individuals

The UXO subcontractor shall have an ATF permit to purchase, use, handle, transport, and store explosives. The UXO subcontractor's Blaster in Charge will be responsible for the proper receipt of explosives from the explosives vendor. The Blaster in Charge may specifically authorize other individuals to perform the receipt and initial inventory of the explosives, but the Blaster in Charge cannot delegate the responsibility for ensuring that the inventory, receipt, and handling of the explosives are performed in accordance with the requirements of this plan.

The CH2M HILL SUXOS will retain authority to approve detonation.

Any individual authorized to receive explosives will be at least a UXO Technician III and will be either a U.S. Department of Justice (DOJ) Employee Possessor or Responsible Person with the UXO subcontractor. Written authorization designating the personnel who can receive or use explosives will be provided by the UXO subcontractor. As the end user of explosives, the Blaster in Charge will certify in writing that the explosives were used for their intended purpose. A copy of this certification, along with all inventory records, will be provided to the CH2M HILL MR Operations Director and the UXO subcontractor's ATF Permit Holder.

5.7 Lost, Stolen, or Unauthorized Use of Explosives

If explosives are discovered to be lost, stolen, or used without authorization, the incident will be reported immediately to the SUXOS, who in turn will inform CH2M HILL's PM, MR Operations Manager, and the MR Market Segment Director. The CH2M HILL PM will notify the NTR.

As the federal permit holder, the UXO subcontractor is required by law to report the theft or loss of explosives to the ATF within 24 hours (27 Code of Federal Regulations [CFR] 55.30). In the event of such an occurrence, the following procedures will be followed:

- The area will be sealed until the appropriate authorities complete their investigation.
- The UXO subcontractor will make the appropriate notifications per 27 CFR 55.30, which include calling the **ATF (1-888-283-2662)** and the local law enforcement authorities.
- The UXO subcontractor is responsible for completing and forwarding ATF Form F 5400.5, *Report of Theft or Loss—Explosive Materials*. This form will be completed by the SUXOS and provided to the MR Operations Director, MR Market Segment Director, PM, and the UXOQCS. Final disposition of the form will be the responsibility of the MR Operations Director.

K:_SOUTHNAVFAC\111626 DO2_CAD\BASE MAP FOR ROUTE.dwg

BENNINGTON ROAD

GATE NO.3

MARINA BY-PASS

LANGLEY DRIVE

FORRESTAL DRIVE

Transfer Point (Pier 1)

Alternate Transfer Point (Pier 2)

LANGLEY DRIVE

PUERTO MEDIO MUNDO

PUNTA MEDIO MUNDO

ISLA PINEROS

ISLA PINERITA

CABEZA DE PERROS

PUNTA PUERCA

ENSENADA HONDA

BAHIA ALGODONES

BAHIA CASCAJO

PUNTA ALGODONES

PLAYA BLANCA

PUNTA CASCAJO

ISLA CABRITAS

ISLA DE CABRAS

AGRICULTURAL AREA

AGRICULTURAL AREA

Baker

LEGEND

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

3000 0 1500 3000

1 inch = 3000 ft.

Figure5-1. Explosives Transportation Route and Transfer Point

NAVAL ACTIVITY PUERTO RICO

SECTION 6

Explosives Siting Plan

This Explosives Siting Plan provides explosives safety criteria for planning and siting explosives operations for intrusive investigation activities. This plan was prepared in accordance with DID MR-005-04. The information in this plan is consistent with the DDESB-approved ESS (CH2M HILL, 2008) and ESS Revision 1 (CH2M HILL, 2009).

6.1 Munitions Response Sites

The fragmenting M67 Hand Grenade is the MGFD for the seven MRSs included in this operation. The ESQD arcs and EZs for intentional and unintentional detonations are based on this MGFD (**Table 6-1, Figure 6-1**).

TABLE 6-1
Exclusion Zone Parameters

	MGFDs		EZs (ft)				
			Fragmentation Effects		Blast Overpressure Effects		
Operation	Description	NEW (lb)	HFD	MFD	K328	K40	K24
Unintentional Detonation	M67 Hand Grenade	0.4063	200	464	274	33	18
Intentional Detonation	M67 Hand Grenade	1.5*	200	464*	375*	46*	27*

* NEW of 0.4046 + 1 lb donor charge = NEW of 1.5 lbs.

The minimum separation distance to protect non-essential personnel from unintentional detonations during intrusive operations is 200 feet (HFD). The TSD for unintentional detonations is 200 feet. ESQD arcs, EZs, and TSDs, are taken from the DDESB-approved ESS (CH2M HILL, 2008).

If, during the course of this project, a MEC item with a greater fragmentation range than the MGFD is encountered, work will stop, the ESQD arcs will be adjusted and the ESS (CH2M HILL, 2008) will be amended.

6.2 Demolition Areas

No MEC will be considered safe to move. All MEC that is found during the course of the investigation will be blown-in-place. No MEC will be stored or transported.

The SUXOS and the UXO Subcontractor's UXO Technician III will evaluate the recovered MEC and existing ESQD arcs to confirm that disposal by detonation can be performed safely.

6.3 Blow-in-Place

If a MEC item is found at the site, the item will be marked and flagged with disposal operations to occur at the end of the intrusive investigation.

Intentional detonations involving the use of sandbags as an engineering control will not exceed 1.5 pounds net explosive weight (NEW) (including donor charge) HD 1.1.

For intentional detonations, the MSD is the distance that both project personnel and the public will be from the detonation. The MSD for intentional detonations for this operation is 464 feet.

Prior to the initiation of demolition operations, all non-essential personnel within the EZ will be evacuated from the detonation site. The appropriate local authorities will be notified of the time and place of the demolition operation. Also, a security boat will be posted off the shore to keep public boats from approaching the island. Prior to priming the demolition charges, all avenues of ingress will be physically blocked by guard personnel. Radio communications will be maintained between the involved parties at all times. Upon completion of disposal operations, the Disposal Team's UXO Technician III and the UXOSO will inspect each disposal shot; the UXOSO will visually inspect the disposal site(s) and the UXO Technician III will stand by at a safe distance, ready to render assistance in the event of an emergency. Upon completion of this inspection and if no residual hazards have been identified, the SUXOS will authorize the resumption of site operations.

6.4 Collection Points

All MEC that is found during the course of the investigation at Piñeros Island will be blown in place. Therefore, no collections points for MEC are planned for this operation. But if MEC is removed from the MPPEH-Safe (5X) container, as described previously in this WP Addendum, then an appropriate area will be selected by the SUXOS and UXOSO near the MPPEH storage area to destroy MEC that may be removed from the MPPEH-Safe (5X) container.

6.5 Consolidated Shots

Consolidated shots are not planned for this operation.

6.6 Safe Holding Areas

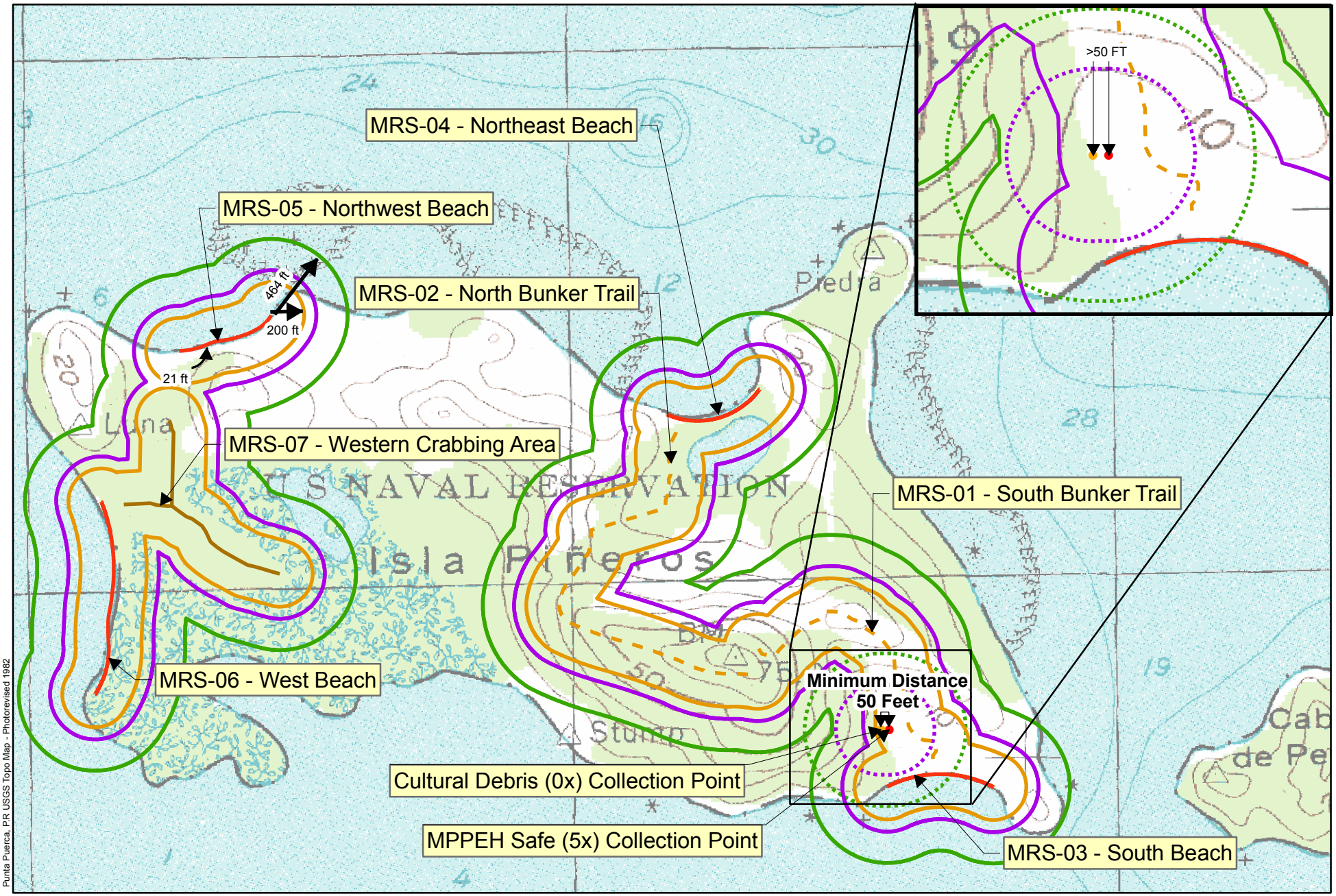
MEC items encountered will be left in place pending response by the SUXOS. The location of the item will be marked with stakes and caution tape.

MPPEH items that are not MEC will be placed in a temporary MPPEH accumulation point located within the current operating MRS until further inspection by UXO personnel. The MEC Team will collect the scrap piles deposited in the MRS and will perform an inspection to confirm that segregation of the items according to proper classification has occurred.

A designated secure area will be established for collection of MPPEH. This area will be locked and will have controlled access. Two scrap metal containers will be positioned at the

storage facility site shown on Figure 6-1 and will remain locked when not in active use. One container will be marked "Cultural Debris (0X)" and will be used to collect general metal debris that is moved from the active MRS. The other container will be marked "MPPEH-Safe (5X)" to indicate the explosives safety status of the contents.

October 13, 2008
Revision No. 1



- Cultural Debris (0x) Collection Point
- MPPEH Safe (5x) Collection Point
- EZ for Unintentional Detonation, 200 feet
- EZ for Intentional Detonation, 464 feet
- PTR (Public Transportation Route) 274 FT
- Accessible Beach
- Trail
- Other Geophysical Investigation Areas

N

0 200 400 800
Feet
1 inch equals 800 feet

Figure 6-1
Explosives Safety Quantity/Distance (ESQD) Arc
Pineros & Cabeza de Perro Islands, Naval Activity Puerto Rico

CH2MHILL

File Path: G:\projects2\PinerosIsland\MXDs\Munitions_Terrestrial_ESQD_MPPEH-20080915.mxd, Date: September 15, 2008 4:17:56 PM, User: JKELLY3

SECTION 7

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Appendix A
Terrestrial Geophysical Investigation Results

ARM Group Inc.
Earth Resource Engineers and Consultants

Technical Report
Digital Geophysical Mapping
Piñeros Island
Puerto Rico
Project Number 06185

1129 West Governor Road • P.O. Box 797 • Hershey, PA 17033-0797
voice: (717) 533-8600 • fax: (717) 533-8605 • e-mail: info@armgroup.net

Table of Contents

1129 West Governor Road • P.O. Box 797 • Hershey, PA 17033-0797
voice: (717) 533-8600 • fax: (717) 533-8605 • e-mail: info@armgroup.net

Introduction

In September of 2006 ARM Group, Inc. performed a digital geophysical mapping (DGM) investigation for the purpose of identifying anomalies associated with potential MEC along the beaches and two transect areas of Pineros Island, Puerto Rico.

Site Description / Background

The following site description is based on information within the scope of work (SOW) and work plan documents provided by CH2M HILL.

Pineros Island, part of the former Roosevelt Roads Naval Station, is located approximately 7 miles east of Fajardo, Puerto Rico. Used historically for a variety of training exercises, it also hosts an extensive WWII bunker system.

A number of narrow beaches are accessible from the sea by zodiac, along with an area in the western portion of the island where there is evidence of land crabbing by locals. A trail leads up to the hill-top bunker from the Northern beach, following an overgrown road, and descends steeply to the southern beach.

Areas of interest for this project were:

- Characterization of the bunker trail
- Sampling of the island's beaches (North, South and West)
- Sampling of the Western Land Crabbing Area.

Anticipated items of interest were approximately of the size of 40mm rounds and grenades. No items larger than a claymore mine were anticipated.

Digital geophysical data were collected for the purposes of density calculations and characterization only; not for future reacquisition.

1129 West Governor Road • P.O. Box 797 • Hershey, PA 17033-0797
voice: (717) 533-8600 • fax: (717) 533-8605 • e-mail: info@armgroup.net

Figure 1: Examples of the terrain encountered on Pineros Island. Left – Bunker Trail looking to the Northwest; Right – Southern Beach looking to the West

Mobilization / Demobilization

On September 10, 2006, ARM mobilized a two man geophysical mapping team and equipment to Fajardo, PR. ARM demobilized on September 16, 2006.

QC Tests

QC tests undertaken included daily shake, static/spike and two-line tests and a start of project six-line test – see Appendix 1 on the CD. The system passed all shake tests, however some values outside of the bounds of the static/spike tests were encountered. These can be accounted for by slight movements of the operator during the spike portion of the tests (tests were conducted on soft beach sand. Hence, with the caveat of recognizing the difficulty of holding the system perfectly still during the spike portion of the static tests on sloping sand, the system passed these QC tests.

The start of project six-line tests and daily two-line tests indicated lags of between 5.5 and 7 fids – acceptable for an EM61 MKII in fiducial mode, sampling data at 15Hz.

Repeat lines were performed on the grid data for the purposes of QC. Images of the repeat data overlain by the interpreted anomalies from the main grid data can be found in Appendix 1.

Digital Geophysical Mapping

Figure 2: Data acquisition with the EM61 MKII, North Beach Area 2

DGM surveys were performed on September 12, 13, 14 and 15 2006. It proved necessary, however, to re-collect the GPS positioned data from the 12th due to poor GPS quality. ARM performed a continuous geophysical survey of five beach areas – two each in the North and West and one in the South of the island – and two transect areas using the EM-61 MkII. The entirety of the island to be surveyed proved unsuitable for the use of sub-meter GPS and, consequently, all data was collected using fiducial positioning, with grid corners and transect start/end points collected with the Trimble AG 114 GPS. The data is presented on the CD in Appendix 2.

All GPS points for the grid corners and start/end points of transects were an average of 50 readings in an effort to gain more accurate positions from the AG 114, which remained in autonomous mode for the entirety of the project – even on the exposed beaches. An extension pole was acquired in order to raise the antenna as close as possible to the canopy for positioning the transect segments. Despite this effort, some grid corners and the points in the western transect were far off enough to rule out a direct warp of the data, instead two point warps were defined for each data segment, with reference to the GPS points and satellite photos taken from Google Earth™, and applied to the data pre-gridding. Along the bunker trail, the majority of points appeared to be correctly positioned and two point warps were defined between each point and applied to the data segments.

No vegetation removal was undertaken during the survey period, however, CH2M HILL provided vegetation removal along the bunker trail. Vegetation removal had not been undertaken in the Western Transect area, limiting the amount of DA that could be

performed to a number of short transect segments and three small grids. UXO avoidance support for all DGM activities was provided by CH2MHILL.

All areas were surveyed with the EM-61 MkII in man-portable (cart) mode with time-based fiducial positioning. Positioning was constrained through the use of control lines (or control points in the case of transects) and potential data gaps were kept to a minimum in the grid data by the use of a lane spacing of 2.5 feet to provide sufficient overlap.

Rising tides and time constraints prevented 100% characterization of the beaches, especially in the west of the island. Low tide occurred in the mornings of the survey days, resulting in the beach grids being collected as the tide was rising, narrowing the area for DGM as the surveys were conducted.

Table 1: Area of grids and length of transects

Grids

ID	Acre	Ha
North Beach Area 1	0.207	0.0838
North Beach Area 2	0.052	0.0209
South Beach	0.284	0.1148
West Beach Area 1	0.017	0.0067
West Beach Area 2	0.039	0.0158
Total:	**0.599**	**0.2420**

Transects

ID	Length (ft)	Length (m)
Bunker Trail	4559.00	1389.58
Western Transects	340.00	103.63
Total:	**4899.00**	**1493.22**

ID	Acre	Ha
Grids in Western Transect Area	0.058	0.0235
Total:	**0.058**	**0.024**

Alternative Length for Western Transects*	1220.00	371.86

*Note: Length assumes the number of lines in each of the three grids within the transect area have been multiplied by their length to give 'pseudo-transect' lengths.

Northern Beaches

Data was collected in sections from two of the northern beaches – the section to the east of the bunker trail head and a portion of the beach in the northwest – for area and length of data collected see Table 1 and for location of all DGM see Figure 3 on page 8. Trash, including metal items, was noted littering the high tide mark of the second beach. The section of beach on to which the bunker trail opens was not re-surveyed in fiducial mode due to a suspected item of MEC discovered by the western end.

Southern Beaches

The entirety of the southern beach was collected just after low tide, a narrower segment collected in the west due to the rising tide. Large metal signs were present in three places along this beach and several pieces of scrap were present at the far eastern end.

Western Beaches

Two small segments of data were collected in the west, sampling two of the beaches – a very narrow portion covering the beach by the entrance to the land crabbing area (constrained by water and vegetation) and a section of the wider beach to the south. No scrap or cultural items were observed in these two sections.

Western Transect Area (Land Crabbing Area)

A small number of transect segments were collected in the parts of the land crabbing area accessible to the DGM equipment. In addition to this, two open areas were characterized – a small area immediately off the beach and a larger open area further inland. Along the transects, trash associated with the land crabbing was noted, along with a concrete pad at the far eastern extent.

Bunker Trail Transect Area

The entirety of the bunker trail that was cleared of vegetation was characterized. Pieces of scrap metal were noted – particularly at the start and end of the trail and in the region of the two bunker entrances that opened onto the northern portion of the trail. These entrances and the gun emplacement to the south also directly affected the instrument response due to the large amounts of re-enforced concrete associated with them. There is a large break in the data in the region of the bunker as the equipment had to pass through the bunker itself to reach the southern portion of the trail; the DGM was picked up again just past the former gun emplacement on the south side of the bunker. Large pieces of scrap metal were present in several places along the trail immediately south of the bunker and concentrations of ordnance related scrap were noted in the far southern portion of the trail, leading to the wooden platform at the trail's terminus.

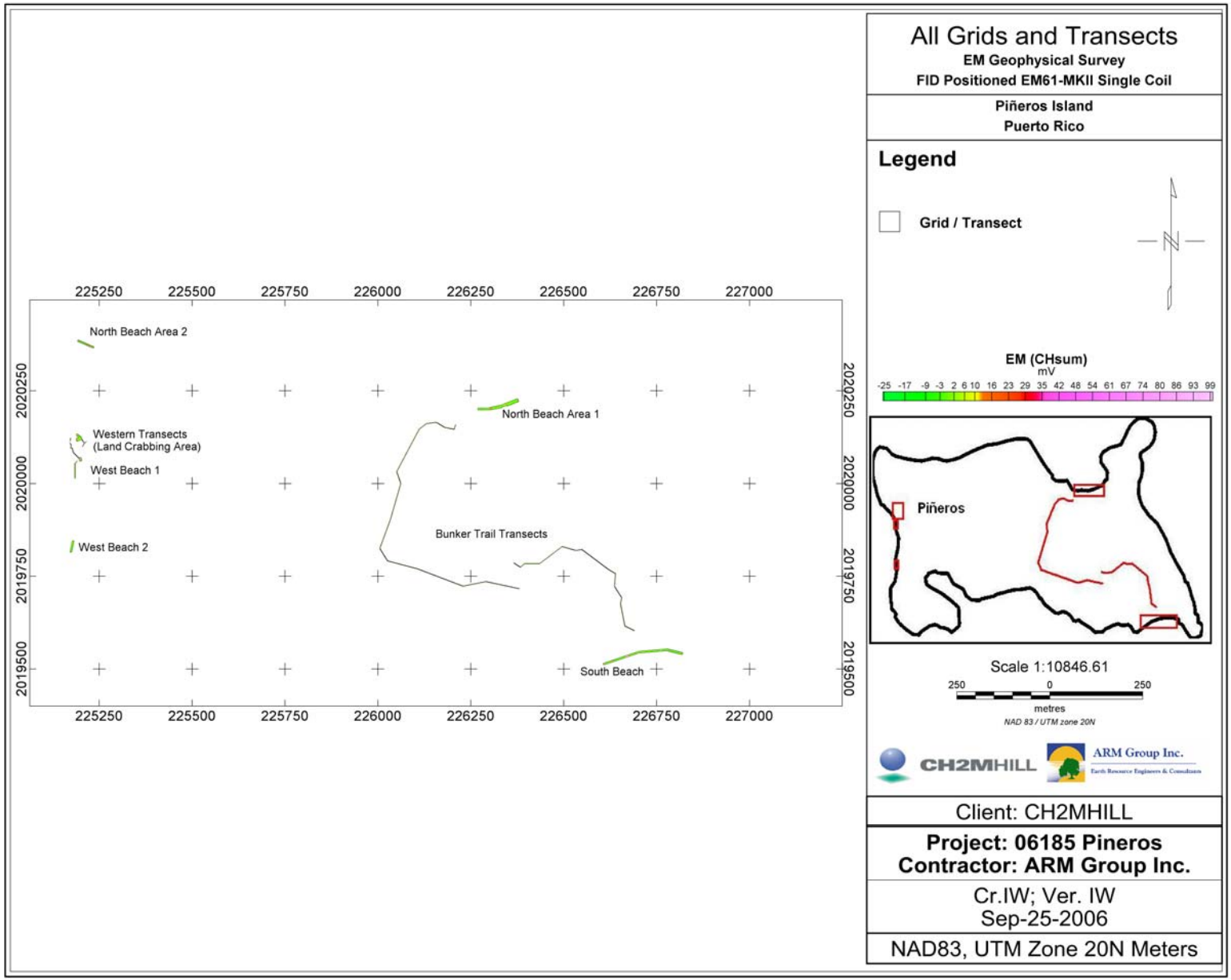

Figure 3: Areas of DGM conducted on Pineros Island – refer to inset for approximate position in relation to coastline.

Data Processing

ARM performed all geophysical data acquisition, data processing, and data analysis. Data analysis and anomaly maps can be found in Appendix 2 on the CD. The data analysis was performed using Geosoft Oasis Montaj software with the UX-Process module. Data was filtered with the UX-Process drift correction filter (10 low / 50 high filter with a window length of 100) to remove instrument drift and level the background and gridded using the minimum curvature method with a cell size of 0.1m and a blanking distance of 0.6m. Maps were displayed with an effective dynamic range of 0mV to 100mV to highlight the smaller anomalies.

Interpretation was performed in Geosoft with targets picked on Ch2 at a threshold of 10mV. As the maximum size of item anticipated, from the SOW, were claymore mines a nominal cutoff of 1000mV was set, above which items were considered scrap. In addition to this, anomalies with regular or linear shape, or coincident with items noted on the grid data sheets as cultural/scrap were marked as such on the maps. Only one anomaly between 600mV and 1000mV was found – anomaly NT14_13 on the bunker trail in the vicinity of one of the bunker entrances. This has been left in as a target but is most likely scrap.

For the grid areas (beaches) the number of anomalies was divided by the grid area to come up with a target density in targets per acre/Ha and for the transects, the number of anomalies was divided by the length to come up with target density in targets per 100 feet/meters – see Table 2 on pages 14 and 15.

Northern Beaches

Targets along beach 1 are fairly evenly distributed and small, with one obviously cultural anomaly present in the western area of the beach. Beach 2, however, has a higher number of larger anomalies present, again fairly evenly distributed.

Target density Area 1: 58.0 targets per acre, 143.2 targets per Ha
Target density Area 2: 230.8 targets per acre, 574.2 targets per Ha
Total target density: 92.7 targets per acre, 229.9 targets per Ha

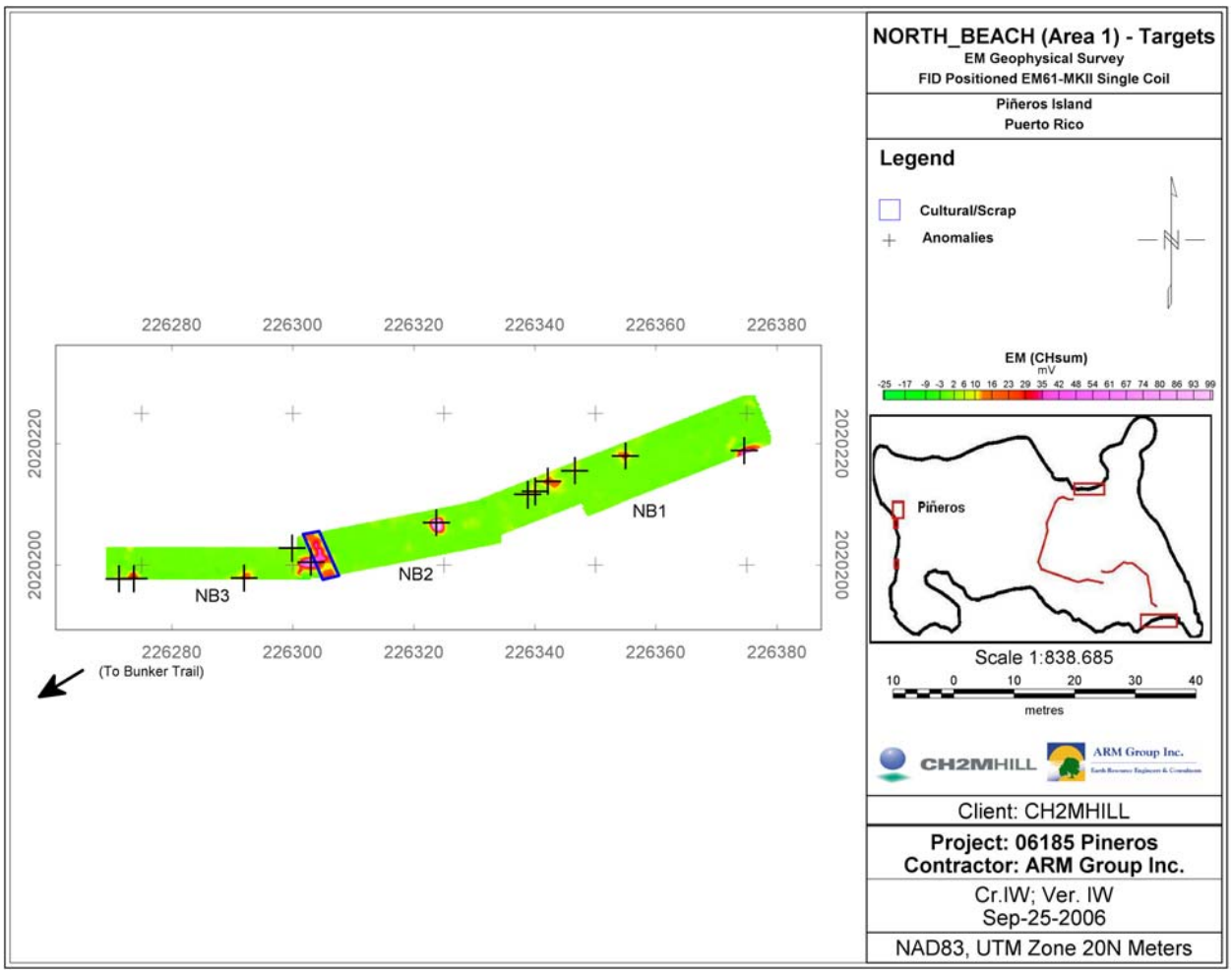

Figure 4: North Beach, Area 1

Southern Beaches

Targets on the southern beach were fairly evenly distributed, though there is a cluster by the entrance to the bunker trail.

Total target density: 59.9 targets per acre, 148.8 targets per Ha

Western Beaches

The grids on the western beaches yielded three targets – one of which may be cultural, though the width of the survey was not enough for it to be fully delineated.

Target density Area 1: 58.8 targets per acre, 149.0 targets per Ha
Target density Area 2: 51.3 targets per acre, 126.6 targets per Ha
Total target density: 53.6 targets per acre, 133.3 targets per Ha

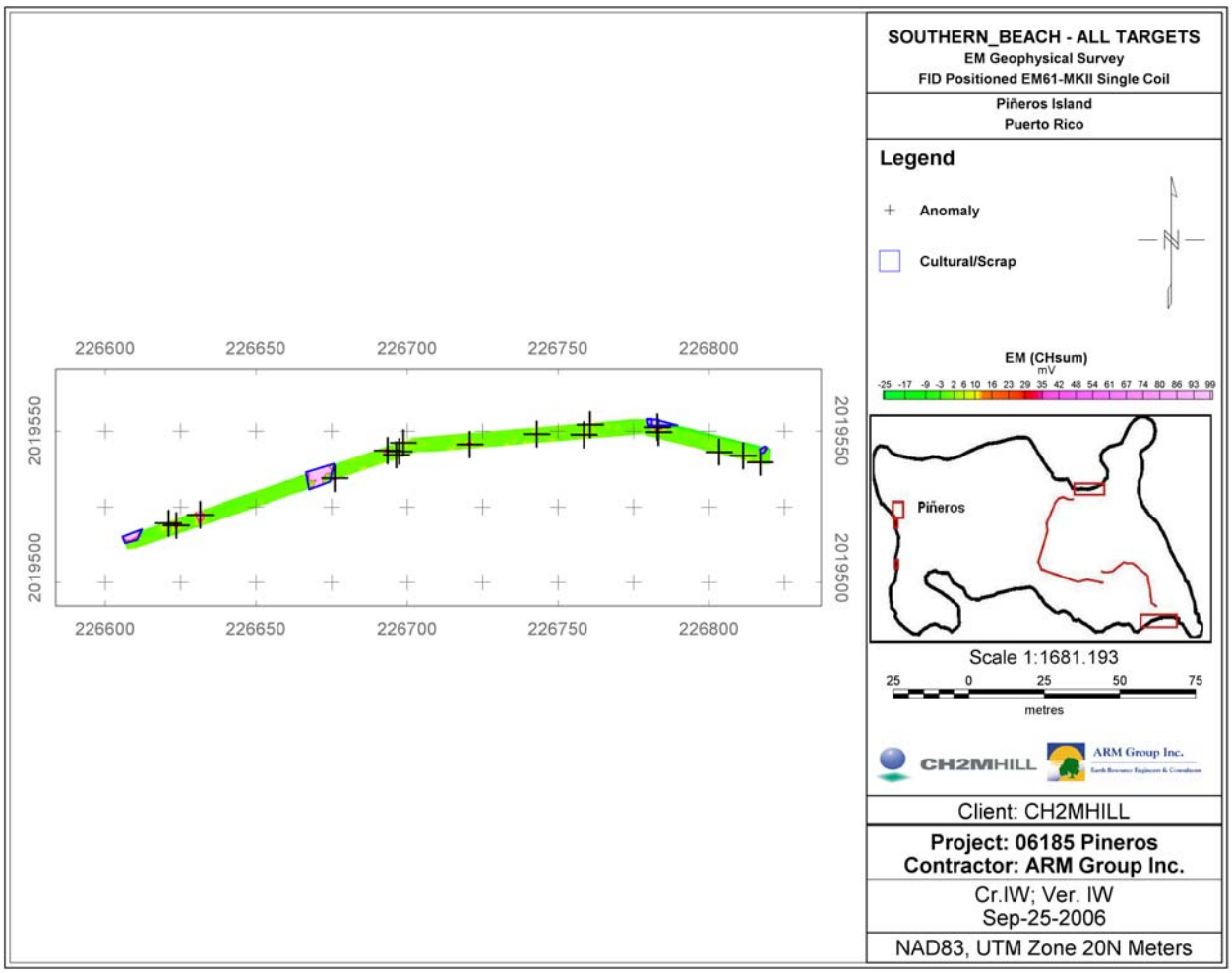

Figure 5: South Beach

Western Transect Area (Land Crabbing Area)

For the purpose of providing a single calculation of target density the linear feet of data collected in the three grids was determined and the number of targets identified in each grid used as the number of targets in these pseudo-transects. There is a cluster of targets by the suspected cultural feature in grid WBT2, one of which is likely itself to be cultural in origin, though the extent of the grid was not great enough for it to be delineated. Two clusters are also present nearby the concrete pad – transects WBT13 and 14.

Target density: 2.9 targets per 100', 9.4 targets per 100m.

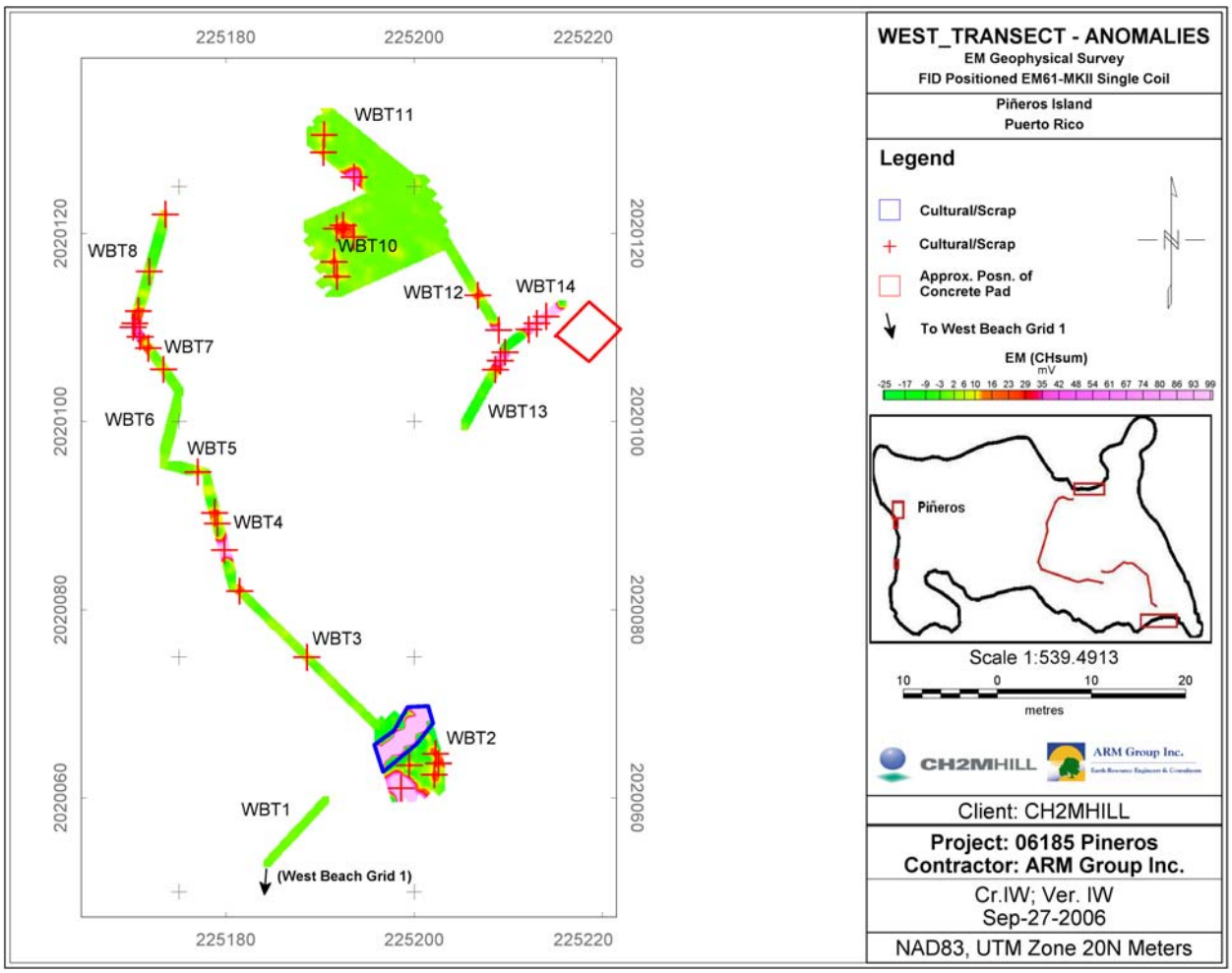

Figure 6: Western Transect Area

Bunker Trail Transect Area

Targets along the bunker trail are clustered in several different areas, not uniformly distributed along its length. Notable points at which these clusters occur are: at the top of the slope leading up from the northern trail head, surrounding all three bunker entrances which open onto the trail, the top of the slope leading up from the southern trail head and the area of the southern trail head, by the wooden platform. As mentioned above, scrap was noted in the area of the bunker entrances and by the southern trail head.

Target density: 2.0 targets per 100', 6.5 targets per 100m.

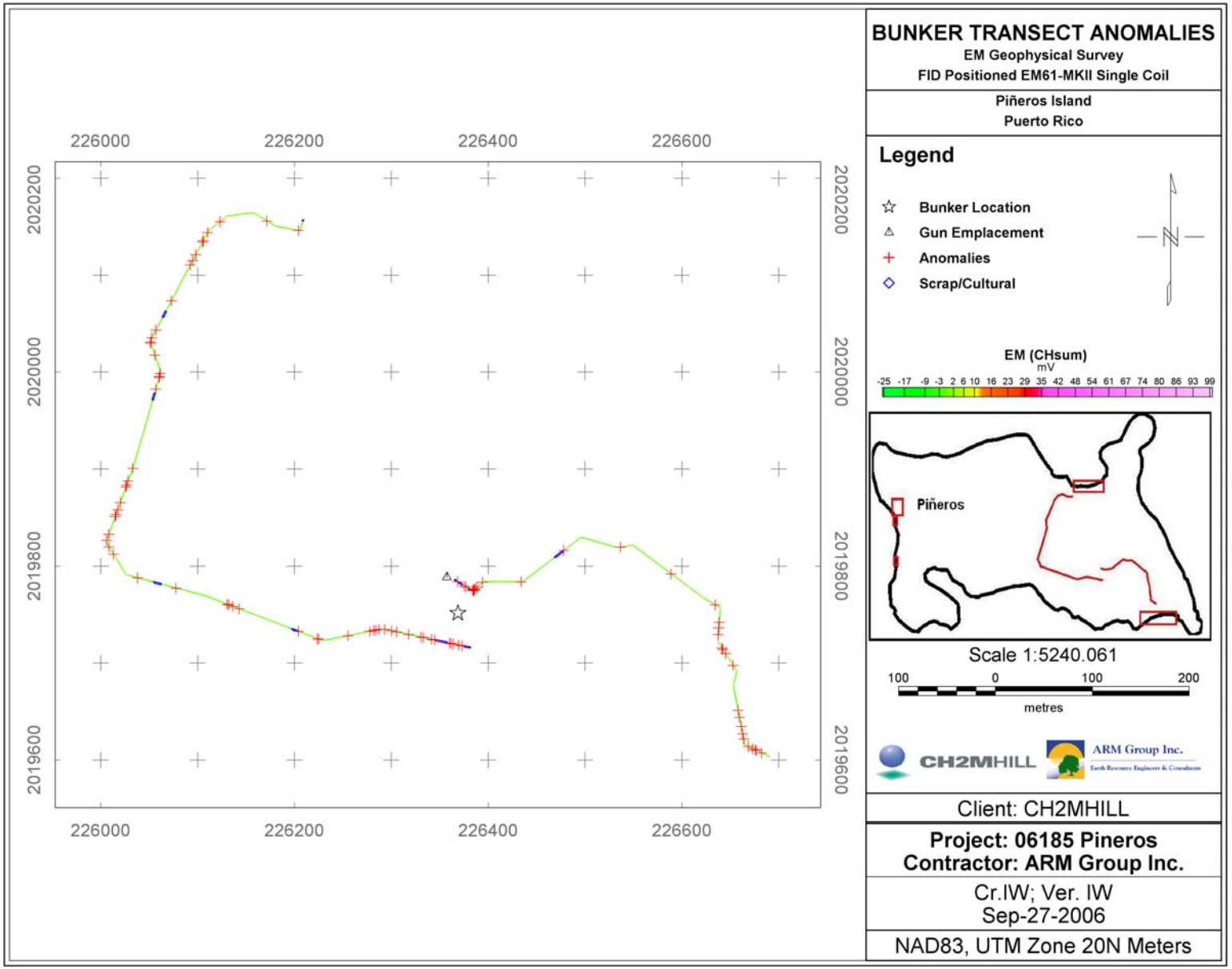

Figure 7: Bunker Trail Transects

Table 2: Target density for each beach and transect section

Northern Beach

ID	No. Anomalies	Area (acre)	Area (Ha)	Targets per Acre	Targets per Ha
North Beach Area 1	12	0.207	0.0838	57.97	143.20
North Beach Area 2	12	0.052	0.0209	230.77	574.16
TOTAL:	**24**	**0.259**	**0.1047**	**92.66**	**229.23**

Southern Beach

ID	No. Anomalies	Area (acre)	Area (Ha)	Targets per Acre	Targets per Ha
South Beach	17	0.284	0.1148	59.86	148.08
TOTAL:	**17**	**0.284**	**0.1148**	**59.86**	**148.08**

Western Beach

ID	No. Anomalies	Area (acre)	Area (Ha)	Targets per Acre	Targets per Ha
West Beach Area 1	1	0.017	0.00671	58.82	149.03
West Beach Area 2	2	0.039	0.0158	51.28	126.58
TOTAL:	**3**	**0.056**	**0.02251**	**53.57**	**133.27**

Western Transect

ID	No. Anomalies	Length (ft)	Length (m)	Targets per 100 ft	Targets per 100m
WBT1	0	30.00	9.14	0.00	0.00
WBT2*	5	200.00	60.96	2.50	8.20
WBT3	2	70.00	21.34	2.86	9.37
WBT4	3	40.00	12.19	7.50	24.61
WBT5	1	15.00	4.57	6.67	21.87
WBT6	0	26.00	7.92	0.00	0.00
WBT7	4	27.00	8.23	14.81	48.61
WBT8	4	42.00	12.80	9.52	31.25
WBT10*	5	440.00	134.11	1.14	3.73
WBT11*	3	240.00	73.15	1.25	4.10
WBT12	2	35.00	10.67	5.71	18.75
WBT13	3	30.00	9.14	10.00	32.81
WBT14	3	25.00	7.62	12.00	39.37
TOTAL:	**35**	**1220.00**	**371.86**	**2.87**	**9.41**

*** NB: Number of lines in each grid multiplied by grid length to give 'pseudo-transect' length**

Grid ID	No. Anomalies	Area (acres)	Area (Ha)	Targets per Acre	Targets per Ha
WBT2, WBT10, WBT11	13	0.058	0.0235	224.14	553.19
TOTAL:	**13**	**0.058**	**0.0235**	**224.14**	**553.19**

Bunker Transect

ID	No. Anomalies	Length (ft)	Length (m)	Targets per 100 ft	Targets per 100m
NT1	0	36.00	10.97	0.00	0.00
NT2	1	116.00	35.36	0.86	2.83
NT3	1	75.00	22.86	1.33	4.37
NT4	0	75.00	22.86	0.00	0.00
NT5	1	50.00	15.24	2.00	6.56
NT6	6	300.00	91.44	2.00	6.56
NT7	3	200.00	60.96	1.50	4.92
NT8	3	100.00	30.48	3.00	9.84
NT9A	10	275.00	83.82	3.64	11.93
NT9B	4	332.00	101.19	1.20	3.95
NT10	2	150.00	45.72	1.33	4.37
NT11	2	300.00	91.44	0.67	2.19
NT12	7	410.00	124.97	1.71	5.60
NT13	5	225.00	68.58	2.22	7.29
NT14	13	265.00	80.77	4.91	16.09
NT15	3	65.00	19.81	4.62	15.14
NT16	7	50.00	15.24	14.00	45.93
NT17	1	125.00	38.10	0.80	2.62
NT18	1	250.00	76.20	0.40	1.31
NT19	0	145.00	44.20	0.00	0.00
NT20	1	50.00	15.24	2.00	6.56
NT21	1	300.00	91.44	0.33	1.09
NT22	1	60.00	18.29	1.67	5.47
NT23	3	115.00	35.05	2.61	8.56
NT24	4	140.00	42.67	2.86	9.37
NT25	0	50.00	15.24	0.00	0.00
NT26	5	200.00	60.96	2.50	8.20
NT27	5	100.00	30.48	5.00	16.40
TOTAL:	**90**	**4559.00**	**1389.58**	**1.97**	**6.48**

Summary

The following is a summary of the project:

- ARM mobilized a two man DGM team on September 10, 2006.
- 0.657 acres of grid data and 4899 linear feet of transect data were mapped from September 13 to September 15, 2006.
- Data analysis indicated that the target density for the presence of possible MEC sources in the surveyed area to the depth of investigation of the geophysical equipment was, on average, 73.46 anomalies per acre (181.51 per hectare) for the beach grids and 2.16 anomalies per 100 feet (7.1 per 100 meters) for the transect areas (including western grids calculated as pseudo-transects). For a breakdown of target density, see table 2 on pages 14 and 15.
- ARM de-mobilized on September 16, 2006.

1129 West Governor Road • P.O. Box 797 • Hershey, PA 17033-0797
voice: (717) 533-8600 • fax: (717) 533-8605 • e-mail: info@armgroup.net

ARM Group Inc.
Earth Resource Engineers and Consultants

Appendix 1 – QC Tests (On CD)

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1129 West Governor Road • P.O. Box 797 • Hershey, PA 17033-0797
voice: (717) 533-8600 • fax: (717) 533-8605 • e-mail: info@armgroup.net

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Appendix 2 – Geophysical Data Acquisition (On CD)

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voice: (717) 533-8600 • fax: (717) 533-8605 • e-mail: info@armgroup.net

Appendix B
Health and Safety Plan

CH2M HILL Health and Safety Plan

This Health and Safety Plan (HASP) will be kept on the site during field activities and will be reviewed as necessary. The plan will be amended or revised as project activities or conditions change or when supplemental information becomes available. The plan adopts, by reference, the Standards of Practice (SOPs) in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual*, as appropriate. In addition, this plan adopts procedures in the project Phase I RFI Work Plan (CH2M HILL, 2006) and Work Plan Addendum. The Site Safety Coordinator (SSC) 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: 357902

CLIENT: NAVFAC BRAC PMO SE

PROJECT/SITE NAME: CLEAN III CTO-172 / Piñeros and Cabeza de Perro Islands, Puerto Rico

SITE ADDRESS: Naval Activity Puerto Rico

CH2M HILL PROJECT MANAGER: Tom Roth/ATL (INC)

CH2M HILL OFFICE: Atlanta

DATE HEALTH AND SAFETY PLAN PREPARED: 12/29/2005; Revised 04/06/2006; Revised 12/02/2009

DATE(S) OF SITE WORK: January 1, 2010 through April 30, 2010

SITE ACCESS: Refer to attached Figure B-1. Access to all sites is physically unrestricted. Signs are posted along some shoreline access points on Piñeros Island warning visitors that the site is off-limits to non-military personnel. Access to Cabeza de Perro is difficult due to physical conditions of the shoreline.

SITE SIZE: Piñeros Island is approximately 310 acres in area and Cabeza de Perro Island is approximately 30 acres in size.

SITE TOPOGRAPHY: The topography of Piñeros Island is characterized by a series of smooth, round hills and low-lying swampy areas. The hills range in elevation from less than 70 feet in the northwest to a hill of 250 feet above mean sea level (MSL) in the south-central portion of the island. Approximately two-thirds of the island is covered in dense jungle vegetation that makes inland access difficult without the use of machetes. Narrow beaches line parts of the island. The remainder of the island consists of lagoons and mangrove swamps.

Cabeza de Perro Island is a smoothly rounded cay with a maximum elevation of 100 feet above MSL. The shoreline of Cabeza de Perro consists of rocky beaches and sea cliffs. Most of this island is covered in tall grasses.

PREVAILING WEATHER: The climate of Piñeros and Cabeza de Perro islands is tropical marine, with minimal fluctuations in temperature, relatively moderate humidity, and frequent rain showers. The islands are directly in the path of the easterly trade winds, which moderate temperature extremes.

The mean annual temperature at the former Roosevelt Roads Naval Station, located approximately 0.5 mile west of Piñeros Island, averages 79.9 degrees Fahrenheit (°F) based on data compiled from 1957 through 1982. Similar historical data show July and August as the warmest month, at 82.4°F, and February as the coldest month, at 76.8°F. The relative humidity averages 65 to 78%.

Rainfall on the island generally consists of brief showers throughout the year. The average annual rainfall on Piñeros Island is approximately 50 inches. The rainy season in this region is typically defined as May through November.

Winds in the vicinity of the former Roosevelt Roads Naval Station are typically from the east or northeast at an average speed of approximately 6 knots. Tropical storms and hurricanes are most likely to occur during the summer and early fall.

SITE DESCRIPTION AND HISTORY: Piñeros and Cabeza de Perro Islands are located in the Caribbean Sea, approximately one-half mile east of the former Roosevelt Roads Naval Station on the eastern coast of Puerto Rico, as shown on Figure B-1.

The Navy acquired Piñeros and Cabeza de Perro islands in the early 1940s as part of its general acquisition of land for the former Roosevelt Roads Naval Station. Shortly after the Navy acquired Piñeros and Cabeza de Perro islands, the British built a network of roads, gun emplacements, and bunkers on Piñeros Island for use during World War II. These facilities were abandoned after the war. Beginning in the late 1950s, Piñeros and Cabeza de Perro islands were utilized by Special Forces personnel for various training activities. Exercises included beach landings combined with sea-to-land gunfire and underwater demolition on offshore coral reefs, and small-arms training.

Training activities have taken place on all parts of Piñeros Island and in offshore waters around Piñeros and Cabeza de Perro islands. Prior to 1987, approximately 300 men, in groups of 50, were trained each year. Underwater demolitions teams utilized two beaches on the northern coast of Piñeros to practice detonating up to 500 pounds of underwater and land explosives. Training in setting up explosives without detonation also occurred at the south shore beach, which had an emplacement of 12 to 15 obstacles in the water jut off the beach. Trails used for small-arms training led from the aforementioned beaches toward the center of the island. Units also utilized the large mangrove swamp on the southwest corner of the island to train for overland maneuvers and the location of objectives by compass at night.

Other training activities at Piñeros and Cabeza de Perro islands have included survival techniques, land navigation, underwater and small-unit demolition, small boat operation, diving, small-arms training (5.56mm, 7.62mm, 9mm, .45 caliber [cal], .38 cal, and .50 cal) ,

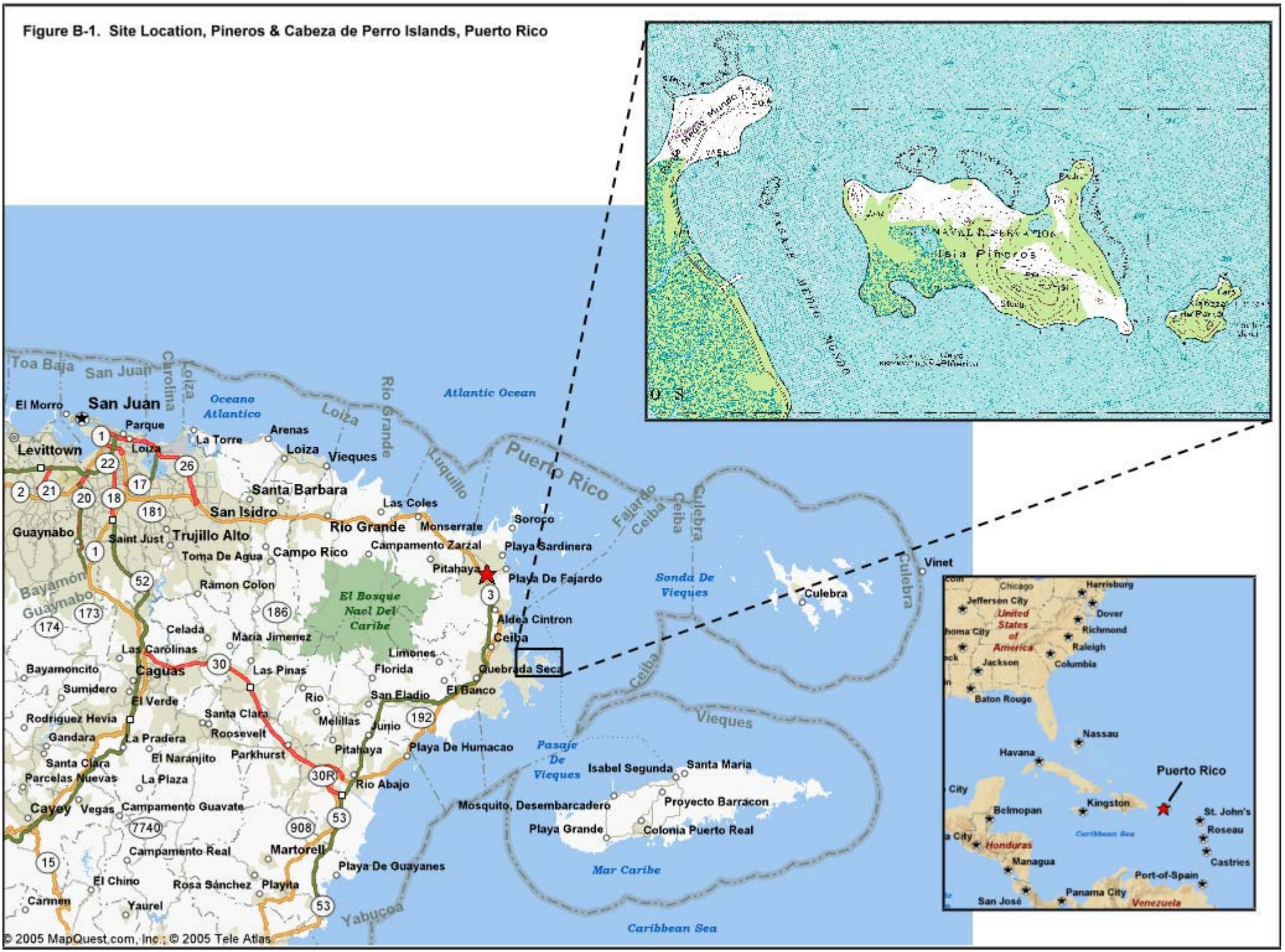
pyrotechnics (smoke grenades, pop flares, grenade simulators, etc.) , and standard military demolitions (claymore mines, plastic explosives, etc.).

The former Naval Station Roosevelt Roads ceased operations in March 2004, and Naval Activity Puerto Rico (NAPR) was created to provide oversight during the final disposal of the property. Current NAPR operations are those necessary to maintain the property and provide utilities to personnel and agencies still present at NAPR. Because Piñeros and Cabeza de Perro islands were part of the former Naval Station Roosevelt Roads, military operations on those islands ceased with the closing of NAVSTA Roosevelt Roads, and the islands are now the responsibility of NAPR.

DESCRIPTION OF SPECIFIC TASKS TO BE PERFORMED:

- Vegetation clearing in four-foot wide paths along a distance of approximately 4,400 feet throughout Piñeros Island;
- Intrusive investigation of the approximately 4,400 feet of cleared pathways and 37,000 square feet of beaches;
- Collection of surface soil samples for munitions constituent (MC) analysis from locations where controlled detonations are conducted on munitions and explosives of concern (MEC) or munitions potentially presenting an explosive hazard (MPPEH);
- MEC/MPPEH excavation, demolition, and disposal (blasting operations).

Figure B-1. Site Location, Pineros & Cabeza de Perro Islands, Puerto Rico



K:_SOUTHNAVFAC\111626 DO2_CAD\BASE MAP FOR ROUTE.dwg

BENNINGTON ROAD

GATE NO.3

MARINA BY-PASS

LANGLEY DRIVE

FORRESTAL DRIVE

Transfer Point (Pier 1)

Alternate Transfer Point (Pier 2)

LANGLEY DRIVE

PUERTO MEDIO MUNDO

PUNTA MEDIO MUNDO

ISLA PINEROS

ISLA PINERITA

CABEZA DE PERROS

PUNTA PUERCA

ENSENADA HONDA

ISLA DE CABRAS

AGRICULTURAL AREA

AGRICULTURAL AREA

BAHIA ALGODONES

PUNTA ALGODONES

PLAYA BLANCA

BAHIA CASCAJO

PUNTA CASCAJO

Baker

LEGEND

SOURCE: GEO-MARINE, INC., SEPTEMBER 6, 2000.

3000 0 1500 3000

1 inch = 3000 ft.

Figure B-2. Explosives Transportation Route and Transfer Point

NAVAL ACTIVITY PUERTO RICO

Contents

1 Tasks to be Performed

1.1 Description of Tasks

(Reference Field Project Start-up Form)

Refer to project documents (i.e., Phase I RFI Work Plan [CH2M HILL, 2006] and Work Plan Addendum) 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 (Hazwoper).

1.1.1 HAZWOPER-Regulated Tasks

General site workers, UXO-qualified personnel, general laborers, and supervisory personnel engaged in MEC removal actions (e.g., SUXOS, UXO Technician III) or other activities that expose or potentially expose them to health hazards, will meet the requirements of 29 CFR 1910.120 (e)(3)(i).

Other employees who perform work on the site, such as land surveying, shall meet the requirements of 29 CFR 1910.120(e)(iii).

Managers and supervisors shall be additionally certified as having received management and supervisory training that meets the requirements of 29 CFR 1910.120(e)(4).

Copies of certifications or certifications from the employer will be kept onsite.

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			
	Vegetation Removal	**Surface Soil Sampling**	**MEC Intrusive Investigation**	**Land Surveying**
Flying debris/objects	X	X	X	
Noise > 85dBA	X		X	
Electrical				
Suspended loads				
Buried utilities, drums, tanks		X	X	
Slip, trip, fall	X	X	X	X
Back injury	X	X	X	X
Confined space entry				
Trenches / excavations			X	
Vehicle traffic				
Elevated work areas/falls				
Fires	X		X	
Poisonous plants and insects	X	X	X	X
Entanglement	X			X
Heavy equipment				
Working near water	X	X	X	X
Working from boat				
Explosion Hazard	X	X	X	X

1.3 Activity Hazard Analysis for Munitions and Explosives of Concern

Principal Steps	Potential Hazards	Recommended Controls
Surveying and establishing boundaries.	Accidental detonation of MEC	Personnel involved will attend site-specific health and safety training and daily safety briefings that will include procedures for MEC avoidance.
		UXO personnel will escort non-UXO personnel in areas that have not been marked as free of surface MPPEH.
		Mark and avoid MPPEH.
		Check location with magnetometer prior to driving stakes.
	Wildlife, slips, trips, falls, insects, poisonous plants, use of hand tools.	Refer to the Activity Hazard Analysis section of this HASP.

Principal Steps	Potential Hazards	Recommended Controls
Vegetation Clearing	Accidental detonation of explosives	Personnel involved will attend site-specific health and safety training and daily safety briefings that will include procedures for MEC avoidance. Be alert and mark all MPPEH located. Only clear to within 4 inches of the ground surface. UXO personnel will escort non-UXO personnel in areas that have not been marked as free of surface MPPEH. Surface sweeps will be conducted with magnetometers or other suitable geophysical instrumentation to identify potential MEC.
MEC Intrusive Investigation	Accidental detonation of explosives	Personnel involved will attend site-specific health and safety training and daily safety briefings MEC and MPPEH is not to be handled by anyone who is not UXO-Qualified Personnel All MEC will be considered to be unsafe to move

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 SSC 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.

2.1 Behavior Based Loss Prevention System

(Reference *CH2M HILL SOP HSE-103, Behavior Based Loss Prevention System*)
A Behavior Based Loss Prevention System (BBLPS) is a system to prevent or reduce losses using behavior-based tools and proven management techniques to focus on behaviors or acts that could lead to losses.

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

- AHA (discussed in Section 3.1)
- Pre-task Safety Plans (PTSP)
- Safe Behavior Observations (SBO)
- Loss and Near Loss Investigations (NLI) (discussed in **Section 9.7)**

The SSC, UXO Safety Officer (UXOSO), or designated CH2M HILL representative onsite is responsible for implementing the BBLPS on the project site. The Project Manager (PM) remains accountable for its implementation. The SSC, UXOSO, or designee shall only oversee the subcontractor's implementation of their AHAs and PTSPs processes on the project.

2.1.1 Pre-task Safety Plans

Daily safety meetings are held with all project personnel in attendance to review the hazards posed and required H&S procedures/AHAs, which apply for each day's project activities. The PTSPs serve the same purpose as these general assembly safety meetings, but the PTSPs are held between the crew supervisor and their work crews to focus on those hazards posed to individual work crews. At the start of each day's activities, the crew supervisor completes the PTSP, provided in **Attachment 5,** with input from the work crew,

during their daily safety meeting. The day's tasks, personnel, tools and equipment that will be used to perform these tasks are listed, along with the hazards posed and required H&S procedures, as identified in the AHA. The use of PTSPs better promotes worker participation in the hazard recognition and control process, while reinforcing the task-specific hazard and required H&S procedures with the crew each day. The use of PTSPs is a common safety practice in the construction industry.

2.1.2 Safe Behavior Observations

SBOs shall be conducted by SSC, UXOSO, or designee for specific work tasks or operations comparing the actual work process against established safe work procedures identified in the project-specific HASP and AHAs. SBOs are a tool to be used by supervisors to provide positive reinforcement for work practices performed correctly, while also identifying and eliminating deviations from safe work procedures that could result in a loss. At least one SBO will be performed each week for tasks/operations addressed in the HASP or AHA. The SBO form in **Attachment 5** will be completed for the task/operation being observed and submitted by the PM weekly to the CH2M HILL SBO Mailbox.

2.2 Project-Specific Hazards

2.2.1 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).
- Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.
- Avoid direct sun whenever possible, which can decrease physical efficiency and increase the probability of heat stress. Take regular breaks in a cool, shaded area. Use a wide-brim hat or an umbrella when working under direct sun for extended periods.
- Provide adequate shelter/shade to protect personnel against radiant heat (sun, flames, hot metal).
- Maintain good hygiene standards by frequently changing clothing and showering.
- Observe one another for signs of heat stress. Persons who experience signs of heat syncope, heat rash, or heat cramps should consult the SSC to avoid progression of heat-related illness.

2.2.2 Vegetation Clearing Safety

- Maintain a safe distance from tree and brush clearing operations.
- Before trimming a tree, inspect the area to identify possible hazards (e.g., presence of power lines, broken or cracked limbs after a severe storm) and take appropriate actions to prevent injuries or accidents. Assume any power lines are energized or "live."
- Mark off area around tree and prevent bystander access. Always work with another person who stays on the ground.
- Learn to recognize trees weakened by disease and types of trees prone to cracking. Inspect tree limbs for strength before climbing.
- Check for cavities in the tree, rotten or dead branches, splits and cracks in the trunk or where branches are attached, broken branches hanging in the tree, etc.
- Inspect the fall protection equipment and lines before each time they are used.
- Tag and remove any damaged or defective equipment from service until it can be repaired or replaced and disposed of properly, according the manufacturer's recommendations.
- If a ladder is used, tie it off on a secure branch.
- Use approved and appropriate fall protection gear when working above ground including when working from a ladder or platform.
- Break small dead branches off by hand as you climb.
- Remove larger branches with proper tools.
- Place hands and feet on separate limbs and move only one hand or foot at a time.
- Raise or lower tools by attaching hand lines to the end of tools. Tools attached at the center might catch on branches. Smaller tools may be raised and lowered in a bucket attached to a hand line.
- Use non-conductive tools and personal protective equipment if working near electrical power lines.
- Do not use dead branches for support.
- Do not climb trees during wet or icy weather or under high wind conditions.
- Do not leave partially sawn limbs on trees.
- Do not carry saws, pruners and other tools while climbing.
- Do not use axes or hatchets. Contact the power utility company before working on trees near power lines to arrange for ways to protect the employees (e.g., cutting off the power to the lines and grounding them or using insulating blankets on the power lines).
- Maintain a minimum working distance of 20 feet from "live" power lines for the voltage they are conducting.
- Use proper ropes with appropriate carriers and hooks for raising and lowering equipment.

- Use a pull rope to prevent branches from falling toward power lines.
- Use non-conducting tools and equipment.
- Wear rubber gloves when using a pole pruner.
- Ensure that the pole pruner's cutting head is connected to the lever at the lower end of the pole with a polypropylene rope. Do not use a wire or chain.
- Apply and maintain a coating of non-conductive, wood preservative to help keep wooden pruner handles dry.
- Use approved safety belts, lifelines, and leather gauntlet gloves.
- Wear head and eye protection and footwear protection with slip-resistant soles.
- Choose close-fitting, long-sleeved clothing.

2.2.3 Working Near Water

When working near water, and there is a risk of drowning or falling in:

- U.S. Coast Guard-approved personal flotation devices (PFDs), or life jacket, provided for each employee will be worn.
- PFDs will be inspected before and after each use. Defective equipment will not be used.
- Sampling and other equipment will be used according to the manufacturer's instructions.
- A minimum of one life-saving skiff will be provided for emergency rescue.
- A minimum of one ring buoy with 90 feet of 3/8-inch solid-braid polypropylene (or equal) rope will be provided for emergency rescue.

2.2.4 Working on Water

- Safe means of boarding or leaving a boat or a platform will be provided to prevent slipping and falling.
- The boat/barge must be equipped with adequate railing.
- Employees should be instructed on safe use.
- Work requiring the use of a boat will not take place at night or during inclement weather.
- The boat/barge must be operated according to U.S. Coast Guard regulations (speed, lightning, right-of-way, etc.).
- The engine should be shut off before refueling; do not smoke while refueling.

2.3 General Hazards

2.3.1 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.

2.3.2 Hazard Communication

(Reference CH2M HILL SOP HS-05, *Hazard Communication)*

The SSC is to perform the following:

- Complete an inventory of chemicals brought on site by CH2M HILL using Attachment 2.
- Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available.
- Request or confirm locations of Material Safety Data Sheets (MSDSs) from the client, contractors, and subcontractors for chemicals to which CH2M HILL employees potentially are exposed.
- Before or as the chemicals arrive on site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with the identity of the chemical and with hazard warnings, and store properly.
- Provide employees with 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.

2.3.3 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.

2.3.4 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 exceeding 40 lbs. -- especially for heavy or awkward loads.
  - Make sure the path of travel is clear prior to the lift.

2.3.5 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.

2.3.6 Electrical

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

- 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.

2.3.7 Compressed Gas Cylinders

- Valve caps must be in place when cylinders are transported, moved, or stored.
- Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.
- Cylinders must be secured in an upright position at all times.
- Cylinders must be shielded from welding and cutting operations and positioned to avoid being struck or knocked over; contacting electrical circuits; or exposed to extreme heat sources.

- Cylinders must be secured on a cradle, basket, or pallet when hoisted; they may not be hoisted by choker slings.

2.3.8 Procedures for Locating Buried Utilities

The project site is located on an uninhabited island with no utilities; therefore, buried utility requirements do not apply.

2.3.9 Confined Space Entry

(Reference CH2M HILL SOP HS-203, *Confined Space Entry*)

No confined space entry will be permitted. Confined space entry requires additional health and safety procedures, training, and a permit. If conditions change such that confined-space entry is necessary, contact the HSM to develop the required entry permit.

When planned activities will not include confined-space entry, permit-required confined spaces accessible to CH2M HILL personnel are to be identified before the task begins. The SSC is to confirm that permit spaces are properly posted or that employees are informed of their locations and hazards.

2.3.10 Knife Use

Knives (fixed/utility) shall not be used. If it is demonstrated that a knife is the right tool for the job, this plan will be amended and the activity that knife use will be used for shall be reviewed. An AHA shall also be developed to address hazards and subsequent controls, personal protective equipment (PPE), and training.

Responsibilities	Supervisors with assistance from the SSC or Senior Unexploded Ordnance Supervisor (SUXOS) are responsible for funding and ensuring the correct tool is being used, employees wear the proper PPE when using knives, and they have reviewed this policy. Employees are responsible for having and utilizing the proper PPE while performing an activity requiring the use of a knife. Employees are also responsible for understanding the proper use of a knife.
Glove Requirements	In general, Kevlar® cut-resistant gloves are to be worn when using a knife in an occupational setting. Other types of gloves may be required and will be identified within the AHA/written procedure. Example - Leather gloves may be worn when using the acetate sleeve cutter.

Training (Refer to the CH2M HILL Virtual Office for additional hand safety topics)	All employees that will use a knife must be trained in the proper use. When using a knife always cut away from yourself. Many tasks using a utility knife require a knife edge but not a sharp point. For these tasks you can add protection against puncture wounds by using a rounded-tip blade. If you use a folding knife, it must be a locking blade type. Never use a knife that will fold under pressure. If you use a fixed-blade knife, make sure there is a handle guard to keep your hand from slipping forward. Also make sure the handle is dry and not greasy or slippery to assure a better grip. When cutting, make the force of the cut carry the blade away from any part of your body. If you have a peculiar situation where this is not possible, protect yourself with a leather apron, or other material placed between you and the blade. Consider putting the material to be cut in a vise or other holding device. If you carry a fixed-blade knife, use a sheath or holder. Store utility knives safely, retract the blade or sheath an open blade before storing. Never leave a knife with the blade exposed on the floor, on a pallet, on a work surface, or in a drawer or cabinet. Keep your knife sharp. A dull blade requires you to use more force to cut, and consequently increases the risk of slip or mistake. Knives used on the job, but not carried with you , must be properly stored when not in use Never use a defective knife. Utility knife blades are brittle and can snap easily. Do not bend them or apply side loads to them by using them to open cans or pry loose objects. Use the knife only to cut. It was not designed to work as a pry bar, screw driver, or hole punch. If you do get cut, seek medical attention to treat the injury by notifying your supervisor and contacting Health Resources at 1-866-893-2514.

Stay focused on the cutting job. It only takes a second of inattention with a sharp blade to produce a serious cut. Letting the mind wander or talking with others while using a knife greatly increases the risk of an accident and injury. If you are interrupted while working with a knife, stop cutting, retract the blade, and place the knife down on a secure surface before dealing with the interruption. You should never continue cutting while distracted!

As always, utilize the hierarchy of controls and first attempt to engineer out the hazard and frequently ask ourselves do we have the right tool for the job.

2.4 Biological Hazards and Controls

2.4.1 Snakes

No poisonous snakes are indigenous to Puerto Rico.

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.

2.4.2 Poison Ivy and Poison Sumac

Poison ivy, poison oak, and poison sumac are not present in tropical locations, including Piñeros and Cabeza de Perro Islands.

2.4.3 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 permanone 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.

2.4.4 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 SSC and/or buddy. Keep bees away by wearing light-colored clothing; avoiding scented soaps and perfumes; and containerizing all food, drinks, and garbage containers.

If stung, and a stinger is present, it should be removed by scraping the stinger away in a side-to-side motion with a fingernail, stiff paper, or credit card. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops. Ice or a cold compress and pain-relieving creams or oral medications may used if needed.

2.4.5 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.

2.4.6 Mosquito Bites

West Nile Virus activity has been detected in Puerto Rico; therefore, 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.

2.4.7 Fire Ant Bites

Fire ants are present in Puerto Rico, although their presence on Piñeros and Cabeza de Perro Islands is unknown. 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.

2.4.8 Other Anticipated Biological Hazards

The following paragraphs identify the potential hazards associated with flora and fauna at the site. If additional concerns are identified, they will be added to this Site Safety Health Plan.

Hazardous Flora. Incidence of contact by individuals to poisonous and thorny plants is high; therefore, bare skin should be covered (i.e., long pants and shirt, steel-toed boots, leather or cotton gloves, safety glasses, and head protection) as much as practical when working in forested or densely vegetated areas. Personnel should avoid entering an area in the direct path of known poisonous flora; a secondary route should be selected. Care should also be taken when walking in such areas because uneven terrain or vines may present a tripping hazard.

While attempting to cut into dense underbrush, hazards exist from the sharp machete and gas-powered weed cutter. Therefore, care should be taken when using such devices. (Note: Hearing protection, steel-toed boots, gloves, and safety glasses are required when using weed cutters.) All rashes and other injuries will be reported to the UXOSO as soon as they are known.

Five plants potentially present on Piñeros Island that are known to be irritating/allergens are Christmas-bush (*Comocladia dodonaea*), White maran (*Croton discolor*), Cowitch (*Stizolobium pruriens*), Manchineel (*Hippomae mancinella*), and Castor bean (*Ricinus communis*):

- Christmas-bush - *Comocladia dodonaea* - is a fairly small shrub that has waxy looking leaves that have a small spine at the end of each of them. The leaves can vary in color from green to yellow to red. The sap and residue on the leaves contain a chemical similar to those found in poison ivy but in a higher concentration.
- White maran - *Croton discolor* - is a fairly large bush (up to 7 ft. tall) that looks like it is drying out and doesn't have long to live. There are two species on the island, but both look very similar and have very hairy leafs. The leaves have a tendency to stick to your clothing because of the hairs of the leaves.
- Cowitch - *Stizolobium pruriens* - is commonly known as Pica-Pica as well as Cowitch. It is a vine that, if cut or disturbed, will release hairs that can cause skin irritations.
- Manchineel - *Hippomae mancinella* - is an evergreen tree found in coastal forest or thickets and can be more toxic than poison ivy or poison sumac. Its sap produces lesions similar to chemical burns.
- Castor bean - *Ricinus communis* - has sap that can cause skin lesions and is found in previously disturbed coastal areas.

Hazardous Fauna. Mosquitoes and sand flies may pose a nuisance and physical hazard to field personnel; they distract workers, leading to accidents, and pose a physical threat by transmitting live microorganisms. Sand fly bites that are repeatedly scratched can cause secondary infections. Avoid the use of perfumes and scented deodorants, and don light-colored clothing. The use of Avon's "Skin So Soft" or other insect repellent is encouraged.

The potential exists to come in contact with other dangerous insects; these include centipedes, fire ants, bees, wasps, hornets, mites, fleas, and spiders. All personnel should perform "checks" on each other periodically and at the end of the work shift, especially when working in grassy or forested areas. All insect bites must be reported to the UXOSO.

Mongooses, rats, and mice have been documented to potentially carry rabies. There is some evidence that mongooses can be infected with the rabies virus in an attenuated form, allowing them to carry and spread the virus for a considerable time before succumbing to

the disease. Any observed unusual behavior by mongooses and other mammals must be reported. Signs of rabies can be characterized in two forms. Animals with furious rabies exhibit agitation and viciousness, followed by paralysis and death. Animals with dumb rabies exhibit lethargy and paralytic symptoms, followed by death. Behavioral indicators for both include fearlessness and change in nocturnal/diurnal rhythms.

Working in wet or swampy areas unprotected shall not be allowed because of the presence of a variety of etiologic (disease-causing agents). Contact with surface water will be kept to a minimum. There have been several incidents of infection by schistosomes (blood flukes) from contact with surface water. The aquatic snail vector, *Australorbis glabratus*, transmits the schistosomes into surface waters, predominantly drainage ditches. Even momentary contact (especially in the presence of blisters, cuts, and open sores) with contaminated surface water is sufficient to acquire an infection. Accidental skin contact requires that the area be washed with isopropyl alcohol. Symptoms of infection are fever, diarrhea, itchy skin, and central nervous system (CNS) damage. Schistosomiasis is hard to treat; once established in its host, it may remain for several years.

Before beginning site activities, each individual shall be questioned as to any known sensitivities to the previously mentioned organisms or agents.

Dengue Fever and other Illnesses. According to the Centers for Disease Control (CDC), Dengue Fever is primarily a viral infection transmitted by mosquito bites in residential areas. The mosquitoes are most active during the day, especially around dawn and dusk, and are frequently found in and around human habitations. The illness is flu-like and characterized by sudden onset, high fever, severe headaches, joint and muscle pain, and rash. The rash appears 3 to 4 days after the onset of fever. Because there is no vaccine or specific treatment, prevention is important. To reduce mosquito bites, travelers should wear clothes that cover most of the body. Travelers should also take insect repellent with them to use on any exposed areas of skin. The most effective repellent is DEET (N, N-diethyl meta-toluamide). Avoid applying high-concentration DEET (greater than 35 percent) products to the skin and refrain from applying repellent to portions of the hands that are likely to come in contact with the eyes and mouth. Rarely, toxic reactions or other problems have developed after contact with DEET. For greater protection, clothing can be soaked in or sprayed with permethrin, which is an insect repellent licensed for use on clothing. If applied according to directions, permethrin will repel insects from clothing for several weeks.

Traveler's Diarrhea is the most frequent health problem for travelers. It can be caused by viruses, bacteria, or parasites that are found universally throughout the region. Transmission is most often through contaminated food or water. Purchase food and beverages from vendors that are professional. Avoid small roadside stands and drink bottled beverages when possible. The use of over-the-counter or prescriptions medications can reduce the length of the attack.

Hepatitis A is a viral infection of the liver transmitted by the fecal oral route; through direct person to person contact; from contaminated water, ice, or shellfish; or from fruits or uncooked vegetables contaminated through handling. Symptoms include fatigue, fever, loss of appetite, nausea, dark urine, jaundice, vomiting, aches and pains, and light stools. No specific therapy supportive care is available, only supportive care. The virus is inactivated by boiling or cooking to 85^{o}C for 1 minute. Therefore, eating thoroughly cooked foods and

drinking only treated water serve as general precautions. CDC recommends hepatitis A vaccine as a precaution.

2.5 Radiological Hazards and Controls

Refer to CH2M HILL's *Corporate Health and Safety Program, Program and Training Manual,* and *Corporate Health and Safety Program, Radiation Protection Program Manual*, for standards of practice in contaminated areas.

Hazards	Controls
None Known	None Required

2.6 Munitions and Explosives of Concern Hazards and Controls

2.6.1 Munitions and Explosives of Concern

Geophysical anomalies and MPPEH have been identified on Pineros Island. The purpose of the intrusive investigation at Pineros Island is to determine whether any of the geophysical anomalies discovered during DGM are MEC or MPPEH items. If MEC or MPPEH is encountered during the intrusive investigation the debris will be systematically collected, inspected, and segregated. All MPPEH will be placed in a temporary MPPEH accumulation point located within the current operating area. All identified MEC will be flagged; no MEC will be considered safe to move and will be blown-in-place. All work will follow the approved Work Plan Addendum and Explosives Safety Submission (ESS).

2.6.2 MEC Avoidance Procedures

MEC avoidance operations will be required during vegetation removal, and sampling operations. Avoidance operations will consist of a team composed of two UXO Technicians, one of which shall be a UXO Technician II.

2.6.3 MEC Procedures

All field activities will be conducted in accordance with the approved Work Plan Addendum and ESS. In addition to the Work Plan Addendum a copy of the approved ESS will be onsite during all field activities. All personnel are required to follow these instructions at all times. When a conflict between these documents and working conditions exists, the ESS will take precedence.

2.6.4 Vegetation

Vegetation removal will be performed under the direction of UXO Technicians; all activities will be conducted after a visual and/or electronic (magnetic) sweep of the area by the UXO Technicians. Vegetation removal teams will include one or more UXO Technicians using appropriate geophysical instruments and observations to avoid MEC.

2.6.5 Munition with the Greatest Fragmentation Distance

Based on the types of munitions used at Pineros and Cabeza de Perro Islands, the munition with the greatest fragmentation distance (MGFD) is the fragmenting M67 Hand Grenade.

2.6.6 Hazard Mitigation

The Explosives Safety Quantity-Distance (ESQD) information for the MGFD is provided in Section 6 of the Work Plan Addendum. In the unlikely case a MEC item with a greater fragmentation distance than the contingency MGFD is encountered, the ESQD arcs will be adjusted and the ESS will be amended.

2.6.7 Types of Explosives to be used Onsite

No explosives will be stored on-site. Explosives for demolition operations will be provided by a licensed vendor on an on-call basis. The explosives vendor will transport explosive material to the NAPR installation and will transfer them in a "day box" portable magazine to a private charter boat, which will transport the explosives to Piñeros Island. Custody of the portable magazine will remain the responsibility of the explosives vendor, whose representative will accompany the portable magazine on the boat under the supervision of the UXO Subcontractor's UXOSO. The explosives vendor's transportation route and the transfer point are shown on Figure B-2. The explosives vendor will enter the NAPR installation at Gate No. 3 on Bennington Drive, where he will be met by the UXO Subcontractor's UXOSO and a NAPR representative. After confirming the vendor's credentials and manifest, he will proceed along the following route: south on Bennington Road; turn left and proceed east on Langley Drive; continue to proceed east on Marina By-pass; turn right and proceed southeast on Forrestal Drive; turn right and proceed southwest on the roadway to Pier 1 or Pier 2.

2.6.8 Explosives Storage, Transportation, and Management

Explosives will not be stored onsite. Transportation and management will be in compliance with the Explosives Management Plan (EMP) and the Explosives Siting Plan (ESP) for this project. The ESP and EMP are provided in Section 5 and Section 6 of the Work Plan Addendum, respectively.

Chemical hazards associated with MEC include toxicity. Toxicity may occur following inhalation of chemical vapors that could potentially be released from soil and ingestion or direct contact with soil and/or ground water that could potentially contain hazardous substances. Therefore, ensure basic sanitation (washing of hands), eating, smoking, etc., are prohibited in the Area.

Explosive residues such as 2,4,6-trinitrotoluene (TNT) 1,3-dinitrobenzene (DNB) and 1,3,5-trinitrobenzene (TNB) are synthetic substances used in explosives. They dissolve in certain liquids. They have no odor or taste. Could affect the nervous system and liver if swallowed or gets on the skin. Exposure to residues can occur through eating, drinking, touching, or inhaling contaminated soil, water, food or air. Therefore ensure proper PPE use, and basic sanitation (washing of hands), eating and smoking are prohibited n the Area.

2.7 Contaminants of Concern

(Refer to Project Files for more detailed contaminant information)

Contaminant	Location and Maximum[a] Concentration (ppm)	Exposure Limit[b]	IDLH[c]	Symptoms and Effects of Exposure	PIP[d] (eV)
2,4,6-trinitrotoluene (TNT) and	GW: NA SB: NA SS: Unknown	1.5 mg/m^3	500 mg/m^3	Irritation skin, mucous membrane; liver damage, jaundice; cyanosis; sneezing; cough, sore throat; peripheral neuropathy, muscle pain; kidney damage; cataract; sensitization dermatitis; leukocytosis (increased blood leukocytes); anemia; cardiac irregularities	UK
1,3-dinitrobenzene (DNB)	GW: NA SB: NA SS: Unknown	1 mg/m^3	50 mg/m^3	Anoxia, cyanosis; visual disturbance, central scotomas; bad taste, burning mouth, dry throat, thirst; yellowing hair, eyes, skin; anemia; liver damage	UK

Footnotes:
[a] Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), S (Surface Soil), SL (Sludge), SW (Surface Water).
[b] Appropriate value of PEL, REL, or TLV listed.
[c] IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen.
[d] PIP = photoionization potential; NA = Not applicable; UK = Unknown.

2.8 Potential Routes of Exposure

Dermal: Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 4.	**Inhalation:** Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in Sections 4 and 5, respectively.	**Other:** Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before drinking or smoking).

3 Project Organization and Personnel

3.1 CH2M HILL Employee Medical Surveillance and Training

(Reference CH2M HILL SOPs HS-113, *Medical Surveillance*, and HS-02, *Health and Safety 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 "SSC" have completed a 12-hour site safety coordinator course, and have documented requisite field experience. An SSC with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones. Employees designated "FA-CPR" are currently certified by the American Red Cross, or equivalent, in first aid and CPR. At least one FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Pregnant employees are to be informed of and are to follow the procedures in CH2M HILL's SOP HS-04, *Reproduction Protection*, including obtaining a physician's statement of the employee's ability to perform hazardous activities before being assigned fieldwork.

Employee Name	Office	Responsibility	SSC/FA-CPR

3.2 Field Team Chain of Command and Communication Procedures

3.2.1 Client

Client Contact

Mark Davidson
NAVFAC
BRAC PMO SE
4130 Faber Place Dr. Suite 202
N. Charleston, SC 29405
843-743-2124
mark.e.davidson@navy.mil

Facility Contact

Pedro Ruiz
Naval Activity Puerto Rico
Public Works Department
Building 31, 2nd Floor
Ceiba, PR 00735
787-865-4152 x459
ruizp@napr.navy.mil

3.2.2 CH2M HILL

Project Manager: Thomas M. Roth, P.E.
Health and Safety Manager: Michael Goldman/ATL for General and Dan Young/NVR for MEC
Field Team Leader: TBD
Site Safety Coordinator: TBD
UXO Safety Officer: TBD

The SSC 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.

SENIOR UXO SUPERVISOR

Name: TBD
Company/Office: TBD
Cellular Number: TBD

The SUXOS is responsible for the execution of all onsite activities in the EZ. The SUXOS will be responsible for overseeing scheduling and ensuring that field activities are performed in accordance with the specified plans. The SUXOS will be familiar with all aspects of H&S as related to MEC and will coordinate with the UXOSO to ensure H&S of site personnel, the public and the environment. The SUXOS reports directly to the Project Manager and is responsible for:

- Directly controlling the operations of all field teams performing MR activities.
- Monitoring the MR field teams daily performance.
- Assisting the MR field teams in achieving maximum operational safety and efficiency.
- Implementing the approved work plans in the field.
- Supervising all MR teams on the project.
- Temporarily stopping work to correct an unsafe condition or procedure.

UXO TECHNICIAN III

UXO Technician III personnel report directly to the SUXOS and are responsible for:

- The safety and efficiency of their assigned field team.
- Temporarily stopping work in order to bring an unsafe condition or procedure to the attention of the SUXOS.
- Exceeding the requirements of the DDESB-approved UXO Personnel Training and Experience Hierarchy.

UXO TECHNICIAN II

The UXO Technician II for this project will report directly to the Project Manager on issues pertaining to the operations at the project site. The UXO Technician II 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 HASP to site and subcontract personnel;
- Review the scope of work (SOW) and ensure that the required safety and health elements are addressed in the HASP and/or WP;
- Coordinating the assignment of personnel and ensuring that the personnel and equipment provided meet the requirements of the WP and HASP;
- 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 offsite emergency and medical response agencies.

UXO QUALITY CONTROL SPECIALIST (UXOQCS)

- Name: TBD
- Company/Office: TBD
- Cellular Number: TBD

The UXOQCS is responsible for:

- Ensuring that the overall QC procedures and objectives of the project are met.
- Reviewing and ensuring that the Quality Control Plan (QCP) addresses all project-specific QC needs and that all appropriate QC requirements are addressed.

- Implementing the MEC-specific sections of the QC Program for all MR-related evolutions.
- Conducting QC inspections of all MEC and explosives operations for compliance with established procedures.
- Directing and approving all corrective actions to ensure that all MR-related work complies with contractual requirements.
- Temporarily stopping work to correct an unsafe condition or procedure.
- Reporting independently of project management to the Corporate MR Safety and QC Officer.
- Exceeding the requirements of the Department of Defense Explosive Safety Board (DDESB)-approved UXO Personnel Training and Experience Hierarchy.

UXO SAFETY OFFICER

The UXO Safety Officer (UXOSO) for this project reports directly to the Project Manager and oversees all UXO safety and health aspects for this site. For this project the UXO Technician II will assume the duties of the UXOSO. He/she will coordinate all daily activities with the Project Manager. The UXOSO will have the following responsibilities;

- Has STOP WORK authority for UXO safety and health reasons;
- Implement and enforce the HASP, and report safety violations to the Project Manager and other appropriate personnel;
- Establishing work zones and controlling access to these zones;
- Conduct daily UXO Safety Briefings;
- Implement and document the Site Specific Hazard Information Training Program;
- Consulting with the SUXOS as necessary;
- Assisting in the continued development of this Avoidance Plan, and the HASP and other safety and health procedures, as applicable;
- Investigate and report accidents/incidents and 'near misses;"
- Conduct visitor orientation;
- Enforce the "buddy" system;
- Restrict site personnel from site activities if they exhibit systems of alcohol or drug use or illness, and continually monitor site personnel for signs of environmental exposure or physical stress;
- Maintain the site safety and monitoring logs;
- Maintains an alternate line of communication with the Project Manager.

UXO TECHNICIANS

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

3.2.3 CH2M HILL Subcontractors

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

MEC Subcontractor: USA Environmental, Inc.
Subcontractor Contact Name: Don Shaw
Telephone: 813-343-6406

Boat and Vegetation Clearance Subcontractor: CREW
Subcontractor Contact Name: Felix Rivera
Telephone: 787-863-1344

The subcontractors listed above are covered by this HASP 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 submit these procedures 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 SSC 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 SSC 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 SSC 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.

4 Personal Protective Equipment (PPE)

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

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

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

PPE Specifications [a]				
Task	**Level**	**Body**	**Head**	**Respirator [b]**
General site entry Site MEC Land Clearing	D	Work clothes; steel-toe, leather work boots; work glove.	Hardhat [c] Safety glasses Ear protection [d]	None required
Any function in this HASP where potential dermal contact with site COCs is limited to the hands only	Modified D_1	Work clothes or cotton coveralls **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Safety glasses Face Shield (as required for splash hazards) Ear protection [d]	None required
Any function identified in this HASP where potential dermal contact with site COCs is NOT limited to the hands only	Modified D_2	**Coveralls:** poly coated or uncoated Tyvek© chemical resistant disposable coveralls. Poly coated will be used for exposure to liquid chemicals or other dangerous splash hazards. **Boots:** Hard toe work boots that provide sufficient ankle support	Hardhat [c] Safety glasses Face Shield (as required for splash hazards) Ear protection [d]	

PPE Specifications [a]				
Task	**Level**	**Body**	**Head**	**Respirator [b]**
		(preferable leather); with outer rubber boot covers or hard toe chemically resistant rubber boots with steel shank.		
Contact HSM prior to implementing Level C PPE upgrade	C	**Coveralls**: Polycoated Tyvek© **Boots:** Steel-toe, chemical resistant boots or steel-toe , leather work boot with rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical resistant nitrile gloves.	Hardhat [c] Safety glasses Face Shield (as required for splash hazards) Ear protection [d]	APR, full face, MSA Ultratwin or equivalent; with GME-H cartridges or equivalent, as applicable to appropriate respiratory protection measures for specific site compounds.

Reasons for Upgrading or Downgrading Level of Protection	
Upgrade[f]	**Downgrade**
• Request from individual performing tasks. • Change in work tasks that will increase contact or potential contact with hazardous materials. • Occurrence or likely occurrence of gas or vapor emission. • Known or suspected presence of dermal hazards. • Instrument action levels (Section 5) exceeded.	• New information indicating that situation is less hazardous than originally thought. • Change in site conditions that decrease the hazard. • Change in work task that will reduce contact with hazardous materials.

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

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

[c] Hardhat and splash-shield areas are to be determined by the SSC.

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

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

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

5 Air Monitoring/Sampling

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

5.1 Air Monitoring Specifications

Air monitoring is not required for the activities covered by this HASP.

5.2 Calibration Specifications

Air monitoring is not required for the activities covered by this HASP.

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
Other: Dan Young/NVR

6 Decontamination

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

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

6.1 Decontamination Specifications

Personnel	Sample Equipment	Heavy Equipment
• Boot wash/rinse • Glove wash/rinse • Outer-glove removal • Body-suit removal • Inner-glove removal • Respirator removal • Hand wash/rinse • Face wash/rinse • Shower ASAP • Dispose of PPE in municipal trash, or contain for disposal • Dispose of personnel rinse water to facility or sanitary sewer, or contain for offsite disposal	• Wash/rinse equipment • Solvent-rinse equipment • Contain solvent waste for offsite disposal	• Power wash • Steam clean • Dispose of equipment rinse water to facility or sanitary sewer, or contain for offsite disposal

6.2 Diagram of Personnel-Decontamination Line

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

Figure B-3 illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the SSC to accommodate task-specific requirements.

7 Spill-Containment Procedures

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

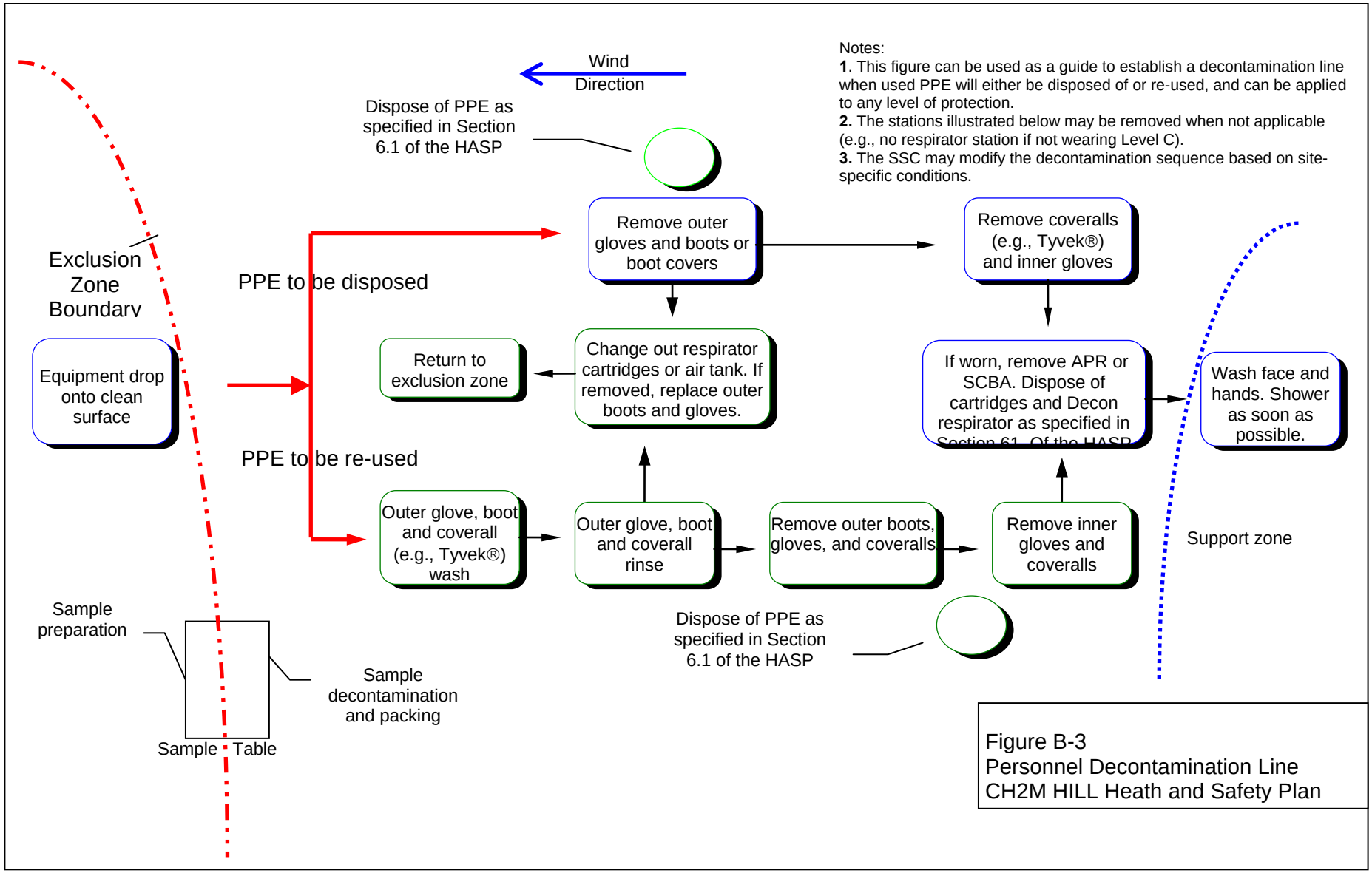


Figure B-3
Personnel Decontamination Line
CH2M HILL Heath and Safety Plan

8 Site-Control Plan

8.1 Site-Control Procedures

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

- The SSC 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 SSC 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-71, *OSHA Postings*.
- Establish support, decontamination, and exclusion zones. Delineate with flags or cones as appropriate. Support zone should be upwind of the site. Use access control at entry and exit from each work zone.
- Establish onsite communication consisting of the following:
  - Line-of-sight and hand signals
  - Air horn
  - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the "buddy system."
- Initial air monitoring is conducted by the SSC in appropriate level of protection.
- The SCC 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

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 in the exclusion zone (EZ). The EZ is the work site encompassing an area large enough to prevent personnel injuries from fragmentation and overpressure resulting from either an unintentional or intentional detonation of MEC.

During all intrusive operations the EZ will be a radius of 200 feet minimum (MK II Grenade) (distance from DDESP TP-16, Chapter 4). During UXO operations, only UXO trained or authorized essential personnel are allowed in the EZ. Authorized personnel are those that

have completed the required training, meet medical requirements and are essential to the ongoing operation.

During all operations on site, the site UXO Technician III will cease operations if non-essential personnel are observed within the operating area (EZ). During duty hours, personnel will provide security at the 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 safe area will be located upwind of the site and outside of the fragmentation (400 feet) 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.

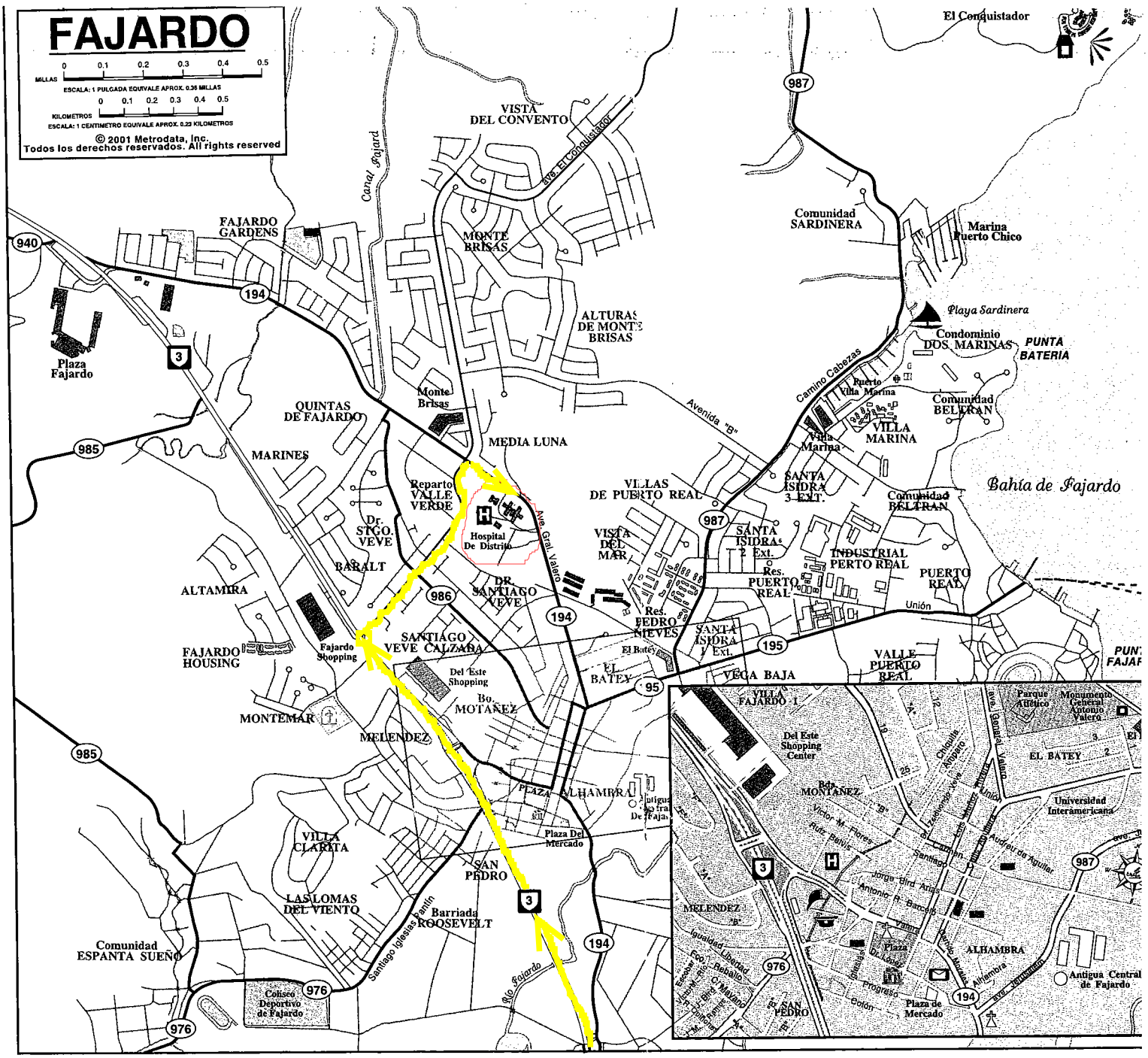
8.3 Hazwoper Compliance Plan

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

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

- In many cases, air sampling, in addition to real-time monitoring, must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site, or while non-Hazwoper-trained staff are working in proximity to Hazwoper activities. Other data (e.g., soil) also must document that there is no potential for exposure. The HSM must approve the interpretation of these data. Refer to subsections 2.5 and 5.3 for contaminant data and air sampling requirements, respectively.
- When non-Hazwoper-trained personnel are at risk of exposure, the SSC must post the exclusion zone and inform non-Hazwoper-trained personnel of the:
  - nature of the existing contamination and its locations
  - limitations of their access
  - emergency action plan for the site

- Periodic air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-Hazwoper-trained personnel (e.g., in an adjacent area) are not exposed to airborne contaminants.
- When exposure is possible, non-Hazwoper-trained personnel must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.
- Remediation treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the Hazwoper standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only Hazwoper-trained personnel (minimum of 24 hours of training) will be permitted to enter the site. All non-Hazwoper-trained personnel must not enter the TSDF area of the site.



Directions to Hospital San Pablo Del Este:

Exit the base and drive north of Route 3 toward Fajardo. After entering town, you will pass the Del Este Shopping Center on your right. After that, turn right onto Avenida El Conquistador. Proceed approximately ½ mile and turn right onto Avenida General Valero.
The hospital will be on your right.

Figure 8-2, Hospital Route

9 Emergency Response Plan

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

9.1 Pre-Emergency Planning

The SSC 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. **Attachment 4** contains all the emergency contacts needed for the SSC to call in the case of injury, emergency, or evacuation.

- 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.
- 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 SSC will evaluate emergency response actions and initiate appropriate follow-up actions.

9.2 Emergency Equipment and Supplies

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

Emergency Equipment and Supplies	Location
20 LB (or two 10-lb) fire extinguisher (A, B, and C classes)	Support Zone
First aid kit	Support Zone
Eye Wash	Support & Decon Zone
Potable water	Support & Decon Zone
Bloodborne-pathogen kit	Support Zone
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 Attachment 4 (e.g., 911).
- The SCC 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 route(s) and assembly area(s) will be designated by the SSC before work begins.
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
- The SSC 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 SSC will account for all personnel in the onsite assembly area.
- A designated person will account for personnel at alternate assembly area(s).
- The SSC 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: Thomas M. Roth/ATL
Dan Young/NVR

Date: January 11, 2006

Approved By: Michael Goldman

Date: January 16, 2006

10.2 Revisions

Revisions Made By: Thomas M. Roth

Date: April 11, 2006

Revisions to Plan: 2.3.4, 2.3.8

Revisions Approved By: Michael Goldman

Date: April 14, 2006

10.3 Revisions

Revisions Made By: Elizabeth Bevc/RDU

Date: December 1, 2009

Revisions to Plan: Task Descriptions, 1.1.1, 1.2, 1.3, 2.1, 2.3.4, 2.3.13 2.3.14, 2.6, 3.2.2, 3.2.3 4, 8.2, Attachments 2, 4, 5, and 7.

Revisions Approved By: Michael Goldman

Date: December 2009

11 Attachments

Attachment 1: Employee Signoff Form – Field Safety Instructions

Attachment 2: Project-Specific Chemical Product Hazard Communication Form

Attachment 3: Chemical-Specific Training Form

Attachment 4: Emergency Contacts

Attachment 5: Project H&S Forms/Permits

Attachment 6: Project Activity Self-Assessment Checklists

Attachment 7: Applicable Material Safety Data Sheets

ATTACHMENT 1

CH2MHILL

EMPLOYEE SIGNOFF FORM

Health and Safety Plan

The CH2M HILL project employees and subcontractors listed below have been provided with a copy of this HASP, have read and understood it, and agree to abide by its provisions.

Project Name: CLEAN III CTO-172 / Pineros Island, PR **Project Number:** 357902

EMPLOYEE NAME (Please print)	**EMPLOYEE SIGNATURE**	**COMPANY**	**DATE**

ATTACHMENT 2

CH2MHILL

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 SSC 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: CLEAN III CTO-172 / Piñeros & Cabeza de Perro Islands, Naval Activity Puerto Rico **Project Number:** 357902

MSDSs will be maintained at the following location(s):

Hazardous Chemical Products Inventory

Chemical	Quantity	Location	MSDS Available	Container Labels	
				Identity	Hazard
Alconox/Liquinox	< 1 Liter	Support/Decon Zones			

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

ATTACHMENT 3

CH2MHILL

CHEMICAL-SPECIFIC TRAINING FORM

Location:	Project #:
HCC:	Trainer:

TRAINING PARTICIPANTS:

NAME	SIGNATURE	NAME	SIGNATURE

REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:

The HCC shall use the product MSDS to provide the following information concerning each of the products listed above.

☐ Physical and health hazards

☐ Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)

☐ Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants shall have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL's written hazard communication program shall be made available for employee review in the facility/project hazard communication file.

ATTACHMENT 4 - EMERGENCY CONTACTS

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

24-hour CH2M HILL Emergency Number 1-866-893-2514

Medical Emergency – 911 or Hospital #: (787) 863-0505 Ambulance #: 911 LEPC (Poison Control)#: (800) 222-1222	**CH2M HILL Medical Consultant** 1-866-893-2514
Fire/Spill Emergency – Not Available Onsite	**Local Occupational Physician**
Coast Guard Search & Rescue Rescue Coordination Center, San Juan Sub-Center 911 or 787-289-2042	
Security & Police – Not Available Onsite	**Corporate Director Health and Safety** Name: Keith Christopher/WDC Phone: 703-376-5111
Utilities Emergency - NA Water: Gas: Electric:	**Health and Safety Manager (HSM)** Name: Michael Goldman/ATL Phone: 770-604-9182 x54133 Cell: 770-331-3127
Site Safety Coordinator (SSC) Name: TBD Phone:	**Regional Human Resources Department** Name: Janie Kovac/HOU Phone: 281-721-8496
Project Manager Name: Tom Roth Phone: 404-259-6674 (cell)	**Corporate Human Resources Department**
Federal Express Dangerous Goods Shipping Phone: 800/463-3339 **CH2M HILL Emergency Number for Shipping Dangerous Goods** Phone: 800/255-3924 Contact the Project Manager. Generally, the Project Manager will contact relevant government agencies.	**Worker's Compensation and Auto Claims**
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): Go to the beach landing area for the work zone you are at (north beach, south beach, or west beach) and wait for boat transport to arrive onshore.

Route to Hospital:

The hospital route directions are from Puerto del Rey Marina.

For non-life-threatening emergencies, injured personnel should be transported to Puerto del Rey Marina on the subcontracted boat.

If the injury is critical, an ambulance should be contacted (call 911) and asked to meet the boat at Puerto del Rey Marina.

For life-threatening injuries or if the injured party cannot be safely moved, Coast Guard response should be requested (call 911).

- **Exit Puerto del Rey Marina and drive North on Route 3 toward Fajardo.**
- **After entering town, go past the Del Este Shopping Center on the right.**
- **Turn right onto Avenida El Conquistador.**
- **Proceed approximately ½ mile and turn right onto Avenida General Valero (Route 194).**
- **The hospital will be on your right.**

Local hospital: Hospital San Pablo del Este
Avenida General Valero, 404, Fajardo PR 00738

Tel: (787) 863-0505
Fax (787) 860-8514

Local ambulance service: 911

CH2M HILL HEALTH AND SAFETY PLAN

Attachment 5

Project H&S Forms and Permits

To be completed as needed for task specific operations.

CH2MHILL

Pre-Task Safety Plan (PTSP)

Project: _____ Location: _____Date:_____

Supervisor: _____ Job Activity:_____

_____

Task Personnel:

_____

_____

_____

_____

List Tasks:

_____

_____

_____

_____

Tools/Equipment Required for Tasks (ladders, scaffolds, fall protection, cranes/rigging, heavy equipment, power tools):

_____

_____

_____

Potential H&S Hazards, including chemical, physical, safety, biological and environmental (check all that apply):

__ Chemical burns/contact	__ Trench, excavations, cave-ins	__ Ergonomics
__ Pressurized lines/equipment	__ Overexertion	__ Chemical splash
__ Thermal burns	__ Pinch points	__ Poisonous plants/insects
__ Electrical	__ Cuts/abrasions	__ Eye hazards/flying projectile
__ Weather conditions	__ Spills	__ Inhalation hazard
__ Heights/fall > 6 feet	__ Overhead Electrical hazards	__ Heat/cold stress
__ Noise	__ Elevated loads	__ Water/drowning hazard
__ Explosion/fire	__ Slips, trip and falls	__ Heavy equipment
__ Radiation	__ Manual lifting	__ Aerial lifts/platforms
__ Confined space entry	__ Welding/cutting	__ Demolition

Other Potential Hazards (Describe):

_____

_____

_____

_____

CH2MHILL

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

Name (Print): _____

Signature:_____ Date:_____

CH2MHILL

Safe Behavior Observation Form		
Project Number:	Client/Program:	☐CCI ☐INC
Project Name:	Observer:	Date:
Position/Title of worker observed:	Background Information/ comments:	
Task/Observation Observed:		

- ❖ Identify and reinforce safe work practices/behaviors
- ❖ Identify and improve on at-risk practices/acts
- ❖ Identify and improve on practices, conditions, controls, and compliance that eliminate or reduce hazards
- ❖ Proactive PM support facilitates eliminating/reducing hazards (do you have what you need?)
- ❖ Positive, corrective, cooperative, collaborative feedback/recommendations

Actions & Behaviors	Safe	At-Risk	Observations/Comments
Current & accurate Pre-Task Planning/Briefing (Project safety plan, STAC, AHA, PTSP, tailgate briefing, etc., as needed)			**Positive Observations/Safe Work Practices:**
Properly trained/qualified/experienced			
Tools/equipment available and adequate			
Proper use of tools			**Questionable Activity/Unsafe Condition Observed:**
Barricades/work zone control			
Housekeeping			
Communication			
Work Approach/Habits			
Attitude			
Focus/attentiveness			**Observer's Corrective Actions/Comments:**
Pace			
Uncomfortable/unsafe position			
Inconvenient/unsafe location			
Position/Line of fire			
Apparel (hair, loose clothing, jewelry)			
Repetitive motion			**Observed Worker's Corrective Actions/Comments:**
Other…			

For WST ES staff please email completed forms to CH2MHILL WST ES Safe Behavior Observations - (WSTESSBO@ch2m.com)
For CNR ES staff please email completed forms to cnressafe@ch2m.com

CH2M HILL HEALTH AND SAFETY PLAN

Attachment 6

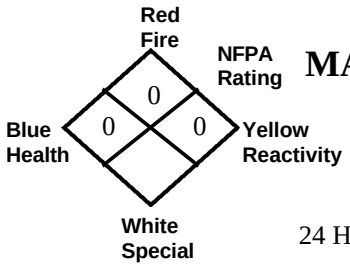
Project Activity Self-Assessment Checklists (Not Applicable to Activities on this Project)

CH2M HILL HEALTH AND SAFETY PLAN

Attachment 7

Applicable Material Safety Data Sheets

Alconox ®



MATERIAL SAFETY DATA SHEET

Alconox, Inc.
30 Glenn Street
White Plains, NY 10603

24 Hour Emergency Number – Chem-Tel (800) 255-3924

I. IDENTIFICATION

Product Name (as appears on label)	ALCONOX
CAS Registry Number:	Not Applicable
Effective Date:	January 1, 2001
Chemical Family:	Anionic Powdered Detergent
Manufacturer Catalog Numbers for sizes	1104, 1125, 1150, 1101, 1103 and 1112

II. HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

There are no hazardous ingredients in ALCONOX as defined by the OSHA Standard and Hazardous Substance List 29 CFR 1910 Subpart Z.

III. PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point (F):	Not Applicable
Vapor Pressure (mm Hg):	Not Applicable
Vapor Density (AIR=1):	Not Applicable
Specific Gravity (Water=1):	Not Applicable
Melting Point:	Not Applicable
Evaporation Rate (Butyl Acetate=1):	Not Applicable
Solubility in Water:	Appreciable-Soluble to 10% at ambient conditions
Appearance:	White powder interspersed with cream colored flakes.
pH:	9.5 (1%)

IV. FIRE AND EXPLOSION DATA

Flash Point (Method Used):	None
Flammable Limits:	LEL: No Data UEL: No Data
Extinguishing Media:	Water, dry chemical, CO_2, foam
Special Fire fighting Procedures:	Self-contained positive pressure breathing apparatus and protective clothing should be worn when fighting fires involving chemicals.
Unusual Fire and Explosion Hazards:	None

V. REACTIVITY DATA

Stability:	Stable
Hazardous Polymerization:	Will not occur
Incompatibility (Materials to Avoid):	None
Hazardous Decomposition or Byproducts:	May release CO_2 on burning

VI. HEALTH HAZARD DATA

Route(s) of Entry:	Inhalation? Yes Skin? No Ingestion? Yes
Health Hazards (Acute and Chronic):	Inhalation of powder may prove locally irritating to mucous membranes. Ingestion may cause discomfort and/or diarrhea. Eye contact may prove irritating.
Carcinogenicity:	NTP? No IARC Monographs? No OSHA Regulated? No
Signs and Symptoms of Exposure:	Exposure may irritate mucous membranes. May cause sneezing.
Medical Conditions Generally Aggravated by Exposure:	Not established. Unnecessary exposure to this product or any industrial chemical should be avoided. Respiratory conditions may be aggravated by powder.
Emergency and First Aid Procedures:	Eyes: Immediately flush eyes with water for at least 15 minutes. Call a physician. Skin: Flush with plenty of water. Ingestion: Drink large quantities of water or milk. Do not induce vomiting. If vomiting occurs administer fluids. See a physician for discomfort.

VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken if Material is Released or Spilled:	Material foams profusely. Recover as much as possible and flush remainder to sewer. Material is biodegradable.
Waste Disposal Method:	Small quantities may be disposed of in sewer. Large quantities should be disposed of in accordance with local ordinances for detergent products.
Precautions to be Taken in Storing and Handling:	Material should be stored in a dry area to prevent caking.
Other Precautions:	No special requirements other than the good industrial hygiene and safety practices employed with any industrial chemical.

VIII. CONTROL MEASURES

Respiratory Protection (Specify Type):	Dust mask - Recommended
Ventilation:	Local Exhaust-Normal Special-Not Required Mechanical-Not Required Other-Not Required
Protective Gloves:	Impervious gloves are useful but not required.
Eye Protection:	Goggles are recommended when handling solutions.
Other Protective Clothing or Equipment:	None
Work/Hygienic Practices:	No special practices required

Appendix C
Munitions Constituents Sampling and Analysis "Crosswalk Table"

Draft

Appendix C
Sampling and Analysis Plan

Piñeros Island
Naval Activity Puerto Rico

Contract Task Order 172

January 2010

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Atlantic

Under the

NAVFAC CLEAN III Program
Contract N62470-02-D-3052

Prepared by

CH2MHILL

Raleigh, North Carolina

The Final Work Plan (CH2M HILL, 2006) provides field sampling information and associated quality control/quality assurance information. The Navy agreed that a crosswalk table between the framework of the Navy's Uniform Federal Policy (UFP) Sampling and Analysis Plan (SAP) and the information provided in the Final Work Plan and this WP Addendum would suffice for this project. The crosswalk table is provided in this appendix.

UFP-SAP Identifying Information Cross-Walk Table

Equivalent UFP-QAPP Worksheet #	Required Information	Crosswalk to Related Information in this Document
A. Project Management		
Documentation		
1	Title and Approval Page	Work Plan (WP) Title Page
2	Table of Contents SAP Identifying Information	Contents and Appendix C – WP Addendum
3	Distribution List	Appendix C - WP Addendum
4	Project Personnel Sign-Off Sheet	Appendix C - WP Addendum
Project Organization		
5	Project Organizational Chart	Figure 2-1 WP
6	Communication Pathways	Section 4.2.2- WP
7	Personnel Responsibilities and Qualifications Table	Section 2.1.2-WP
8	Special Personnel Training Requirements Table	Section 4.2.1- WP and WP Addendum, Appendix B WP Addendum
Project Planning/ Problem Definition		
9	Project Planning Session Documentation (including Data Needs tables) Project Scoping Session Participants Sheet	None for project
10	Problem Definition, Site History, and Background. Site Maps (historical and present)	Section 1.1, 1.2, 1.4 – WP Figures 1-1, 1-2, 1-3, 1-4, 1-5 – WP
11	Site-Specific Project Quality Objectives	Section 4 – WP
12	Measurement Performance Criteria Table	Table 3-2, 3-3 – Work Plan Addendum
13	Sources of Secondary Data and Information Secondary Data Criteria and Limitations Table	Sections 1.3 and 1.4 of WP, 1.5 WP Addendum
14	Summary of Project Tasks	Section 3 – WP Addendum
15	Reference Limits and Evaluation Table	Appendix C - WP Addendum
16	Project Schedule/Timeline Table	Figure 2-1 – WP Addendum
B. Measurement Data Acquisition		
Sampling Tasks		
17	Sampling Design and Rationale	Section 3.6.1 – WP
18	Sampling Locations and Methods/ SOP Requirements Table Sample Location Map(s)	Section 3.6, Table 3-2 – WP Addendum
19	Analytical Methods/SOP Requirements Table	Section 3.6.2, Table 3-2 - WP Addendum

Equivalent UFP-QAPP Worksheet #	Required Information	Crosswalk to Related Information in this Document
20	Field Quality Control Sample Summary Table	Section 3.6.2 Table 3-3 – WP Addendum
21	Project Sampling SOP References Table Sampling SOPs	Appendix E – WP
22	Field Equipment Calibration, Maintenance, Testing, and Inspection Table	Section 4.3.6 - WP
Analytical Tasks		
23	Analytical SOPs Analytical SOP References Table	Appendix C – WP Addendum
24	Analytical Instrument Calibration Table	Appendix C - WP Addendum
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	Appendix C - WP Addendum
Sample Collection		
26	Sample Handling System, Documentation Collection, Tracking, Archiving and Disposal Sample Handling Flow Diagram	Section 4.3.5 - WP
27	Sample Custody Requirements, Procedures/SOPs Sample Container Identification Example Chain-of-Custody Form and Seal	Section 4.3.5 - WP
Quality Control Samples		
28	QC Samples Table Screening/Confirmatory Analysis Decision Tree	Section 3.6.2, Table 3-3- WP Addendum
Data Management Tasks		
29	Project Documents and Records Table	Section 3.7 - WP
30	Analytical Services Table Analytical and Data Management SOPs	Appendix C – WP Addendum
C. Assessment Oversight		
31	Planned Project Assessments Table Audit Checklists	Tables 4-1a – 4-3b WP
32	Assessment Findings and Corrective Action Responses Table	Section 4.3.13 - WP
33	QA Management Reports Table	Section 4.3.14 – WP
D. Data Review		
34	Verification (Step I) Process Table	Section 4.3.8 – WP
35	Validation (Steps IIa and IIb) Process Table	Section 4.3.8 – WP
36	Validation (Steps IIa and IIb) Summary Table	Section 4.3.8 – WP
37	Usability Assessment	Section 4.3.8 – WP

UFP-SAP Identifying Information

Site Name/Number: Piñeros Island, Naval Activity Puerto Rico
Operable Unit: N/A
Contractor Name: CH2M HILL
Contract Number: N62470-02-D-3052
Contract Title: Navy CLEAN III
Work Assignment Number (optional): Task Order 0072

1. This work plan addendum was prepared in general accordance with the requirements of the *Uniform Federal Policy for Quality Assurance Plans (UFP-QAPP)* (USEPA, 2005) and *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS* (USEPA, 2002).

Identify any additional guidance used to prepare Sampling and Analysis Plan (SAP): N/A

2. Identify regulatory program: Resource Conservation and Recovery Act

3. This work plan is a site-specific work plan.

4. List dates of scoping sessions that were held: Formal scoping sessions were not used.

5. List dates and titles of any SAP documents written for previous site work that are relevant to the current investigation.
N/A

6. List organizational partners (stakeholders) and connection with lead organization:
United States Environmental Protection Agency (USEPA) and Naval Activity Puerto Rico (NAPR).

7. Lead organization: Department of the Navy

8. If any required SAP elements or required information are not applicable to the project or are provided elsewhere, then note the omitted SAP elements and provide an explanation for their exclusion below:

The crosswalk table below references the location of all 37 required elements of the UFP-SAP.

Distribution List
Pineros and Cabeza de Perro Islands, NAPR

Address	Phone #	Mail	Hard Copies	CD Copies	Delivery Method
Mr. Tim Gordon US Environmental Protection Agency Region II 290 Broadway - 22nd Floor New York, NY 10007-1866	212-637-4167	Fed-Ex	2	2	Standard Overnight
Anthony Scacifero TechLaw, Inc. 2 Landau Road Basking Ridge, NJ 07920	973-241-5181	Fed-Ex		1	Standard Overnight
Mr. Carl A. Soderberg U.S. Environmental Protection Agency Caribbean Environmental Protection Division Centro Europa Building, Suite 417 1492 Ponce de Leon Ave. Santurce, PR 00907-4127	787-729-6951	Fed-Ex	1	1	International Overnight
Ms. Bonnie Capito Librarian and Records Manager Atlantic Division - LANTDIV Room 2400 6506 Hampton Blvd. Norfolk, VA 23508-1278	757-322-4785	Fed-Ex	1		Standard Overnight
Mr. Mark Davidson BRAC Program Management Office SE 4130 Faber Place Drive, Suite 202 N. Charleston, SC 29405	843-743-2124	FedEx	1	1	Standard Overnight
Mr. Stacin Martin NAVFAC Atlantic EV31 6506 Hampton Blvd, Bldg A Norfolk VA 23508	757-322-4780	FedEx	1	1	Standard Overnight
Mr. Pedro Ruiz Naval Activity Puerto Rico Security, BLDG 1205 1st Floor (for Env. Div) ATTN: Mr. Pedro Ruiz Ceiba, PR 00735	787-865-4429	Fed-Ex		1	International Overnight
Ms. Gloria Toro Environmental Quality Board Land Pollution Control Area 1305 Ponce DeLeon Avenue Rio Piedras, PR 00907	787-767-8181	Fed-Ex	1	1	International Overnight

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Mr. Felix Lopez U.S. Fish & Wildlife Service PR 301, Km 5.1 Boqueron, PR 00622	787-851-7297	Fed-Ex		1	International Overnight
Dr. Lisamarie Carrubba National Marine Fisheries Service USWFS Refuge PR 301, Km 5.1 Boquerón, PR 00622	787-851-3700	FedEx		1	International Overnight
Mr. Mark Kimes, P.E. Michael Baker Jr., Inc. Airside Business Park 100 Airside Drive Moon Township, PA 15108	412-269-2009			1	Standard Overnight

Project Personnel Sign-off Sheet

Review Signatures:

_____

Thomas Roth, P.E. Date
CH2M HILL – Project Manager

_____

Timothy Garretson, Date
CH2M HILL – Senior MR Consultant

_____

Dan Young, CSP CRSP Date
CH2M HILL – Quality Assurance Manager

Approval Signatures

_____

Jonathan Tucker Date
NAVFAC Atlantic – Chemist/QA Officer

Other Approval Signatures:

_____

Mark E. Davidson Date
BRAC PMO SE – Navy Technical Consultant

Reference Limits and Evaluation Tables

Tables will be supplied by laboratory including items listed below:

Analyte	CAS Number	Project Action Limit (µg/L)	Project Action Limit Reference[1]	Project Quantitation Limit Goal (µg/L)	Laboratory-specific[2]	
					QLs (µg/L)	MDLs (µg/L)

Analytical SOPs/Analytical SOP Reference Table

Tables will be supplied by laboratory including items listed below:

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)

Analytical Instrument Calibration Table

Tables will be supplied by laboratory including items listed below:

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]

Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Tables will be supplied by laboratory including items listed below:

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]

SAP Worksheet #15-1
Reference Limits and Evaluation Table

Matrix: Soils

Analytical Group: METAL and EXPLO

		2006 Results						2010 Laboratory (Empirical Labs)					
								Laboratory-specific			MS/MSD and LCS Recovery Limits		
Analyte	CAS Number	Number of Results	Number of Detects	Min Detect (mg/kg)	Max Detect mg/kg)	Min QL (mg/kg)	Max QL (mg/kg)	LOQ (mg/Kg)	LOD (mg/Kg)	DL (mg/Kg)	Lower Limit (%)	Upper Limit (%)	RPD (%)
Aluminum	7429-90-5	0 (NA)						10.0	5.00	2.50	80	120	20
Antimony	7440-36-0	0 (NA)						0.750	0.400	0.250	80	120	20
Arsenic	7440-38-2	10	8	1.1	48.7			0.50	0.300	0.150	80	120	20
Barium	7440-39-3	10	10	27.2	126			2.00	0.500	0.250	80	120	20
Beryllium	7440-41-7	0 (NA)						0.250	0.100	0.0500	80	120	20
Cadmium	7440-43-9	10	2	0.63	13.7			0.250	0.100	0.0500	80	120	20
Calcium	7440-70-2	0 (NA)						250	100	50.0	80	120	20
Chromium	7440-47-3	10	10	2.3	20.6			0.300	0.200	0.100	80	120	20
Cobalt	7440-48-4	0 (NA)						0.625	0.500	0.250	80	120	20
Copper	7440-50-8	0 (NA)						1.00	0.400	0.250	80	120	20
Iron	7439-89-6	0 (NA)						5.00	3.00	1.50	80	120	20
Lead	7439-92-1	10	10	6.4	133			1.00	0.600	0.300	80	120	20
Magnesium	7439-95-4	0 (NA)						250	150	50.0	80	120	20
Manganese	7439-96-5	0 (NA)						0.750	0.300	0.150	80	120	20
Mercury	7439-97-6	10	1	0.13	0.13			0.0330	0.0260	0.0130	80	120	20
Nickel	7440-02-0	0 (NA)						1.00	0.300	0.250	80	120	20
Potassium	7440-09-7	0 (NA)						250	150	50.0	80	120	20
Selenium	7782-49-2	10	10	0.58	1.9			0.300	0.250	0.150	80	120	20
Silver	7440-22-4	10	9	0.14	0.62			0.250	0.100	0.0500	80	120	20
Sodium	7440-23-5	0 (NA)						250	150	50.0	80	120	20
Thallium	7440-28-0	0 (NA)						0.400	0.200	0.150	80	120	20
Vanadium	7440-62-2	0 (NA)						1.00	0.500	0.250	80	120	20
Zinc	7440-66-6	0 (NA)						1.00	0.500	0.250	80	120	20
Cyanide	57-12-5	0 (NA)						1.00	0.50	0.200	80	120	20
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	28	0			0.62	0.62	0.1	0.067	0.033	75	125	30
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	28	0			0.62	0.62	0.1	0.067	0.033	70	135	30
1,3,5-Trinitrobenzene (1,3,5-TNB)	99-35-4	28	0			0.62	0.62	0.1	0.067	0.033	75	125	30
1,3-Dinitrobenzene (1,3-DNB)	99-65-0	28	0			0.62	0.62	0.1	0.067	0.033	80	125	30
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	479-45-8	28	0			1.2	1.2	0.1	0.067	0.033	10	150	30
Nitrobenzene (NB)	98-95-3	38	0			0.38	0.62	0.1	0.067	0.033	75	125	30
2,4,6-Trinitrotoluene (2,4,6-TNT)	118-96-7	28	0			1.2	1.2	0.1	0.067	0.033	55	140	30
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	19406-51-0	28	0			1.2	1.2	0.1	0.067	0.033	80	125	30
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	35572-78-2	28	0			1.2	1.2	0.1	0.067	0.033	80	125	30
2,4-Dinitrotoluene (2,4-DNT)	121-14-2	38	1	0.41	0.41			0.1	0.067	0.033	80	125	30
2,6-Dinitrotoluene (2,6-DNT)	606-20-2	38	0			0.38	1.2	0.1	0.067	0.033	80	120	30
2-Nitrotoluene (2-NT)	88-72-2	28	0			1.2	1.2	0.1	0.067	0.033	80	125	30
3-Nitrotoluene (3-NT)	99-08-1	28	0			1.2	1.2	0.1	0.067	0.033	75	120	30
4-Nitrotoluene (4-NT)	99-99-0	28	0			1.2	1.2	0.1	0.067	0.033	75	125	30
Perchlorate	14797-73-0	0 (NA)						0.004	0.002	0.001	80	120	15

NA: not analyzed

QL: quantitation limit (using this as a generic term to correspond to the numerical value of the nondetect result)

LOQ: Limit of Quantitation (new for DoD QSM v. 4.1)

LOD: Limit of Detection (new for DoD QSM v. 4.1)

DL: Detection Limit (new definition from DoD QSM v. 4.1)

MS/MSD: matrix spike/matrix spike duplicate

LCS: laboratory control sample

RPD: relative percent difference

Appendix D
Biological Assessment for Removal of Munitions and Explosives of Concern

Biological Assessment for Removal of Munitions and Explosives of Concern

Piñeros and Cabeza de Perro Islands
Naval Activity Puerto Rico

Contract Task Order 172

December 2009

Prepared for

Department of the Navy
Base Realignment and Closure Program Management Office Southeast

Under the

LANTDIV CLEAN III Program
Contract N62470-02-D-3052

Prepared by

CH2MHILL

Chantilly, Virginia

Biological Assessment
for
Munitions and Explosives of Concern Removal
on Isla Piñeros, Puerto Rico

Prepared by: _____ Date 12/28/09
Richard Reaves, Ph.D.
Endangered Species Biologist
CH2M HILL

Reviewed by: _____ Date 01/06/10
James E. Anderson
Director, Navy BRAC PMO SE

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List of Acronyms and Abbreviations

BA	Biological Assessment
BIP	blow in place
ESA	Endangered Species Act
EFH	Essential Fish Habitat
GPS	global positioning system
MC	munitions constituents
MD	munitions debris
MEC	munitions and explosives of concern
MRA	munitions response area
MRS	munitions response site
NAPR	Naval Activity Puerto Rico
U.S.	United States
USN	United States Navy
USFWS	U.S. Fish and Wildlife Service

SECTION 1

Summary of Determinations

This United States Navy (USN) biological assessment (BA) has formulated a determination regarding the potential effects on the federally listed hawksbill sea turtle (*Eretmochelys imbricata*) from removal of munitions and explosives of concern (MEC) on Isla Piñeros in the following areas:

- Beach Areas
- Bunker Trail
- Land Crabbing Areas

USN also proposed to remove MEC from offshore areas near Isla Piñeros and Cabeza de Perro. The three sea turtle species, the West Indian manatee, and two protected species of coral may occur in or adjacent to underwater areas that will be subjected to MEC removal. However, because the onshore MEC removal will be accomplished independently of offshore MEC removal and because the onshore MEC removal would not adversely affect offshore species, potential impacts of underwater MEC removal are being addressed in a separate BA with the National Marine Fisheries Service.

The proposed work will require reclearing of vegetation in areas where vegetation was cleared for a geophysical investigation in 2006. Following reclearing of vegetation, geophysical anomalies identified as potentially representing subsurface MEC will be intrusively investigated by manual digging at the anomaly locations to a depth not greater than two feet in order to determine the source of each geophysical anomaly. MEC will be destroyed in place through the use of donor explosives placed around the MEC. All demolition locations will be covered with sandbags to mitigate the blast effects and to reduce the risk of shrapnel being ejected. Munitions debris (MD) will be collected and moved to a central location. If necessary for demilitarization, the MD will also be subjected to demolition with explosives at a designated location.

Previous studies conducted by Geo-Marine in 2002 and 2004 confirmed that the hawksbill sea turtle nests on Isla Piñeros, with a nesting period that typically occurs during the period June 1 through December 31. During the nesting period, sea turtles and their nests may be found landward within 50 meters of the high tide line on beaches, although typically not more than 25 meters landward of the beginning of vegetation. The topography of Isla Piñeros is such that the land typically begins either to ascend quickly or rapidly descends into mangrove swamp inside the vegetation line of the beaches. The U.S. Navy considers the beach and adjacent vegetation on Isla Piñeros to be comparable to the areas designated as Zone 2 beaches on Vieques, as defined in the Final Biological Assessment of the Former Live Impact Area within the Former Vieques Naval Training Range, Vieques, Puerto Rico (Geo-Marine, 2006) (see Attachment 1). Typical beaches on Pineros, as represented by Munitions Response Site (MRS)-03 (South Beach) and MRS-04 (Northeast Beach) are shown in Figures 3 and 4.

The leatherback and green sea turtles also may nest on the beaches of Isla Piñeros, but the amount of suitable beach habitat for nesting is limited on the island. Geo-Marine documented a single green sea turtle nesting on the island during their 2002 and 2004 surveys.

Should work occur during the June 1 through December 31 nesting period, a qualified biologist will inspect each beach for the presence of sea turtles prior to geophysical anomaly reacquisition, intrusive investigation of anomalies, and demolition of MEC on the beach. Daily beach surveys conducted by qualified biologists to identify whether sea turtles are using beaches on Isla Piñeros would begin two weeks prior to MEC reacquisition and demolition. This monitoring requirement is based upon the 2006 BA mitigation requirements specified for Zone 2 beaches in Vieques for the vegetation and munitions removal actions there. No work will be conducted until the beach is clear of turtles. Any active nests will be marked and a 100-meter protection zone will be created around each nest to prevent incidental damage during the planned investigation and demolition activities. No vegetation clearing or ordnance detonation would occur within the protection zone. Any active nests would be relocated if MEC discovered within the protection zone can not be moved to a safe detonation site. Relocation would be done by qualified biologists, whose qualifications would be verified by USFWS prior to commencing work. Relocation would be the minimum safe distance from the MEC location to allow detonation. Unless the relocation sites are designated by the USFWS, the relocation will occur to beaches where there would be no clearance or removal actions.

All work is planned during daylight hours, minimizing the possibility that hatchlings would emerge from the nests during working hours. However, a qualified biologist will examine the beach landing areas upon approach and no boats will be landed and no workers or equipment will be disembarked on beaches where hatchlings are observed.

The Virgin Islands tree boa and the Puerto Rican boa have not been found in Isla Piñeros and have likely been eliminated from the island, if they ever occurred there, because of the large number of rats present on the island. Because these species are not expected to occur on Isla Piñeros, no impacts to the species are anticipated and no surveys or mitigation measures are proposed.

The piping plover is known to winter in Puerto Rico, but it does not nest in the Caribbean. However, any use of Isla Piñeros by this species would be incidental and confined to the surf zone and beach areas. Any individuals would be expected to move away from MEC investigation areas because of the level of human activity involved. No impacts to the piping plover are anticipated.

The roseate tern, Caribbean brown pelican, and yellow-shouldered blackbird may occur on Isla Piñeros and use proposed MEC removal areas or adjacent habitats at Isla Piñeros, but these species would not be expected to nest on the island. Neither species was observed on the island during 2006 investigations. Prior to any MEC detonation near a lagoon, a qualified biologist will inspect the lagoon using 10X50 binoculars to determine whether either species is in or over the lagoon.

The yellow-shouldered blackbird is known to have nested near Isla Piñeros, with historical documentation of nesting at Roosevelt Roads. The yellow-shouldered blackbird was not

observed on Isla Piñeros during 2006 investigations, which were conducted during its nesting period. This species is not expected to occur on Isla Piñeros and no impacts to the yellow-shouldered blackbird are anticipated. Prior to any MEC detonation near a lagoon, a qualified biologist will inspect the lagoon using 10X50 binoculars to determine whether the species is in or over the lagoon.

Procedures, including surveys and work delays, are specified to prevent incidental impacts to protected bird species.

The USN requests United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) concurrence with the determination of findings of this analysis that the MEC investigation in the above-identified areas on Isla Piñeros are **not likely to affect** hawksbill sea turtle, leatherback sea turtle, green sea turtle, Virgin Islands tree boa, Puerto Rican boa, piping plover, roseate tern, brown pelican, and yellow-shouldered blackbird. Additionally, the proposed actions would not threaten the continued existence of these species.

The USN will continue to consult with USFWS and NMFS with regard to potential impacts from underwater MEC removal. Those actions will be addressed through a separate BA.

SECTION 2

Introduction

This document is being submitted to fulfill requirements under Section 7 of the Endangered Species Act (ESA). This BA by the USN addresses potential impacts to protected species associated with the investigation and demolition of potential subsurface MEC at Isla Piñeros, Puerto Rico. Previous consultation with USFWS identified three protected species of sea turtle, one protected snake species, and four protected bird species that could potentially be impacted by MEC removal on Isla Piñeros.

The hawksbill sea turtle (*Eretmochelys imbricata*), leatherback sea turtle (*Dermochelys coriacea*) and green sea turtle (*Chelonia mydas*) may use the beach areas or landward vegetation adjacent to the beaches for nesting. Hawksbill sea turtles are known to nest in vegetation on the landward side of beaches on Isla Piñeros. Leatherback and green sea turtles have been documented nesting on the northern beaches of Isla Piñeros and leatherback tracks have been found on the eastern and western beaches of the island. The Puerto Rican boa (*Epicrates inornatus*) and Virgin Islands tree boa (*Epicrates monensis granti*) are not known to be present on the island, but have the potential to occur there. The piping plover (*Charadrius melodus*), the roseate tern (*Sterna dougalii*), the Caribbean subspecies of brown pelican (*Pelecanus occidentalis occidentalis*), and the yellow-shouldered blackbird (*Agelaius xanthomus*) occur in Puerto Rico and nearby islands. These birds could utilize habitats on Isla Piñeros.

In addition to the sea turtles, the West Indian manatee (*Trichechus manatus*) and Elkhorn (*Acropora palmata*) and staghorn (*Acropora cervicornis*) corals can occur in the waters off of Isla Piñeros and Cabeza de Perro. No activities are proposed that would result in the investigation of underwater areas offshore of the island. Therefore, there is no potential to interact with or adversely affect marine species at sea, any areas of growing coral, or areas that may be designated as Essential Fish Habitat (EFH). Therefore, underwater impacts to marine species, corals, and EFH are not further considered in this BA.

During initial discussions with USFWS, it was determined that the potential for impacts to species other than sea turtles from the proposed investigations for MEC to be non-existent (activities would not occur when the species would be present on Isla Piñeros) or de minimis (temporary displacement). Accordingly, USFWS did not request inclusion of these additional species in the BA completed for the MEC investigations. However, USFWS specified that these species would be included in subsequent coordination with USFWS prior to implementation of MEC removal activities.

Isla Piñeros and Cabeza de Perro are located off the coast of Puerto Rico (Figure 1). These small islands were part of the former Roosevelt Roads Naval Station and were used for various military training exercises from the late 1950s until the closing of Roosevelt Roads in 2004. Naval Activity Puerto Rico (NAPR) was established to provide caretaker services for the facility on 1 April 2004.

The Department of the Navy anticipates transferring control of the Islands to an agency of the Commonwealth of Puerto Rico. Due to the past military operations, MEC are potentially

present on these islands. To facilitate transfer of the islands and future human use of parts of Isla Piñeros, the investigation of potential subsurface MEC, including in-place demolition of any MEC that may be found, will be conducted in the following areas that were the subject of a geophysical investigation in 2006:

- Beach Areas
- Bunker Trail
- Land Crabbing Areas

The USN proposes MEC removal to clear munitions from Isla Piñeros, which has the potential to impact protected species and associated habitats. The USN has developed a work plan for MEC removal that will accomplish MEC clearance goals while providing protection for protected and sensitive species that may occur on Isla Piñeros.

SECTION 3

Proposed Action

Munitions response activities at this munitions response area (MRA) will be conducted at seven munitions response sites (MRS), which are all located on Piñeros Island and shown on Figure 2:

- MRS-01 – South Bunker Trail
- MRS-02 – North Bunker Trail
- MRS-03 – South Beach
- MRS-04 – North East Beach
- MRS-05 – North West Beach
- MRS-06 – West Beach
- MRS-07 – West Crabbing Area

The USN proposes to investigate the 209 terrestrial geophysical anomalies that were identified through the 2006 field effort as representing potential MEC. The anomalies are located in the MRSs listed above. The USN proposes to use geophysical equipment to reacquire anomalies identified during the 2006 non-intrusive investigation and then dispose of the MEC with blow-in-place (BIP) procedures.

MD remaining after BIP would be collected and moved to a designated collection site. Should it be determined that MD remaining after BIP must be demolished with explosives, this would occur at the collection site. The designated MD collection site would be located to minimize potential impacts to sensitive species. A qualified biologist will locate the MD collection site in an area that is more than 100 meters from active sea turtle or bird nests. Further precautions to protect sensitive species, identified for BIP procedures below, would be implemented prior to demolition.

3.1 MEC Investigation on Beaches (MRS-03, -04, -05, -06)

Beaches on Isla Piñeros typically are less than 10 feet wide. Though small, these beaches could be used for sunbathing, picnicking, and locations from which to swim or snorkel. MEC demolition would be limited to the sandy beaches from the low tide line up to the edge of landward vegetation. No MEC removal or vegetation clearing would occur within the first ten meters of vegetation adjacent to the beaches. Work on a given beach will be completed in one or two days.

Following BIP demolition, the UXO team will inspect the MEC disposal site to ensure complete destruction of MEC. Following demolition, all large metallic fragments from the demolition will be collected for disposal and the UXO team will clean and restore the area.

Once anomalies are reacquired, the UXO team will intrusively investigate the source of each anomaly by using hand tools such as spades, trowels, shovels, pry bars. If MEC is discovered, BIP operations will be conducted.

Prior to conducting MEC investigations on beaches, a qualified biologist will inspect the beaches for the presence of sea turtles and sea turtle nests and signs of recent sea turtle activity. Any nests located during this survey would be recorded using mapping grade global positioning system (GPS) equipment and clearly marked with flagging. During anomaly reacquisition, personnel would avoid intrusion into nest areas while conducting geophysical investigations. Daily beach surveys conducted by qualified biologists to identify whether sea turtles are using beaches on Isla Piñeros will begin two weeks prior to MEC reacquisition and demolition and continue throughout the MEC removal process on beaches. This monitoring requirement is based upon the 2006 BA mitigation requirements specified for Zone 2 beaches in Vieques for the vegetation and munitions removal actions there.

If turtles are observed on a beach, no work will be conducted until the beach is clear of turtles. Any active nests will be marked and a 100-meter protection zone will be created around each nest to prevent incidental damage during the planned investigation and demolition activities. No vegetation clearing or ordnance detonation would occur within the protection zone. Any active nests would be relocated if MEC discovered within the protection zone or detonation would be delayed until after the eggs had hatched and the young had entered the sea. Relocation would be done by qualified biologists, whose qualifications would be verified by USFWS prior to commencing work. Relocation would be the minimum safe distance from the MEC location to allow detonation. Unless the relocation sites are designated by the USFWS, the relocation would occur to beaches where there would be no clearance or removal actions.

If a nest is relocated away from a BIP site, MEC demolition would not occur until after the nest is relocated.

Prior to ordnance demolition on beaches, a qualified biologist will check the beach and adjacent waters for the presence of protected bird species. If any protected bird species is in the area, MEC demolition will be delayed until after the animal(s) leave the area.

Immediately prior to demolition, a qualified biologist will scan the overhead sky for the presence of any birds. If birds are in flight within 100 meters of the detonation site, the detonation will be delayed until no birds are within 100 meters of the detonation site.

3.2 Remove MEC on Bunker Trail (MRS-01, -02)

USN proposes to remove MEC from areas along the North and South Bunker Trails where geophysical anomalies have been identified that represent potential subsurface MEC. All vegetation less than 4 inches in diameter would be removed within six inches of ground level to allow detection and removal of MEC. Due to rapid growth of vegetation in tropical climates, it is expected that the trails created during the 2006 non-intrusive investigation will need to be cleared again prior to MEC removal to allow for the use of geophysical equipment for anomaly reacquisition. Only the areas that were cleared for the 2006 investigation will be cleared for the current operations. No vegetation will be cleared within ten meters of the vegetation line at the edge of a beach. Vegetation will be removed using handheld tools, such as machetes and chain saws. Removal equipment will be operated to avoid disruption of possible MEC on the ground surface and will be equipped with

safeguards to protect the operator. Cut vegetation will be left in place. No trees greater than four inches in diameter will be removed.

No protected plant species were found in this corridor in 2006 and none are expected to have established since the initial clearing. Aggressive pioneering species would have most likely grown over the previously cleared path rather than rare plant species. Therefore, no impacts to protected plant species are anticipated and no additional vegetation surveys will be conducted.

Once geophysical anomalies are reacquired, the UXO team will intrusively investigate the source of each anomaly by using hand tools such as spades, trowels, shovels, pry bars. Hand excavation will be limited to within two feet of the surface due to the soil conditions and types of munitions used. If MEC is discovered, BIP operations will be conducted on it.

All fragments remaining after demolition, and other debris recovered from the intrusive investigation, will be collected for disposal and the UXO team will clean and restore the area.

The four protected avian species (piping plover, Caribbean brown pelican, roseate tern, and yellow-shouldered blackbird) could occur in or near areas where MEC removal activities would occur along the Bunker Trail. Prior to BIP of MEC, a qualified biologist will inspect the area to verify that no roosting species or active nests of these species are within 100 meters of the BIP site. If an active nest is found within 100 meters of the proposed BIP, the MEC removal will be delayed until after young have fledged.

Boats traveling from Puerto Rico to Isla Piñeros will have a qualified biologist on board to scan the water for presence of sea turtles or manatees. Boats in transit will not come within 500 feet of these species and will wait until the animals have moved from the boat's path before continuing. Boats will anchor off-shore in area free of seagrass or coral. Personnel and equipment will transfer between the boat and shore via unpowered rafts.

Where safety measures allow, any dry debris will be removed from the immediate BIP area to reduce the potential for fire.

Prior to ordnance demolition on beaches, a qualified biologist will check the beach and adjacent waters for the presence of protected bird species. If any protected bird species is in the area, MEC demolition will be delayed until after the animal(s) leave the area.

Immediately prior to demolition, a qualified biologist will scan the overhead sky for the presence of any birds. If birds are in flight within 100 meters of the detonation site, the detonation will be delayed until no birds are within 100 meters of the detonation site.

3.3 Remove MEC in land crabbing areas (MRS-07)

USN proposes to remove MEC from identified potential land crabbing areas where geophysical anomalies have been identified that represent potential subsurface MEC. The potential land crabbing areas occur along the beach ridge that extends into the mangrove swamp on the southwestern part of Isla Piñeros. All vegetation less than 4 inches in diameter would be removed within six inches of ground level to allow detection and removal of MEC. Due to rapid growth of vegetation in tropical climates, it is expected that

the trails created during the 2006 non-intrusive investigation will need to be cleared again prior to MEC removal to allow for the use of geophysical equipment for anomaly reacquisition. Only the areas that were cleared for the 2006 investigation will be cleared for the current operations. No vegetation will be cleared within ten meters of the vegetation line at the edge of the beach. Vegetation will be removed using handheld tools, such as machetes and chain saws. Removal equipment will be operated to avoid disruption of possible MEC on the ground surface and will be equipped with safeguards to protect the operator. Cut vegetation will be left in place. No trees greater than four inches in diameter will be removed.

Once geophysical anomalies are reacquired, the UXO team will intrusively investigate the source of each anomaly by using hand tools such as spades, trowels, shovels, pry bars. Hand excavation will be limited to within two feet of the surface due to the soil conditions and types of munitions used. If MEC is discovered, BIP operations will be conducted on it.

Where safety measures allow, any dry debris will be removed from the immediate BIP area to reduce the potential for fire.

All fragments remaining after demolition, and other debris recovered from the intrusive investigation, will be collected for disposal and the UXO team will clean and restore the area.

Boats traveling from Puerto Rico to Isla Piñeros will have a qualified biologist to scan the water for presence of sea turtles or manatees. Boats in transit will not come within 500 feet of these species and will wait until the animals have moved from the boat's path before continuing. Boats will anchor off-shore in area free of seagrass or coral. Personnel and equipment will transfer between the boat and shore via unpowered rafts.

Prior to conducting MEC investigations on beaches or immediately landward of beaches, a qualified biologist will inspect the beaches for the presence of sea turtles and sea turtle nests and signs of recent sea turtle activity. Any nests located during this survey would be recorded using mapping grade global positioning system (GPS) equipment and clearly marked with flagging. During anomaly reacquisition, personnel would avoid intrusion into nest areas while conducting geophysical investigations.

Daily beach surveys conducted by qualified biologists to identify whether sea turtles are using beaches on Isla Piñeros will begin two weeks prior to MEC reacquisition and demolition and continue throughout the MEC removal process on beaches. This monitoring requirement is based upon the 2006 BA mitigation requirements specified for Zone 2 beaches in Vieques for the vegetation and munitions removal actions there. If turtles are observed on a beach, no work will be conducted until the beach is clear of turtles. Any active nests will be marked and a 100-meter protection zone will be created around each nest to prevent incidental damage during the planned investigation and demolition activities. No vegetation clearing or ordnance detonation would occur within the protection zone. Any active nests would be relocated if MEC discovered within the protection zone or detonation would be delayed until after the eggs had hatched and the young had entered the sea. Relocation would be done by qualified biologists, whose qualifications would be verified by USFWS prior to commencing work. Relocation would be the minimum safe distance from the MEC location to allow detonation. Unless the relocation sites are

designated by the USFWS, the relocation would occur to beaches where there would be no clearance or removal actions. If a nest is relocated away from a BIP site, MEC demolition would not occur until after the nest was relocated. If a nest is relocated away from a BIP site, MEC demolition will not occur until after the nest was relocated.

Prior to ordnance demolition on beaches, a qualified biologist will check the beach and adjacent waters for the presence of protected bird species. If any protected bird species is in the area, MEC demolition will be delayed until after the animal(s) leave the area.

Immediately prior to demolition, a qualified biologist will scan the overhead sky for the presence of any birds. If birds are in flight within 100 meters of the detonation site, the detonation will be delayed until no birds are within 100 meters of the detonation site.

SECTION 4

Location and Setting Description

4.1 Location

Isla Piñeros is located in the Caribbean Sea, approximately one-half mile east of the former Roosevelt Roads Naval Station on the eastern coast of Puerto Rico (Figure 1).

4.2 Setting Description

Isla Piñeros is approximately 1 mile by 0.5 mile in size with an approximate area of 310 acres. The topography of Isla Piñeros is characterized by a series of smooth, round hills and low-lying swampy areas (Figure 2). The hills range in elevation from less than 70 feet in the northwest to 250 feet above MSL in the south-central portion of the island. The hills run generally in a southeast to northwest direction. These hills are generally very steep, with slopes of greater than 25% found on 45.3% (140.5 acres) and slopes of 15 to 25% on 13.6% (42.2 acres) of the island. Only approximately 12.6% (39 acres) of the surface area on Isla Piñeros consists of upland with slopes less than 15%. The remaining 28.5% (88.2 acres) of Isla Piñeros is low-lying mangrove swamp or brackish lagoon. The most significant area of swamp is located on the southwestern portion of the island, and two others are located in the northeastern portion of the island. Isla Piñeros is surrounded by mostly narrow (less than ten-foot-wide) sandy beaches, except where steep rock cliffs abut the ocean. Coral reefs border the north and east coastlines.

MEC removal would be limited to specified beaches and upland trails. No MEC removal will occur in the mangrove swamps or in the lagoons.

SECTION 5

Species Descriptions

5.1 Hawksbill Sea Turtle

The hawksbill is a small to medium-sized sea turtle. In the U.S. Caribbean, nesting females average 62 - 94 cm in straight carapace length. Weight is typically 43 - 75 kg. The following characteristics distinguish the hawksbill from other sea turtles: two pairs of prefrontal scales; thick, posteriorly overlapping scutes on the carapace; four pairs of coastal scutes; two claws on each flipper; and a beak-like mouth. The epidermal scutes that overlay the bones of the shell are the tortoiseshell of commerce. These epidermal scutes are unusually thick, and carpacial scutes are often richly patterned with irregularly radiating streaks of brown or black on an amber background. The scutes of the plastron of Atlantic hawksbills are usually clear yellow, with little or no dark pigmentation. The soft skin on the ventral side is cream or yellow, and may be pinkish-orange in mature individuals. The scales of the head and forelimbs are dark brown or black with sharply defined yellow borders. There are typically four pairs of inframarginal scales. The head is elongate and tapers sharply to a point. The lower jaw is V-shaped.

Hawksbills utilize different habitats at different stages of their life cycle. Posthatchling hawksbills occupy the pelagic environment, taking shelter in weedlines that accumulate at convergence points. Hawksbills reenter coastal waters when they reach approximately 20-25 cm carapace length. Coral reefs are the resident foraging habitat of juveniles, subadults and adults. This habitat association results from the hawksbill's diet of sponges, which need solid substrate for attachment. The ledges and caves of reefs provide shelter for resting both during the day and night. Hawksbills are also found around rocky outcrops and high energy shoals, which are also optimum sites for sponge growth. Hawksbills are may inhabit mangrove-fringed bays and estuaries, where coral reefs are absent. In Texas, juvenile hawksbills are associated with stone jetties.

Hawksbills utilize both low- and high-energy nesting beaches in tropical oceans of the world. Both insular and mainland nesting sites are known. Hawksbills will nest on small pocket beaches, and because of their small body size and great agility, can traverse fringing reefs that limit access by other species. They exhibit a wide tolerance for nesting substrate type. Nests are typically located landward of the beach under dense vegetation, which provides shade and cover.

The hawksbill occurs in tropical and subtropical seas of the Atlantic, Pacific and Indian Oceans. The species is widely distributed in the Caribbean Sea and western Atlantic Ocean, with representatives of at least some life history stages regularly occurring in southern Florida and the northern Gulf of Mexico (especially Texas); in the Greater and Lesser Antilles; and along the Central American mainland south to Brazil. Within the United States, hawksbills are most common in Puerto Rico and its associated islands, and in the U.S. Virgin Islands.

Nesting within the southeastern United States occurs principally in Puerto Rico and the U.S. Virgin Islands, the most important sites being Mona Island and Buck Island. Nesting also occurs on other beaches of St. Croix, and on Culebra Island, Vieques Island, mainland Puerto Rico, St. John and St. Thomas. Within the continental United States, nesting is restricted to the southeast coast of Florida and Florida Keys.

The hawksbill turtle was listed as endangered in 1970. It is a solitary nester, making population trends or estimates difficult. In 1983, the only known apparently stable populations were in Yemen, northeastern Australia, the Red Sea, and Oman. Commercial exploitation is the major cause of the continued decline of the hawksbill sea turtle. There is a continuing demand for the hawksbill's shell as well as other products including leather, oil, perfume, and cosmetics. Prior to being certified under the Pelly Amendment, Japan had been importing about 20 metric tons of hawksbill shell per year.

5.2 Leatherback Sea Turtle

The leatherback is the largest living turtle, and is so distinctive as to be placed in a separate taxonomic family, Dermochelyidae. The carapace is distinguished by a rubber-like texture, about 4 cm thick, and made primarily of tough, oil-saturated connective tissue. No sharp angle is formed between the carapace and the plastron, resulting in the animal being somewhat barrel-shaped. The average curved carapace length for adult turtles is 155 cm and weight ranges from 200-700 kg. Hatchlings are mostly black on the dorsal side; the flippers are margined in white, and rows of white scales appear as stripes along the length of the back. Hatchlings average 61.3 mm long and 45.8 g in weight. In the adult, the skin is black and scaleless. The undersurface is mottled pinkish-white and black. The front flippers are proportionally longer than in any other sea turtle, and may span 270 cm in an adult. In both adults and hatchlings, the upper jaw bears two tooth-like projections at the premaxillary-maxillary sutures. Age at sexual maturity is unknown.

The leatherback turtle's range extends from Cape Sable, Nova Scotia, south to Puerto Rico and the U.S. Virgin Islands. Critical habitat for the leatherback includes the waters adjacent to Sandy Point, St. Croix, U.S. Virgin Islands, up to and inclusive of the waters from the hundred fathom curve shoreward to the level of mean high tide. Nesting occurs from February - July with sites located from Georgia to the U.S. Virgin Islands. Leatherbacks prefer nesting on wide sandy beaches. During the summer, leatherbacks tend to be found along the east coast of the U.S. from the Gulf of Maine south to the middle of Florida.

The leatherback turtle was listed as endangered throughout its range in 1970. Nesting populations of leatherback sea turtles are especially difficult to discern because the females frequently change beaches. However, current estimates are that 20,000 - 30,000 female leatherbacks exist worldwide. Habitat destruction, incidental catch in commercial fisheries, the harvest of eggs and flesh are the greatest threats to the survival of the leatherback.

The recovery plan for the leatherback sea turtle concludes that nesting trends in the United States appear stable. Populations have declined in Mexico, Costa Rica, Malaysia, India, Sri Lanka, Thailand, Trinidad, Tobago, and Papua New Guniea. The collapse of these nesting populations was precipitated by a tremendous over harvest of eggs, direct harvest of adults, and incidental mortality from fishing. In the Atlantic and Caribbean, the largest nesting

assemblages are found in the U.S. Virgin Islands, Puerto Rico, and Florida. Nesting data for these locations have been collected since the early 1980's and indicate that the annual number of nests is likely stable; however, information regarding the status of the entire leatherback population in the Atlantic is lacking.

5.3 Green Sea Turtle

Adult green turtles may reach a size of 1 m long and 180 kg mass. The carapace is smooth and is colored gray, green, brown and black. The plastron is yellowish white. Hatchlings weigh about 25 g, and are about 50 mm long. Hatchlings are black on top and white on the bottom. Age at sexual maturity is estimated at 20-50 years.

In the southeastern United States, green turtles are found around the U.S. Virgin Islands, Puerto Rico, and the continental U.S. from Texas to Massachusetts. The primary nesting sites in U.S. Atlantic waters are along the east coast of Florida, with additional sites in the U.S. Virgin Islands and Puerto Rico. Nesting occurs on open sandy beaches with occasional nesting in beach vegetation.

The green sea turtle was listed as endangered/threatened in, 1978. The breeding populations off Florida and the Pacific coast of Mexico are listed as endangered while all others are threatened. Total population estimates for the green turtle are unavailable, and trends are particularly difficult to assess because of wide year-to-year fluctuations in numbers of nesting females, difficulties of conducting research on early life stages, and long generation time. The recovery team for the green turtle concluded that the species status has not improved appreciably since listing. The greatest cause of decline in green turtle populations is commercial harvest for eggs and food. Other turtle parts are used for leather and jewelry, and small turtles are sometimes stuffed for curios. Incidental catch during commercial shrimp trawling is a continuing source of mortality that adversely affects recovery.

5.4 Virgin Islands Tree Boa

The Virgin Islands tree boa is a blotched brown semi-arboreal snake restricted to a number of islands from Puerto Rico eastward into the British Virgin Islands. The Virgin Islands tree boa lives in subtropical dry forests where it hunts at night and captures lizards while they sleep in trees. During the day, it remains in termite nests or under rocks and debris. There are no current estimates of the number of Virgin Island boas, but they are rare and their extremely disjunct current distribution indicates past extirpation from islands and overall population decline.

Large-scale habitat destruction and the introduction of exotic mammalian predators caused severe population declines. The Indian mongoose, feral and domestic cats, and two rat species predate on eggs and young and adult boas. The small, uninhabited cays and islets where the species has become concentrated are vulnerable to inundation from oceanic storms.

The Virgin Islands tree boa was listed as Threatened in 1970. The species is known from Isla Culebra, Puerto Rico but not from Isla Piñeros. Surveys conducted in 2006 during MEC

investigations did not locate the Virgin Islands tree boa on the island. Isla Piñeros has a large population of exotic rats and the presence of large numbers of these pests makes it unlikely that the species would survive on the island.

5.5 Puerto Rican Boa

The Puerto Rican boa is the largest snake native to Puerto Rico, reaching lengths of 6 to 9 feet. The color of the boa is variable, usually ranging from tan to very dark brown (sometimes grayish), with 70-80 dorsal blotches (indistinct cross-bars) from neck to vent. The Puerto Rican boa is nocturnal and remains dormant throughout the day, retreating to caves, rocky areas along streams, or trees for concealment during the day. Adult prey items include small mammals, birds, and bats. Juveniles feed on smaller prey items including lizards and insects.

Large-scale habitat destruction and the introduction of exotic mammalian predators are considered the likely causes of population declines, although human predation to obtain their oil as a folk remedy. Introduced rats and feral cats predate upon the eggs and young.

The Virgin Islands tree boa is listed as Endangered. The species is known from Isla Culebra, Puerto Rico, and Vieques, but is not known from Isla Piñeros. Surveys conducted in 2006 during MEC investigations did not locate the Puerto Rican boa on the island. Isla Piñeros has a large population of exotic rats and the presence of large numbers of these pests makes it unlikely that the species would survive on the island.

5.6 Piping Plover

The piping plover is a small, stocky, sandy-colored bird resembling a sandpiper. Adults have yellow-orange legs, a black band across the forehead from eye to eye, and a black ring around the base of the neck. It runs in short starts and stops and blends into the sandy habitat on outer beaches where it feeds and nests when it is stationary.

Population decline in this species resulted from multiple factors. Development has decreased coastal habitat and has resulted in increased numbers of predators such as raccoons, skunks, and foxes. Human disturbance, vehicular and on foot, disrupts nesting and can result in brood failure. Pets, especially dogs, may harass the birds during foraging and nesting and domestic and feral cats will predate on plover eggs and chicks.

The piping plover was listed under the Endangered Species Act in 1986. Subsequent recovery has more than doubled the population, but the Atlantic population remains at fewer than 2,000 pairs. The piping plover breeds on coastal beaches from Newfoundland and southeastern Quebec to North Carolina. These birds winter primarily on the Atlantic Coast from North Carolina to Florida, although some migrate to the Bahamas and West Indies. There are winter occurrences recorded from Puerto Rico, but the species does not nest in there.

5.7 Roseate Tern

The roseate tern is a medium-sized, colonial-nesting, marine waterbird with a worldwide distribution. It is a slender bird with a typical body length of 35 - 40 cm. It has a deeply forked tail with white streamers, 15 - 25 cm in length, and a wingspan of approximately 60 cm. Upper and lower body surfaces are paler than that of the common tern (*S. hirundo*), which is similar in appearance. Both common terns and roseate terns have a dark carpal bar over the bend of the wing in winter plumage, although it is slightly lighter in roseate terns

The North American subspecies is divided into two breeding populations, one in the northeastern United States and Nova Scotia, and the other in the southeastern United States and islands of the Caribbean Sea. Roseate terns are distributed throughout the Caribbean, with the largest populations in the Lesser Antilles. Population numbers are not known, but estimated at 3,000 to 6,000 breeding pairs for the region. There was an estimated 25 percent decline in population from 1976 to 1979.

The Caribbean breeding population of the roseate tern was listed as Threatened in 1987. Caribbean roseate terns typically select sparsely vegetated, rocky offshore islands for nesting, although they may nest on sandy beaches. Foraging typically occurs in the surf along beaches. Predation of eggs and birds, as well as poaching of eggs and adults for human consumption, are the major threats to this species. Disturbance early may cause nest abandonment or exposure of eggs to extreme temperatures. Winter habitat is concentrated along the north and northeastern coasts of South America. It is not known if the two populations of the North American subspecies winter in proximity.

5.8 Caribbean Brown Pelican

The brown pelican is a large dark gray-brown water bird with white about the head and neck. The Caribbean subspecies resembles the eastern subspecies, but the Caribbean brown pelican has a darker non-breeding plumage and darker undersurface plumage during breeding than the eastern brown pelican. The species can weigh up to 8 pounds and have a wingspan of over 7 feet.

Brown pelicans typically nest in colonies in mangrove trees, or similarly sized vegetation, on small coastal islands. Ground nesting also may occur. Tree nests are well built from sticks, reeds, straw, palmetto leaves, and grasses. Ground nests may be .made of similar materials, or may be on bare ground. The Caribbean brown pelican begins nesting between May and August and nesting peaks during September through November. Normal clutch size for the brown pelican is three eggs. Males and females share in incubation and rearing duties. The Caribbean brown pelican occurs in the West Indies and other Caribbean Islands and to Guyana and Venezuela in South America.

In Puerto Rico, the brown pelican is known to breed at nine sites located at Anasco on the west coast, Montalva Bay on the southwestern coast, and at Cayo Conejo, off Vieques Island on the southeastern coast. Foraging is primarily in shallow estuarine waters and the species

seldom ventures more than 20 miles from the coast. Sand spits and offshore sand bars are used extensively as daily loafing and nocturnal roost areas.

The brown pelican was listed as threatened in 1970. On February 20, 2008, the USFWS proposed delisting the species due to its rangewide recovery. Food appears to be the dominant factor affecting the Caribbean brown pelican populations. The timing and success of the breeding cycle is closely linked to alternating but unpredictable periods of food abundance and scarcity. Most breeding occurs in the U.S. Virgin Islands, but adult and juvenile pelicans migrate to Puerto Rico after nesting, presumably to exploit more predictable food resources in extensive estuarine and mangrove systems. Young pelicans frequently remain in Puerto Rico for 5 years before their first breeding. Adults seem to remain in Puerto Rico until they meet pre-breeding nutritional requirements and return to breeding colonies. The most serious man-induced threats to the Caribbean brown pelican are poaching of eggs, young, and adults; human disturbance; entanglement in fishing gear; and loss or degradation of mangrove forests.

5.9 Yellow-Shouldered Blackbird

There are two subspecies, *Agelaius xanthomus xanthomus*, known only from Puerto Rico and formerly from Vieques Island, and *Agelaius xanthomus monensis*, which occurs only on Mona and Monito Islands. The yellow-shouldered blackbird is a medium-sized (20 to 23 centimeters) glossy black bird with yellow epaulets. Male and female plumage is similar. Immature birds are a duller than adults and have a brown abdomen. The yellow epaulets are usually edged with a narrow white margin.

The breeding season extends from April through August and appears to coincide with onset of spring rains. The yellow-shouldered blackbird is monogamous, with pairing beginning 6 to 10 weeks prior to breeding. Pairs display site fidelity and re-establish nests in areas used in previous years. Yellow-shouldered blackbirds nest in scattered mangroves and in cavities in dead trees and stumps.

The yellow-shouldered blackbird was listed as endangered in 1976 and critical habitat was designated for the species. Isla Piñeros is not within or near any of the designated critical habitat in Puerto Rico. The yellow-shouldered blackbird was widespread and abundant in Puerto Rico and Mona Island until the 1940s. Loss of habitat, predation by exotic mammals (cats and rats), and brood parasitism by the shiny cowbird have since contributed to its drastic decline in numbers, estimated at more than 80 percent reduction in population size.

SECTION 6

Effects of Proposed Action Implementation

Nine federally protected species were identified as having potential to occur on Isla Piñeros. Based on current environmental conditions on the island, particularly the abundance of rats that would be potential predators, the USN has determined that the Virgin Islands tree boa and the Puerto Rican boa are unlikely to occur on the island. No adverse affect to this species would be expected. Therefore, the Virgin Islands tree boa and the Puerto Rican boa are not further discussed.

The activities described under the Proposed Action have the potential to affect the other seven federally protected species that may occur on Isla Piñeros: hawksbill sea turtle, leatherback sea turtle, green sea turtle, piping plover, roseate tern, Caribbean pelican, and the yellow-shouldered blackbird. These federally listed species may occur on Isla Piñeros, either as transients, residents, or seasonal nesters, during the period when MEC removal would be conducted. Therefore, the effects analysis in this document focuses on the elements associated with each activity and their potential impacts to these species. The following discussion of potential impacts is divided by individual activities.

6.1 Remove MEC on Beaches

During the period June through December, hawksbill sea turtles may come ashore on Isla Piñeros to nest, but is also is possible that hawksbills may come ashore on Isla Piñeros outside of the typical breeding times. When coming ashore, hawksbills may be encountered on the beaches as they cross the beach to reach nesting habitat in the dense vegetation landward of the beaches. Typically, these beach crossings will occur at night and personnel engaged in MEC investigations on beaches would not encounter turtles. To assure that hawksbills are not disturbed by MEC investigations, each beach will be visually scanned for the presence of turtles moving from sea to nest sites or returning to the sea. If hawksbills are observed on the beach, no activity will occur until all observed turtles have returned to the sea.

Beaches would be accessed by boat. The Navy proposes to use up to two boats (approximately 35 ft in length) and one dinghy in conducting the MEC removal. Boats would not anchor in areas where seagrass or sponges occur.

Should work occur during the June 1 through December 31 nesting period, daily beach surveys will be conducted by qualified biologists to identify whether sea turtles are using beaches on Isla Piñeros beginning two weeks prior to MEC reacquisition and demolition and continue throughout the MEC removal process on beaches. This monitoring requirement is based upon the 2006 BA mitigation requirements specified for Zone 2 beaches in Vieques for the vegetation and munitions removal actions there. If turtles are observed on a beach, no work will be conducted until the beach is clear of turtles.

All beach MEC removal will occur within the open beach area and no intrusion into the vegetation landward of the beach would occur. Prior to conducting MEC removal on

beaches, a qualified biologist will inspect the beaches for the presence of sea turtles and sea turtle nests and signs of recent sea turtle activity. The names and qualifications of all biological survey personnel will be submitted to USFWS for approval in advance of any work. Any nests located during this survey would be recorded using mapping grade global positioning system (GPS) equipment and clearly marked with flagging. Data collected during beach surveys would be collected on standard Puerto Rico Department of Natural and Environmental Resources (DNER)/USFWS forms and all data would be submitted to USFWS when field work is complete.

During anomaly reacquisition, personnel would avoid intrusion into nest areas while conducting geophysical investigations. If a nest is within 100 feet of an anomaly, the nest will be relocated away from the detonation site prior to MEC removal or MEC removal will be delayed until after young had hatched and entered the sea. Relocation would be done by qualified and permitted biologists. The qualifications of these biologists would be verified by USFWS and the Puerto Rico DNER prior to commencing work. An appropriate permit from the Puerto Rico DNER would be obtained in advance of any relocations. Unless the relocation sites are designated by the USFWS, the relocation would occur to beaches where there would be no clearance or removal actions. Relocation would be the minimum safe distance from the MEC location to allow detonation.

Because all of the procedures described above would be implemented, the proposed activity is not likely to affect the hawksbill sea turtle.

Green and leatherback sea turtles may nest on the beaches of Isla Piñeros. A qualified biologist would survey beaches for signs of sea turtle activity and sea turtle nests prior to any MEC removal activities. Any nests located during this survey would be recorded using mapping grade global positioning system (GPS) equipment and clearly marked with flagging. During anomaly reacquisition, personnel would avoid intrusion into nest areas while conducting geophysical investigations. If a nest is within 100 feet of an anomaly, the nest will be relocated away from the BIP site prior MEC removal or MEC removal will be delayed until after young had hatched and entered the sea. Relocation would be done by qualified and permitted biologists. The qualifications of these biologists would be verified by USFWS and the Puerto Rico DNER prior to commencing work. An appropriate permit from the Puerto Rico DNER would be obtained in advance of any relocation. Relocation would be the minimum safe distance from the MEC location to allow detonation. Unless the relocation sites are designated by the USFWS, the relocation would occur to beaches where there would be no clearance or removal actions. Because these procedures will be fully implemented, the proposed activity is not likely to affect leatherback and green sea turtles.

Prior to ordnance detonation within 200 meters of beaches, a qualified biologist will check the area and adjacent waters for the presence of protected bird species. If any protected bird species is in the area, MEC detonation will be delayed until after the animal(s) leave the area.

Immediately prior to detonation, a qualified biologist will scan the overhead sky for the presence of any birds. If birds are in flight within 100 meters of the BIP site, the detonation will be delayed until no birds are within 100 meters of the BIP site.

Where safety measures allow, any dry debris will be removed from the immediate BIP area to reduce the potential for fire.

Because these procedures would be fully implemented, the proposed activity is not likely to affect piping plover, Caribbean brown pelican, roseate tern, and yellow-shouldered blackbird.

6.2 Remove MEC on Bunker Trail

The proposed Bunker Trail would extend from the westernmost beach on the northern shore of Isla Piñeros to the beach in the southwestern corner of the island, crossing through a World War II bunker on the highest hill on the island along the route. MEC removal along this route would have the potential to impact hawksbill sea turtles only within ten meters landward of the vegetation line of the two beaches, as the species would not occur farther inland. Additionally, the potential for impact would be likely to occur only during the peak nesting period of June 1 through December 31.

No vegetation would be cleared within ten meters of the vegetation line on a beach. Prior to any MEC disposal within 110 meters of beach shore, a qualified biologist will investigate to determine whether any sea turtle nests are in beachside vegetation within 100 meters of a proposed BIP site. If a sea turtle nest is discovered within 100 meters of a proposed disposal site, the nest would be relocated or the MEC would be left in place until after the young had hatched and hatched and entered the sea. Relocation would be done by qualified biologists, whose qualifications would be verified by USFWS prior to commencing work. Relocation would be the minimum safe distance from the MEC location to allow detonation. Unless the relocation sites are designated by the USFWS, the relocation would occur to beaches where there would be no clearance or removal actions.

Because all of the procedures described above would be implemented, the proposed activity is not likely to affect the hawksbill sea turtle.

Neither leatherback nor green sea turtles would occur along the bunker trail, except at the beaches at either end of the trail. MEC removal in those areas was addressed in Section 6.1. No additional impacts to these species would result and no additional mitigation is proposed. The proposed activity is not likely to affect leatherback and green sea turtles.

The four protected avian species (piping plover, Caribbean brown pelican, roseate tern, and yellow-shouldered blackbird) could occur in or near areas where MEC removal activities would occur along the Bunker Trail. Prior to BIP of MEC, a qualified biologist will inspect the area to verify that no roosts or active nests of these species are within 100 meters of the BIP site. If protected birds are roosting within 100 meters of the proposed BIP, the MEC removal will be delayed until after the roosting birds have left the area. If any active nests are found within 100 meters of the proposed BIP, the MEC removal will be delayed until after young have fledged.

Prior to ordnance detonation within 200 meters of beaches or lagoons, a qualified biologist will check the area and adjacent waters for the presence of protected bird species. If any protected bird species is in the area, MEC detonation will be delayed until after the animal(s) leave the area.

Immediately prior to detonation, a qualified biologist will scan the overhead sky for the presence of any birds. If birds are in flight within 100 meters of a detonation site, the detonation will be delayed until no birds are within 100 meters of the detonation site.

Where safety measures allow, any dry debris will be removed from the immediate BIP area to reduce the potential for fire.

Because these procedures would be fully implemented, the proposed activity is not likely to affect piping plover, Caribbean brown pelican, roseate tern, and yellow-shouldered blackbird.

6.3 Remove MEC in land crabbing areas

The potential land crabbing area is landward of the beach on the western shore of the island. MEC removal along this route would only have the potential to impact hawksbill sea turtles within ten meters landward of the vegetation line of the beaches adjacent to the land crabbing areas, as the species would not occur farther inland. Such impact would be likely to occur only during the peak nesting period of June 1 through December 31.

No vegetation clearing would occur within 10 meters landward of the vegetation line. Prior to any MEC removal within 110 meters of beach shore, a qualified biologist will investigate to determine whether any sea turtle nests are in beachside vegetation within 100 meters of a proposed BIP site. If a sea turtle nest is discovered within 100 meters of a proposed BIP site, the nest will be relocated or the MEC would be left in place until after the young had hatched and hatched and entered the sea. Relocation would be done by qualified biologists, whose qualifications would be verified by USFWS prior to commencing work. Relocation would be the minimum safe distance from the MEC location to allow detonation. Unless the relocation sites are designated by the USFWS, the relocation would occur to beaches where there would be no clearance or removal actions.

Because all of the procedures described above would be implemented, the proposed activity is not likely to affect the hawksbill sea turtle.

Neither leatherback nor green sea turtles would occur in the land crabbing areas. No impacts to these species would result and no mitigation measures are proposed. The proposed activity is not likely to affect leatherback and green sea turtles.

The four protected avian species (piping plover, Caribbean brown pelican, roseate tern, and yellow-shouldered blackbird) could occur in or near MEC removal activities in land crabbing areas. Prior to establishing a MEC disposal site, a qualified biologist will inspect the area to verify that no roosts or active nests of these species are within 100 meters of the proposed BIP site. If protected birds are roosting within 100 meters of the proposed BIP, the MEC removal will be delayed until after the roosting birds have left the area. If any active nests are found within 100 meters of the proposed BIP, the MEC will be left until after young have fledged.

Prior to ordnance detonation within 200 meters of beaches or lagoons, a qualified biologist will check the area and adjacent waters for the presence of protected bird species. If any protected bird species is in the area, BIP will be delayed until after the animal(s) leave the area.

Immediately prior to detonation, a qualified biologist will scan the overhead sky for the presence of any birds. If birds are in flight within 100 meters of the BIP site, the BIP will be delayed until no birds are within 100 meters of the site.

Where safety measures allow, any dry debris will be removed from the immediate BIP area to reduce the potential for fire.

Because these procedures would be fully implemented, the proposed activity is not likely to affect piping plover, Caribbean brown pelican, roseate tern, and yellow-shouldered blackbird.

SECTION 7

Conclusion

The USN proposes to conduct removal of MEC on Isla Piñeros in the following areas:

- Beach Areas
- Bunker Trail
- Land Crabbing Areas

The proposed work will result in demolition of identified MEC on beaches, in the land crabbing areas, and along the Bunker Trail. Prior to MEC detonation in the land crabbing areas and along the Bunker Trail, vegetation clearing also may be required to establish ground visibility.

The hawksbill sea turtle may nest on Isla Piñeros during the period June 1 through December 31. During the nesting period, sea turtles may be found landward within 50 meters of the high tide line on beaches. The USN requests USFWS concurrence with the determination of findings of this analysis that the MEC removal in the above-identified areas on Isla Piñeros are **not likely to affect** hawksbill sea turtle and would not threaten the continued existence of the species.

Leatherback and green sea turtles may nest on the beaches of Isla Piñeros. No intrusive activities would occur on beaches or underwater during MEC investigations in these areas. The USN requests USFWS concurrence with the determination of findings of this analysis that the MEC removal in the above-identified areas on Isla Piñeros are **not likely to affect** leatherback and green sea turtles and would not threaten the continued existence of these species.

The Virgin Islands tree boa and Puerto Rican boa would not occur on Isla Piñeros. The MEC removal would not affect these species. The USN requests USFWS concurrence with the determination of findings of this analysis that the MEC removal in the above-identified areas on Isla Piñeros are **not likely to affect** the Virgin Islands tree boa and Puerto Rican boa and would not threaten the continued existence of these species.

The piping plover may occur on Isla Piñeros as a winter resident or transient. MEC removal may result in temporary displacement of animals, but would not adversely affect this species. The USN requests USFWS concurrence with the determination of findings of this analysis that the MEC removal in the above-identified areas on Isla Piñeros are **not likely to affect** piping plover and would not threaten the continued existence of this species.

The roseate tern and the Caribbean brown pelican may occur on Isla Piñeros during the period when MEC removal is proposed. MEC removal activities, including detonations, may result in temporary disturbance to and relocation of animals foraging near the MEC removal and disposal sites. Procedures that would be implemented during MEC removal operations would prevent adverse impacts to these species. The USN requests USFWS concurrence with the determination of findings of this analysis that the MEC removal in the above-identified areas on Isla Piñeros are **not likely to affect** the roseate tern, Caribbean

brown pelican, or yellow-shouldered blackbird and would not threaten the continued existence of these species.

As mentioned above, the USN will consult with NMFS on proposed underwater MEC removal near Isla Piñeros. This consultation will result in development of a work plan that will accomplish MEC clearance goals while providing protection for aquatic protected species through avoidance or mitigation. The consultation with NMFS will address the marine species identified above that may utilize the waters near Isla Piñeros and Cabeza de Perro.

SECTION 8

Review of Literature and Other Information

All pertinent literature was reviewed. The following summary indicates the primary references utilized during preparation of this biological assessment.

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U.S. Fish and Wildlife Service. 2006. U.S. Fish and Wildlife Service Division of Endangered Species, Species Accounts: West Indian Manatee. http://www.fws.gov/enangered/i/a/saa0c.html. Website accessed January 31, 2006.

U.S. Fish and Wildlife Service. 1999. South Florida Multi-Species Recovery Plan: The Birds, Roseate Tern (4-429 through 4-444). U.S. Fish and Wildlife Service, Atlanta, GA. Southeast Region.

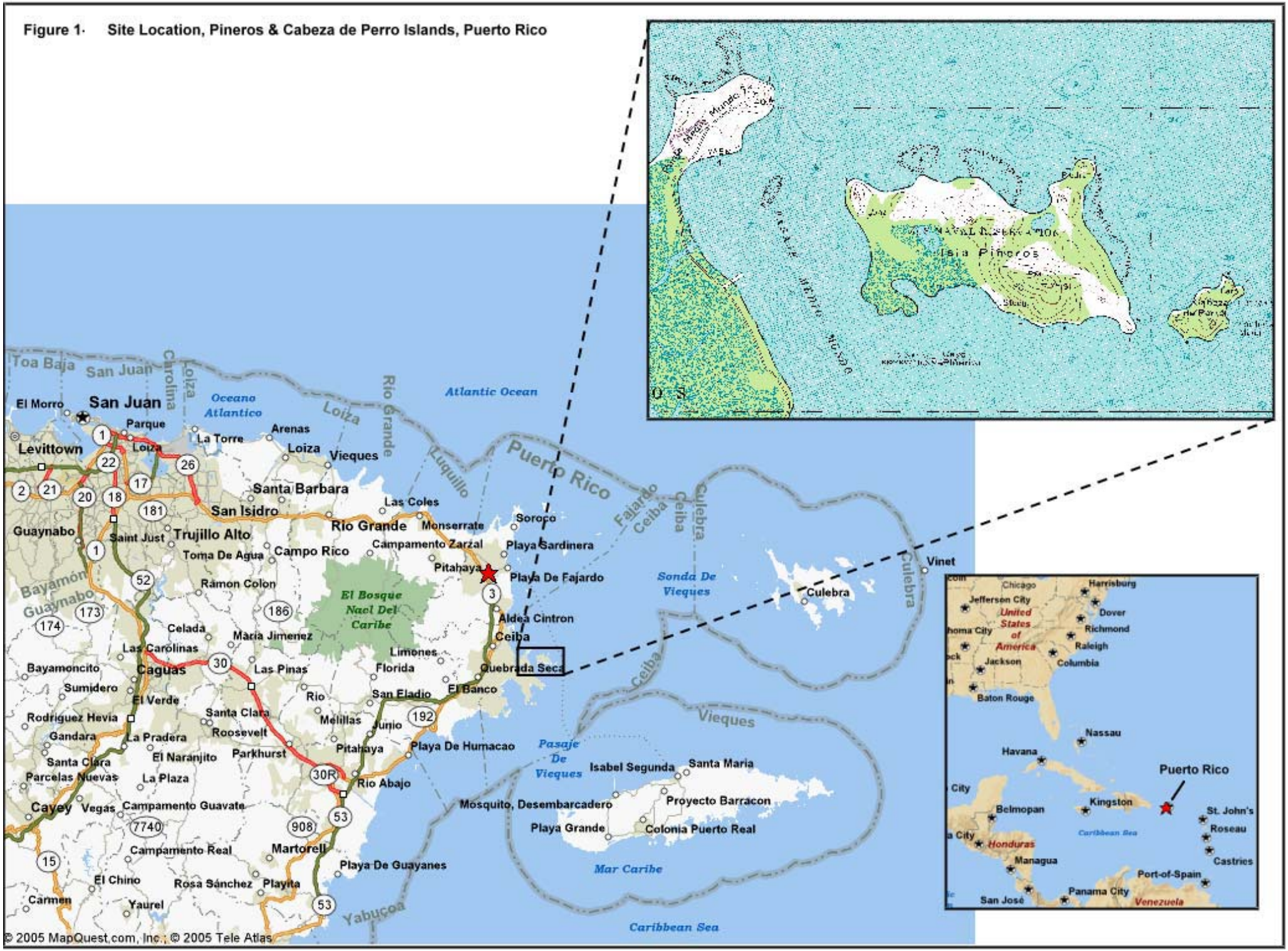
U.S. Fish and Wildlife Service. 1996. Piping Plover (*Charadrius melodus*) Atlantic Coast Population Revised Recovery Plan. Prepared by the Atlantic Coast Piping Plover Recovery Team for the U.S. Fish and Wildlife Service Region Five Hadley, Massachusetts

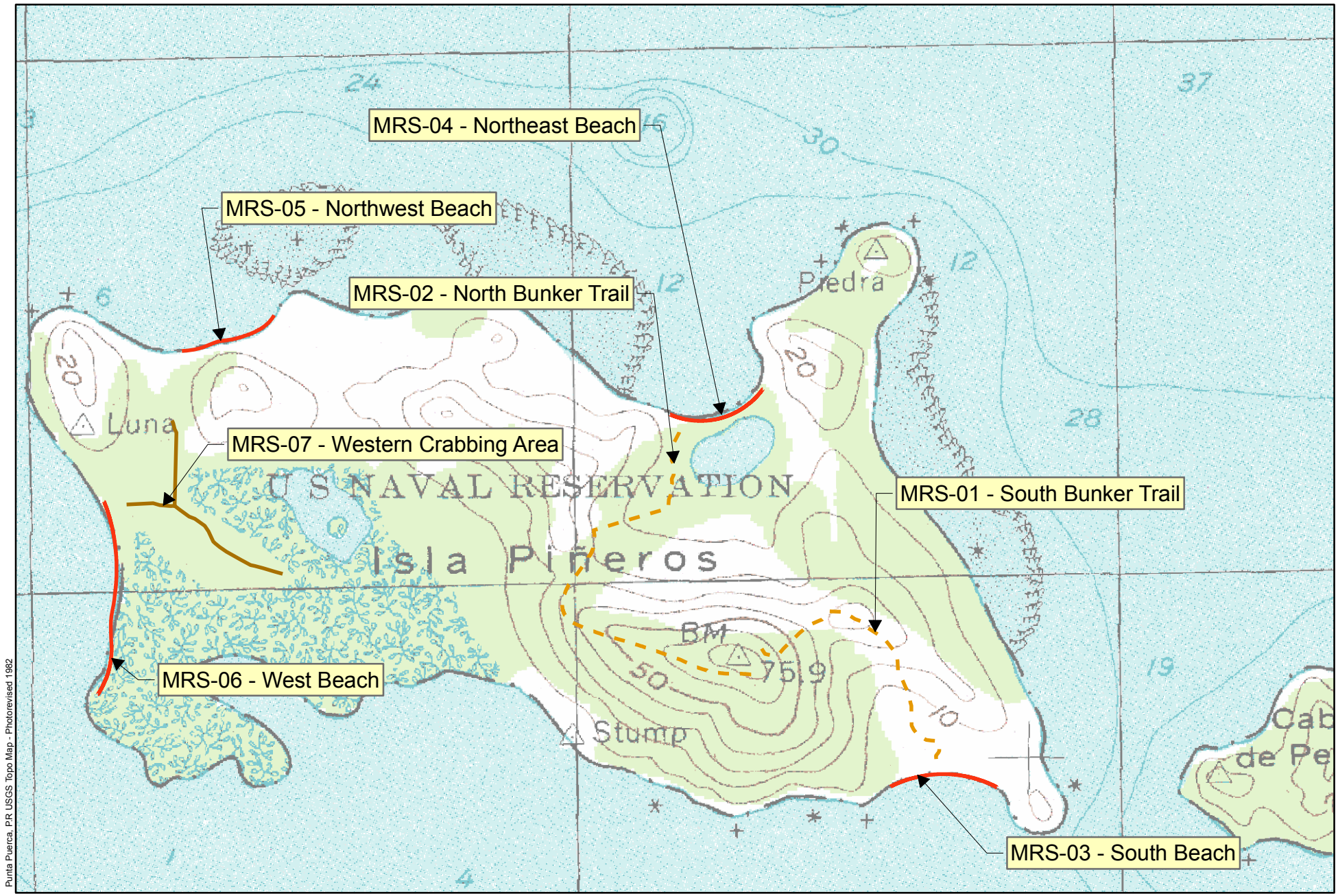
U.S. Fish and Wildlife Service. 1996. Yellow-Shouldered Blackbird Revised Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, GA. Southeast Region. Prepared by: Boqueròn Field Office, Boqueròn, Puerto Rico

U.S. Fish and Wildlife Service. 1993. Recovery Plan: Caribbean Roseate Tern ('Sterna dougallii'). U.S. Fish and Wildlife Service, Atlanta, GA. Southeast Region.

U.S. Fish and Wildlife Service. 1986. Virgin Islands Tree Boa Recovery Plan, U.S. Fish and Wildlife Service, Atlanta, Georgia. 23 pp

Figure 1· Site Location, Pineros & Cabeza de Perro Islands, Puerto Rico





N

0 200 400 800

Feet

1 inch equals 800 feet

- Accessible Beach
- Trail
- Other Geophysical Investigation Areas

Figure 2

Munitions Response Sites

Pineros & Cabeza de Perro Islands, Naval Activity Puerto Rico

CH2MHILL

File Path: G:\projects2\PinerosIsland\MXDs\Munitions_Response_Sites.mxd, Date: January 31, 2008 9:29:43 AM, User: JKELLY3

Figure 3. MRA-03, South Beach

Figure 4. MRA-04, Northeast Beach

3.3.8 Vegetation Removal and Munitions Detonation Zones for Sea Turtle Nest Avoidance

Three work zones would be established to ensure sea turtle nest avoidance during vegetation removal and munitions detonations within the former LIA (**Figure 3-2; Figure 3-3**).

- Zone 1: No restrictions; sea turtle nesting is not expected within this area. Zone 1 begins at the westernmost boundary of the former LIA, moves through the interior to the easternmost boundary adjacent to eastern conservation area. From the interior of the former LIA, Zone 1 moves to the outer edge of the 70-m Hawksbill nesting habitat, or to cliffs and other topographical boundaries (**Figure 3-2**). During aerial surveys conducted from 2000 through 2003, only one Hawksbill nest was recorded at 70 m from the high tide line on Tamarindo Sur (see **Figure 6-2;** DON 2001).

  Establish construction activities and vegetation removal set backs to protect suitable nesting habitat for the endangered hawksbill sea turtles in areas adjacent to Zone 1. The same approach will be implemented for light installation, fencing, vehicular traffic, and other activities.

- Zone 2: Minor restrictions; 1 to 3 historical sea turtle nesting events have occurred within this zone. Zone 2 includes the northern beaches of Playa Icacos (Beach no.'s B-25 through B-28), Playa Salinas (Beach no.'s B-22 through B-24), Fosil (Beach no. B-21), and southern beaches between the western point of Bahía Salina del Sur and Tamarindo Sur (Beach no.'s B-8 through B-10; **Figure 3-2**). The morning of scheduled vegetation removal or munitions detonation, Zone 2 beaches will be surveyed by experienced or trained personnel for active sea turtle nests. The beaches will be surveyed twice weekly until the vegetation removal or ordnance detonation action is completed. If nests are not present on Zone 2 beaches, detonation activities can be scheduled.

  Experienced or trained personnel will conduct pedestrian avoidance surveys before the scheduled removal and/or detonation action. Twice weekly pedestrian avoidance surveys, performed every 3 to 4 days, will be conducted each morning for active sea turtle nests on the Zone 2 beaches until ordnance or vegetation removal actions are completed. In the event an active sea turtle nest is found during the pedestrian survey, a decision will be made to either leave the nest *in-situ* or relocate the nest. If the nest is left *in-situ*, a 100 yard (yd) (91 m) protection zone, based on the USFWS 2001 Biological Opinion, will be established around the nest and no ordnance will be detonated. Establish a vegetation removal protection zone, by beach, based on the Hawksbill sea turtle nesting habitat **(Table 3-2)**. Vegetation will be removed using machetes if sea turtle nests are present. The experienced or trained personnel will monitor Zone 2 beaches, daily, until the hatchlings vacate the nest or the nest is no longer viable.

- Zone 3: Major restrictions; 4 or more historical sea turtle nesting events occurred within this area. Zone 3 includes the northern beaches of Playa de Barco (Beach no.'s B-19 and B-20), Playa Brava (Beach no.'s B-15 through B-18), and the southern beaches of Bahía Salina del Sur (Beach no.'s B-1 through B-5) and Tamarindo Sur (Beach no.'s B-11 through B-14; **Figure 3-2**). Avoidance surveys for sea turtle tracks and nests will be conducted in Zone 3.

  Experienced or trained personnel will conduct pedestrian avoidance surveys beginning 75 days prior to the scheduled start date for any removal and/or detonation action. Surveys will be conducted each morning for active sea turtle nests on the Zone 3 beaches until ordnance or vegetation removal actions are completed. In the event an active sea turtle nest is found during the pedestrian survey, an exclusion zone will be established and no ordnance will be detonated or vegetation removed within the exclusion zone. The experienced or trained personnel will monitor the Zone 3 beaches, daily, until the hatchlings vacate the nest or the nest is no longer viable.

In Zone 2 and Zone 3, vegetation removal within the hawksbill sea turtle nesting habitat will not occur during the peak nesting season from June to mid December. Based on observations, the hawksbill sea turtle nesting habitat varies from 10 m to 25 m from the edge of the woody vegetation. If leatherback

and/or green sea turtle nests are left *in situ*, vegetation removal activities will not occur within 10 meters of the landward edge of the nest track. Vegetation will be removed using machetes if sea turtle nests are present.

7.0 CONSERVATION OR MITIGATION MEASURES

The following measures would be implemented to prevent, minimize, or otherwise mitigate potential adverse impacts of the proposed action on federally listed threatened or endangered species.

7.1 SEA TURTLES

Three work zones would be established to ensure sea turtle nest avoidance during vegetation removal and munitions detonations within the former LIA.

- Zone 1: No restrictions; sea turtle nesting is not expected within this area.
- Zone 2: Minor restrictions. The morning of scheduled vegetation removal or munitions detonation, Zone 2 beaches will be surveyed by experienced or trained personnel for active sea turtle nests. The beaches will be surveyed twice weekly until the vegetation removal or ordnance detonation action is completed. Surveys would cover both the open sand and the area below the vegetation.
- Zone 3: Major restrictions. Experienced and trained personnel would conduct pedestrian avoidance surveys beginning 75 days prior to the scheduled start date for any removal action. Surveys will be conducted each morning for active sea turtle nests on the Zone 3 beaches until ordnance or vegetation removal actions are completed.

The following measures would be performed before, during, and after vegetation removal or ordnance detonation activities.

7.1.1 Pre-Vegetation Removal or Ordnance Detonation Mitigation Measures

- Establish construction activities and vegetation removal set backs to protect suitable nesting habitat for the endangered hawksbill sea turtles in areas adjacent to Zone 1. The same approach would be implemented for light installation, fencing, vehicular traffic, and other activities (USFWS 2006).
- Based on the sea turtle nesting habitats observed, **Table 3-2** established the set backs on all former LIA beaches. Based on the hawksbill sea turtle nesting habitat, instead of the high tide line, measuring and flagging the set back on these beaches will be measured landward from the edge of the exiting woody vegetation since the high tide line changes daily (USFWS 2006).

7.1.2 Mitigation Measures during Vegetation Removal or Ordnance Detonation

- Comply with vegetation removal and munitions detonation zones for sea turtle nest avoidance protocols outlined in **Section 3.3.8**, **Figure 3-2, and Figure 3-3**.
- Experienced and trained personnel would conduct morning pedestrian surveys, based on the suitable nesting habitat for the endangered hawksbill sea turtles in areas adjacent to Zone 1, Zone 2, and/or Zone 3 criteria and for active sea turtle nests of the beach(es) scheduled for ordnance or vegetation removal. In Zone 2 and Zone 3, surveys would cover both the open sand and the area below the vegetation.
- Experienced and trained personnel will monitor Zone 2 beaches twice a week and Zone 3 beaches, daily, until the nest hatches or the nest is no longer active.
  - The experienced and trained personnel will identify the nest by species, mark the nest using GPS, and identify, record, and mark any new sea turtle nests, and report observations to the USN and USFWS.
- On Zone 2 and Zone 3 beaches, when nests are found, each nest will either be relocated or a 100 yd (91 m) protection zone would be established around the nest (USFWS 2001).
- When Leatherback and/or green turtle nests are left *in situ*, a vegetation protection zone will be designated around the nest and marked with flagging tape (8 meters from the nest in Zone 2 and 10 meters from the nest in Zone 3). Vegetation removal outside the protection